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Construction and validity of an online course for nurses on central venous catheters in children at home[a]

Construção e validação de curso online para enfermeiros sobre cateteres venosos centrais em crianças no domicílio

Construcción y validación de un curso en línea para enfermeros sobre catéteres venosos centrales en niños en el hogar

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Abstract

Objective: to construct an online, self-instructional course for nurses who provide care to children using a central venous catheter at home and validate the course content by experts. **Method:** this is a methodological study, based on Instructional Design using the ADDIE model, developed in two stages between September 2019 and May 2020: course construction; and content validity by a committee of eight experts, recruited by the snowball method through electronic. The Educational Content Validation Instrument in Health was used, with a cut-off point ≥0.8 for content validity. **Results:** twenty-five technological products are created for the course's final production: four pedagogical action plans, six storyboards, nine educational video resources and 6 course modules in Sharable Content Object Reference Model format, applicable on different platforms. All modules presented a Content Validity Index ≥0.80 in all domains and in the overall assessment. **Conclusion and implications for practice:** the content of all modules has been validated by experts. The course contributes to care practice, allowing updating based on current and scientifically validated content. It can be used in other pedagogical proposals, as long as the Creative Commons Attribution 4.0 International License premises are met.

Keywords: Catheterization, Central Venous; Child; Home Care Services; Education, Continuing; Nursing.

Resumo

Objetivo: construir um curso *online* