

Construction and validity evidence of online course content on cardiopulmonary resuscitation of the newborn*

Construção e evidências de validade de conteúdo de curso *on-line* sobre reanimação cardiopulmonar do recém-nascido

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 Hévila Ferreira Gomes Medeiros Braga¹

 Antônio Marcos de Souza Soares¹

 Antônio Carlos da Silva Barros¹

 Flavia Paula Magalhães Monteiro¹

 Regina Cláudia de Oliveira Melo²

 Leidiane Minervina Moraes de Sabino¹

 Emanuella Silva Joventino Melo¹

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¹Universidade da Integração Internacional da Lusofonia Afro-Brasileira. Redenção, CE, Brazil.

²Universidade Federal do Ceará. Fortaleza, CE, Brazil.

Corresponding author:

Hévila Ferreira Gomes Medeiros Braga
Rua Vicente Leite, 1500 - Aldeota.
CEP: 60170-151. Fortaleza, CE, Brazil.
E-mail: hevila.medeiros.hm@gmail.com

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ASSOCIATE EDITOR: Luciano Marques dos Santos 

ABSTRACT

Objective: to develop and validate the content validity of an online course on cardiopulmonary resuscitation for newborns, intended for nursing staff. **Methods:** an applied research study on technological development conducted in two stages: development of the online course and validation by nine experts—five from the health field and four from the fields of Distance Education, Virtual Learning Environments, and Moodle—as well as the target audience, consisting of 50 nursing professionals. The Content Validity Coefficient and descriptive statistics were used. **Results:** the course was divided into seven modules, including a diagnostic evaluation, learning units on the cardiopulmonary neonatal resuscitation, post-resuscitation care, and a summative assessment. The content validity was 0.99 among health and technical experts, and 0.97 among nursing professionals, demonstrating the appropriateness of the content and technical aspects, as well as the target audience's acceptance of the educational technology. **Conclusion:** the online course demonstrated evidence of content validity among experts and the target audience, establishing itself as a potentially useful educational strategy for improving nursing practice in neonatal cardiopulmonary resuscitation. **Contributions to practice:** this technology can support continuing education initiatives and the standardization of care protocols in neonatology.

Descriptors: Education, Distance; Educational Technology; Cardiopulmonary Resuscitation; Infant, Newborn; Nursing.

RESUMO

Objetivo: construir e verificar as evidências de validade de conteúdo de curso *on-line* sobre reanimação cardiopulmonar do recém-nascido para profissionais da equipe de enfermagem. **Métodos:** pesquisa aplicada de desenvolvimento tecnológico conduzida em duas etapas: construção do curso *on-line* e validação por nove *experts*, sendo cinco da área da saúde e quatro da área de Educação a Distância/Ambiente Virtual de Aprendizagem/Moodle, além do público-alvo, composto por 50 profissionais de enfermagem. Utilizou-se o Coeficiente de Validade de Conteúdo e estatística descritiva. **Resultados:** o curso foi estruturado em sete módulos, contemplando avaliação diagnóstica, unidades de aprendizagem sobre reanimação cardiopulmonar neonatal, cuidados pós-reanimação e avaliação somativa. O Coeficiente de Validade de Conteúdo foi de 0,99 entre os *experts* da saúde, 0,99 entre os *experts* da área técnica e 0,97 entre os profissionais de enfermagem, demonstrando adequação do conteúdo, aspectos técnicos e aceitação da tecnologia educacional pelo público-alvo. **Conclusão:** o curso *on-line* apresentou evidências de validade de conteúdo junto aos *experts* e público-alvo, configurando-se como estratégia educacional potencialmente útil para o aperfeiçoamento da enfermagem em reanimação cardiopulmonar neonatal. **Contribuições para a prática:** a tecnologia poderá apoiar ações de educação permanente e padronização das condutas assistenciais em neonatologia.

Descritores: Educação a Distância; Tecnologia Educacional; Cardiopulmonary Resuscitation; Recém-Nascido; Enfermagem.

Introduction

Cardiopulmonary arrest in newborns is a sudden condition characterized by the cessation of the heartbeat and breathing⁽¹⁾. In neonates, this condition is often related to an inadequate transition from the intrauterine to the extrauterine environment or to anatomical and physiological immaturity⁽²⁾.

In 2024, approximately 2.3 million children worldwide died within the first 28 days of life, accounting for 47% of all deaths among children under five years of age⁽³⁾. Given this, it is essential to have trained healthcare professionals available to care for newborns, providing immediate and follow-up care and, when necessary, performing neonatal resuscitation⁽²⁾.

In this context, the nursing team plays a crucial role, often being the first to identify emergency signs and initiate cardiopulmonary resuscitation (CPR) maneuvers. In situations of cardiopulmonary arrest, the actions of the nursing team in advanced life support is essential to reverse the condition, searching to restore oxygenation and spontaneous circulation, as well as ensuring the return of neurological functions and minimizing sequelae⁽⁴⁾.

The impact that CPR performed by trained healthcare professionals can have on neonatal mortality is evident, since this care, when provided quickly and effectively, prevents deaths and, consequently, can improve the quality of life for the child and their family⁽⁵⁾. In this context, the proper performance of neonatal cardiopulmonary resuscitation requires not only speed and efficiency in care but also continuous scientific updating, clinical reasoning, and specific technical skills on the part of the professionals responsible for caring for the newborn.

A study on nurses' perceptions of cardiopulmonary arrest management in the Neonatal Intensive Care Unit (NICU) presented data showing that the main challenges reported are related to the lack of up-to-date training for healthcare professionals on the subject, the absence of a visible protocol, and an excess of staff present during CPR⁽⁶⁾.

Furthermore, optimizing the approach to CPR in hospitalized newborns is considered an important issue, given that many newborns in the NICU exhibit cardiopulmonary instability that progresses to cardiorespiratory arrest, with an incidence 10 times higher in hospitalized newborns than at birth⁽⁷⁾. Thus, continuing education strategies focused on neonatal CPR are essential for keeping professionals up to date, strengthening clinical competencies, and improving neonatal patient safety.

To this end, Information and Communication Technologies (ICTs), in the context of distance learning, have been used to enhance the skills of nursing professionals, including in CPR courses, as they facilitate adaptation to users' contexts, situations, and time availability, provide supplementary educational resources, and offer diverse ways of presenting content⁽⁸⁾. This modality also broadens access to training, allowing professionals to participate in educational activities without having to take time off from work—a particularly relevant aspect in neonatal care.

In this scenario, the distance education (DE) courses, especially those developed in Virtual Learning Environments, have been highlighted as promising strategies for permanent education in health. They offer students flexibility and autonomy, facilitating the continuous professional updating of healthcare professionals without compromising their patient care activities. In addition, they enable repeated access to the content of the course, allowing professionals to review procedures and updates according to their learning needs.

Despite the growth of online educational strategies in the health field, there are still few courses specifically aimed at improving the nursing staff's skills in cardiopulmonary resuscitation of newborns in a hospital setting, as well as studies presenting evidence of the validity of these educational technologies. This limits the availability of reliable educational resources to support continuing education initiatives in this area. Given this, the objective of this study was to develop and validate the content validity of an onli-

ne course on cardiopulmonary resuscitation for newborns, intended for nursing staff.

Methods

Type of study

This is an applied research project on technological development conducted in two stages: 1) development of the online course; and 2) verification of content validity by experts and the target audience. The Digital Educational Material Development Model was followed to develop the course, which proposes five sequential phases: analysis and planning; modeling (conceptual, navigation, and interface); implementation; evaluation and maintenance; and distribution⁽⁹⁾. These stages took place from May 2023 to August 2024.

Online course construction

During the analysis and planning phase, the course topic, educational objectives, and resources were defined. A diagnostic analysis was conducted with nursing professionals from neonatal units, selected through non-probabilistic convenience sampling by publicizing the study in messaging app groups for healthcare professionals working in neonatal care. Participants included professionals working in neonatal intensive care units (NICUs), Conventional Neonatal Intermediate Care Units, and pediatric emergency departments, with the aim of identifying learning needs and content relevant to the course. In addition, the instructional content was developed in accordance with guidelines from the American Heart Association (AHA)⁽¹⁰⁾, Pediatric Advanced Life Support (PALS)⁽¹¹⁾, and the Neonatal Resuscitation Program of the Brazilian Society of Pediatrics⁽²⁾.

During the modeling phase, the course was organized into learning units with videos, images, and questionnaires. The H5P (Course presentation) tool was used, an open-source, HTML5-based platform that presents interactive content in slides, with hyperlinks

and hypertext to access supplementary materials.

The course assessment process included three stages: diagnostic (pre-test), formative (questionnaires for each unit), and summative (post-test). Two educational videos were developed and included in the course: Video 1: Cardiac massage and ventilation in newborns, recorded in an on-site NICU simulation environment with the participation of the researchers; Video 2: Preparation and administration of epinephrine, recorded in the university's clinical simulation laboratory. Both were narrated, subtitled, and edited using Canva®.

All instructional materials were organized and formatted using the Unilab Virtual platform, the virtual learning environment of the *Universidade da Integração Internacional da Lusofonia Afro-Brasileira* (UNILAB) (University of International Integration of Afro-Brazilian Lusophony), through the use of an editor profile that allowed the researcher to structure the course, make content available, insert activities, and manage the entire pedagogical implementation within the virtual environment. It should be noted that support was also provided by the specialized team at the university's Institute of Distance Education, which is responsible for the strategy and production of instructional materials for distance learning.

Evidence of content validity

After the course was developed and implemented on the platform, it was validated by experts. Nine professionals participated, including five from the health field and four from the technical field, selected through non-probabilistic convenience sampling. Participants were recruited through the researchers' professional and academic networks and invited individually via e-mail. The selection of experts was based on criteria that included academic background, professional experience, and scientific output⁽¹²⁾. The study included professionals with experience in child health, neonatal health, and cardiopulmonary resuscitation, as well as judges with expertise in distance

education (DE), online courses, and the use of the Moodle Virtual Learning Environment (VLE).

Data collection was conducted via Google Forms® by email, with the following documents submitted: Free and Informed Consent Form (FICF) for participants to sign, a questionnaire to characterize the experts (academic and professional data), a validation instrument adapted to the theme of this study⁽¹³⁾, a link to access the online course, and instructions for logging in and navigating the course. The assessment was conducted in a single round, with each expert completing the instruments only once.

Healthcare experts evaluated the educational technology using a questionnaire consisting of items organized into the domains of objectives, structure and presentation, relevance, and environment, which were answered on a four-point Likert scale, along with a space for suggestions and comments. They also evaluated the course questionnaires in terms of organization, clarity, and objectivity, using dichotomous responses (Yes/No). Meanwhile, technical experts evaluated the technology using a questionnaire that addressed aspects of functionality, usability, and efficiency, and also included space for suggestions for improvements. After analyzing the evaluations, all suggestions deemed relevant were incorporated, resulting in the first version of the course, which was then submitted for evaluation by the target audience.

Fifty nursing staff members, including nurses and nursing technicians, participated in the target audience evaluation. The inclusion criteria were: working in neonatal intensive care units, medium-risk nurseries, mother-baby rooms, emergency departments, or urgent care units. Professionals who were absent from work due to vacation or leave during the evaluation period were excluded. Participants were recruited through posters promoting the study displayed at healthcare facilities and by sharing the link to the study in messaging groups for teams working in newborn care units. Professionals from healthcare facilities located in Fortaleza, Ceará, and in the municipalities of the Baturité Massif, Ceará, participated.

Data collection was realized by the FICF and two forms posted on the online course platform. Initially, participants read and signed the FICF before accessing the study materials. Upon completion of the course, each participant completed the assessment instruments once. The first form was designed for the collection of sociodemographic and professional data, while the second, administered at the end of the course, used a 24-item instrument covering six dimensions: interaction and stimulation; interest and motivation to learn; dedication, discipline, and time management; communication tools; course quality; and the student's role in the learning process⁽¹⁴⁾.

In addition, participants answered a supplementary questionnaire developed by the researchers, consisting of questions regarding content comprehension, clarity of language, use of teaching resources, difficulties encountered during the course, and suggestions for improvement. A question was also included to assess the relevance of each course unit, rated on a four-point scale (1 = not relevant; 2 = requires major revision; 3 = requires minor revision; 4 = relevant).

Data analysis

The data were organized in Microsoft Excel® and analyzed using IBM SPSS Statistics, version 29.0.2.0. The characteristics of the participants, both experts and the target audience, were described using descriptive statistics, including absolute and relative frequencies of the responses obtained. Content validity was estimated using the individual Content Validity Coefficient (CVCi) and total Content Validity Coefficient (CVCt), calculated based on the average of the scores assigned by the raters to each item, with values greater than 0.80 considered adequate.

Ethical aspects

This study was submitted to and approved by the Research Ethics Committee of the University of International Integration of Afro-Brazilian

Lusophony, under Opinion No. 6.428.083/2023 and Certificate of Submission for Ethical Review: 29622220.4.0000.5576.

Results

The online course titled “Cardiopulmonary Resuscitation of the Newborn” was posted in the section dedicated to continuing education courses at: <https://virtual.unilab.edu.br/course/index.php?categoryid=34>. Its objective was to enhance the knowledge of nursing professionals in caring for newborns experiencing in-hospital cardiopulmonary arrest.

During the analysis and planning phase, 21 nurses from neonatal units identified the main topics for the online course: medication administration, chest compressions, positive-pressure ventilation, step-by-

step resuscitation, and defining the role of each healthcare professional in neonatal CPR.

Based on this phase and on content developed in accordance with current resuscitation guidelines, the online course was organized into seven modules, including introductory discussions (with a study guide, supplementary material, email support, and a pre-test with 10 questions); five learning units (introductory concepts for identifying cardiorespiratory arrest in newborns; characteristics of a high-performance team; care for neonatal ventilation; chest compressions and medications; post-resuscitation care); and final discussions (a post-test with 10 questions and certification for those who score at least 7 points), totaling 60 hours of course load.

On the initial screen of the course, an infographic was inserted illustrating the learning path throughout the modules (Figure 1).

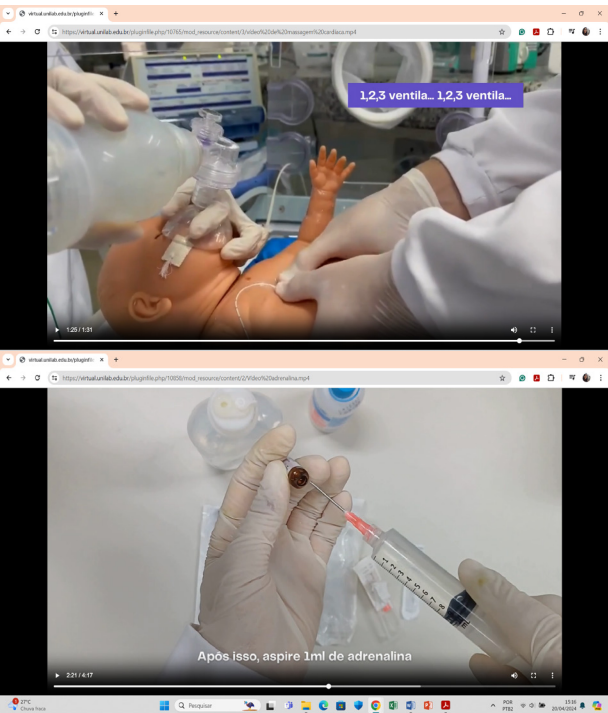


Note: the illustrations above (screenshots from the mobile app) were only available in Portuguese

Figure 1 – Infographic of the main course screen. Redenção, CE, Brazil 2024

As for the videos, the first one addressed the chest compression-ventilation ratio and lasted one minute and thirty-one seconds, while the second de-

monstrated the preparation and administration of epinephrine and lasted four minutes and seventeen seconds (Figure 2).



Note: the illustrations above (screenshots from the mobile app) were only available in Portuguese

Figure 2 – Simulation video on the relationship between chest compression, ventilation, and adrenaline administration. Redenção, CE, Brazil 2024

The course was structured sequentially, demanding that the participant must conclude each module to move forward, but allowing them to revisit previous content. The interface used soft colors, dark fonts, and original or public-domain images (Pixabay®, Freepik®, and Canva®), with all sources properly credited.

The pre-test was set up for a single attempt with no immediate review, to avoid memory bias in the post-test. After completing the course and taking the post-test, participants will have access to complete feedback on their performance.

In the second stage, five healthcare professionals participated (all women, aged 28 to 42 years [mean 33.8; ± 6.0] with 1 to 10 years of professional experience), with practical experience (60%) and/or academic output (80%) in the subject area; 60% were specialists in pediatric/neonatal nursing. In addition, four experts in DE/Moodle VLE (all men, aged 30 to 44 years (mean 35.5; ± 5.9) with 5 to 11 years of profes-

sional experience) participated. Their work involved systems analysis, the design of virtual classrooms, and hypermedia for DE (distance education).

Health experts assigned the course a total CVC score of 0.98. In addition, the questionnaires used for the course’s diagnostic, formative, and summative assessments received 100% positive agreement from the experts regarding their organization, objectivity, and clarity (Table 1).

Table 1 – Evaluation of the online course by health experts (n=5). Redenção, CE, Brazil 2024

Objectives	CVCi*
Addresses the topic effectively.	1.00
The contents are appropriate with the course proposal.	1.00
Correctly explains the purpose of the course.	1.00
It highlights the key aspects.	1.00
Structure and presentation	
The Student Guide provides clear information about interaction and the teaching-learning process.	1.00
The course content accurately addresses the topic.	1.00
The course promotes integration between the contents.	1.00
Up-to-date content, with appropriate references.	1.00
The information is correct from a scientific point of view.	0.95
Adequate and well-distributed number of classes and topics.	0.95
The sequence of units is clear, structured and adequate.	1.00
The language used is accessible to the target audience.	1.00
Audiovisual materials complement the textual content.	1.00
Intuitive navigation, no risk of confusion for the target audience.	0.90
Evaluations provide an adequate review of the material.	1.00
Relevance	
Emphasizes the care of the newborn who needs resuscitation.	1.00
Provides knowledge about newborn resuscitation to the target audience.	1.00
Clarifies the main stages of newborn resuscitation.	1.00
Encourages critical reflection on the subject.	1.00
It is important for the complementary training of the target audience.	1.00
Suitable for offer as an extension course on the Unilab/Virtual platform†.	1.00
Environment	
The platform is suitable for content presentation.	1.00
Attractive and clear homepage with good student support.	1.00
Platform features fit for learning.	1.00
Platform tools favor learning.	1.00
Meets usage expectations and course objectives.	1.00
CVC‡	0.99

*Content Validity Coefficient per item; †Virtual learning platform of the University of International Integration of Afro-Brazilian Lusophony; ‡Total Content Validity Coefficient

Healthcare experts made suggestions related to: the clarity and standardization of the content; the appropriateness of the terminology used; improvements to the wording of certain passages; the or-

ganization and formatting of the material; as well as improvements to the virtual learning environment's interface, including adjustments to image display, the tracking of user progress and performance, and navigation between course sections. All suggestions were reviewed and implemented.

As for the distance education experts, they rated all criteria as adequate, with a total CVC of 0.99, indicating an appropriate course (Table 2).

Table 2 – Evaluation of the online course developed in the Moodle virtual learning environment by distance education specialists (n=4). Redenção, CE, Brazil 2024

Functionality	CVCi*
The course is capable of generating positive results.	1,00
The resources made available in the course are adequate.	1,00
The course utilizes the platform's resources efficiently.	1,00
Usability	
The course is easy to navigate.	1,00
It is easy to learn the concepts used and their applications.	1,00
The amount of information entered on each screen is adequate.	1,00
Provides information clearly.	1,00
Graphic design is user-friendly.	0,93
The design of the environment is intuitive, engaging, and user-friendly.	1,00
The font type and font size of the content are appropriate.	0,93
Visuals make it easier to understand and learn.	1,00
It's easy to learn how to use the educational resource.	1,00
Intuitive feature with clear steps for activities.	1,00
Efficiency	
Proposed time appropriate to the content presented.	1,00
The number of classes and topics is consistent with the proposed time.	1,00
Organization into topics makes it easier to understand and find the themes.	1,00
Resources are used appropriately.	1,00
Resources are used efficiently and understandably.	1,00
CVCt†	0,99

*Content Validity Coefficient per item; †Total Content Validity Coefficient

The technical experts presented suggestions relate to the usability and visual presentation of the technology, recommending adjustments to the colors of the interface to improve the contrast between text and buttons, as well as changing the font color to enhance readability. All suggestions were accepted and incorporated into the first version of the course.

The course was then made available for evaluation

by nursing professionals. Fifty members of the nursing staff participated, including 26 (52%) nurses and 24 (48%) nursing technicians. The majority were female (92%), self-identified as mixed-race (84%), aged between 26 and 35 years (mean 33.4; $\pm$ 7.9 years), had between 5 and 10 years of training (42%) (mean 5.03; $\pm$ 4.44 years) and worked primarily in high-complexity units (48%).

The evaluation of the target audience showed satisfaction with the online course and high agreement on the assessed aspects, resulting in a total CVC of 0.97 (Table 3).

Table 3 – Evaluation of the online course by nursing professionals (n=50). Redenção, CE, Brazil 2024

Interaction and stimulation	CVCi*
The environment facilitates interaction and interest in the subject	0.95
The environment enables learning situations	0.96
The online course allows you to freely navigate the content	0.95
The activities are relevant and meet the proposed objectives	0.97
Access to the modules is easy	0.93
The online course instigates/invites change in behavior and attitude	0.94
Interest motivation to learn	
The online course motivates you to learn about cardiopulmonary resuscitation of the newborn	1.00
The course features readings and supplementary notes on course content	0.99
The course stimulates the desire to study beyond the content presented	1.00
Dedication, discipline and time management	
During access to the course, a schedule was organized for course activities	0.96
During access to the course, there was self-discipline for online teaching	0.96
During access to the course, there was access to the modules with the proposed regularity	0.96
Communication tools	
The online course sparks the exchange of information with colleagues	0.93
The links provided are relevant to the learning content	0.99
An email was used to clarify doubts about the content	0.95
Course	
The course is explanatory and easy to understand	0.99
The content is well divided between the modules	0.98
The information is presented in a logical and coherent way	0.99
The writing style is easy to understand	0.99
The colors and size of the letters are suitable	0.98
Images contribute to learning	0.99
Media correlate with content and complement texts	0.99
Student's role in the learning process	
You consider yourself to have freedom in the construction of your knowledge	0.98
You believe that you are responsible for your learning process	0.99
CVCt†	0.97

*Content Validity Coefficient per item; †Total Content Validity Coefficient

As for the assessment of the relevance of the learning units, this was considered 100% satisfactory by the participants rated it as satisfactory. The overall evaluation of the course was predominantly positive, but there were suggestions for improvement, such as the inclusion of clinical cases, a more in-depth treatment of mechanical ventilation, the creation of discussion forums, greater clarity regarding access to the course on the platform, and the implementation of in-person practical classes. The suggestions were incorporated into the final version of the course, with the exception of in-person practical classes, as they were not compatible with the distance education model.

Discussion

The construction of an online course is a complex and challenging process, as it involves the integration of various fields of knowledge, such as the health topic being addressed, pedagogical principles, digital design, layout, and the teaching learning process. Thus, the integration of these elements contributed to the online course focused on neonatal resuscitation being deemed valid and, ultimately, made available to the target audience.

The proposed online course offers unlimited access to content, with flexibility in terms of time, pace, and location of study. This feature is important in the context of continuing education in health, given the need to expand strategies for professional development that are compatible with the work schedules of nursing professionals. Thus, through virtual environments, it is possible to create interactive and engaging learning spaces, leading to positive effects on students' knowledge, skill acquisition, and perception⁽¹⁵⁻¹⁶⁾, making learning increasingly independent and flexible.

In addition, the course was elaborated according to the needs of the target audience, as identified in the situational diagnostic study conducted beforehand. Incorporating the target audience's needs helps ensure a closer alignment between the course content and the practical demands of the profession, thereby enhan-

cing the technology's relevance and applicability.

To complement the theoretical content videos demonstrating technical procedures, such as chest compressions, ventilation, and the administration of epinephrine, were included. The use of these audiovisual resources was considered strategic for visually illustrating key steps in neonatal care, bringing the presented content closer to clinical reality. These resources, such as the videos, facilitate understanding and memorization through visual and auditory stimuli, which promotes knowledge retention and skill development, especially in healthcare training, where the combination of theoretical knowledge and practical demonstration is essential⁽¹⁷⁻¹⁸⁾.

The course also incorporated various assessment strategies, including diagnostic, formative, and summative assessments. This structure makes it possible to track student progress throughout the course and provides feedback to students. In distance learning, instructional materials and reinforcement activities are essential elements for guiding the teaching-learning process⁽¹⁹⁾, and the course structure, which incorporates various educational resources, including videos, formative assessments, and supplementary materials, is aligned with evidence indicating that digital technologies are most effective when they combine different teaching methods capable of promoting active student participation⁽¹⁹⁻²⁰⁾.

About the evidence of the course's validity, this is considered a fundamental step to ensure that the course meets the necessary requirements for the target audience. Both health experts and those in the distance learning/Moodle field assigned a CVC above 0.80 to all evaluated items, which demonstrates that the course is an appropriate and functional learning environment. These results reinforce the idea that the development of technologies must consider not only the scientific quality of the content but also pedagogical aspects that influence the user experience and the achievement of educational objectives.

Healthcare experts gave a positive evaluation of the course's objectives, structure, and presentation, highlighting its clarity, accuracy, and an approach appro-

appropriate to the course's purpose, given that resuscitation courses must follow up-to-date guidelines to ensure clinical safety. In distance education courses, clearly defined objectives are essential for guiding content, methodology, and assessment, as well as for helping students understand the competencies, they are expected to develop throughout the training program⁽²¹⁾. In this sense, the consensus among the experts observed in these evaluated domains suggested that there was alignment between the educational objectives, the content covered, and the teaching strategies used.

Similarly, the organization of the course into learning units and sequential activities was considered appropriate by the experts, indicating that this structure facilitates student progression throughout the course. Information organized in a logical and gradual manner facilitates the assimilation of content and contributes to greater engagement, especially in virtual environments⁽²²⁾. In the context of neonatal resuscitation, which involves decision-making and the performance of complex procedures, the didactic organization can promote understanding of the different stages of care.

In addition to content quality, aspects related to the interface and technology performance are also key factors in the suitability of online courses. The appeal, clarity, and suitability of virtual platforms are fundamental to user satisfaction and course retention, since a pleasant and well-organized interface facilitates navigation and provides a more dynamic user experience⁽²³⁾. Furthermore, functionality, usability, and efficiency make resources more accessible and intuitive, allowing students to focus on the content rather than on technical difficulties⁽²⁴⁾. In this regard, the consensus among technical experts indicated that the course met these requirements. It was emphasized that the development of educational technologies must consider, in addition to scientific accuracy, aspects related to the user experience, since limitations in the interface can compromise its use, even when the content is of high quality.

In the evaluation with the target audience, the course was considered motivating, relevant, and ade-

quate for supporting the training process of nursing professionals. Participants positively recognized the aspects related to interaction, content organization, communication resources, and autonomy during the course. These findings corroborate evidence that well-structured digital environments foster motivation to learn and strengthen lifelong learning, an essential aspect of continuing education in nursing⁽²⁵⁻²⁶⁾.

The presented suggestions provided by the target audience helped improve the final version of the course, highlighting the importance of incorporating user feedback into the process of developing educational technologies. As a result, the inclusion of clinical cases, discussion forums, and improvements in platform access brought the course more in line with the expectations of healthcare professionals. Although some participants suggested including in-person classes, this proposal was not incorporated because it was incompatible with the course's purpose.

The maintenance of the exclusively online format preserved some of the key advantages of distance learning, namely flexibility in terms of time and place of study, a crucial aspect for healthcare professionals working in settings with varying work schedules and shifts. Furthermore, it broadens access to training opportunities in contexts where geographic limitations and costs make in-person training difficult to conduct⁽²⁷⁾.

In this sense, the online course developed presents itself as a dynamic and flexible technology capable of contributing to the updating of health professionals. It is an interactive educational strategy that promotes knowledge and encourages active learning. Considering that the recommendations for cardiopulmonary resuscitation are periodically reviewed, the course content has been updated according to the most recent guidelines, maintaining its alignment with available scientific evidence. It should be noted that technologies of this nature require continuous review to ensure their scientific relevance. Therefore, it is hoped that this research will strengthen the teaching-learning process mediated by distance education technologies, collaborating for professional development in the fields of pediatric and neonatal health.

Study limitations

Among the study limitations are the small number of experts involved in the validation process, which may have limited the diversity of evaluations and opinions regarding the course, as well as the lack of geographic representation across the country. Furthermore, content validation reflects the subjective judgment of the experts and the target audience regarding the suitability of the educational technology; on its own, it does not allow for inferences about its effectiveness in knowledge acquisition or behavioral change.

Contributions to practice

The educational technology developed will may support continuing education initiatives in neonatal units, contributing to the training of nursing staff in neonatal cardiopulmonary resuscitation and to the standardization of care protocols. In addition, the course can also be used for nursing students, expanding training opportunities in different teaching and learning contexts.

Conclusion

The Neonatal Cardiopulmonary Resuscitation course was developed and positively evaluated based on the established criteria. The results indicate that the course demonstrated evidence of content validity among experts and the target audience, establishing itself as a potentially useful resource for enhancing knowledge in continuing education in neonatal nursing.

Authors' contributions

Conception and design or analysis and interpretation of data: **Braga HFGM, Sabino LMM, Melo ESJ**. Drafting the manuscript or providing critical review of the intellectual content: **Braga HFGM, Soares MAS,**

Melo ESJ. Final approval of the version to be published and agreement to be responsible for ensuring that all aspects of the manuscript related to the accuracy or integrity of any part are properly investigated and resolved: **Braga HFGM, Soares AMS, Barros ACS, Monteiro FPM, Melo RCO, Sabino LMM, Melo ESJ**

Data availability

The authors declare that the dataset and supplementary materials supporting the results of this study are available upon request from the corresponding author.

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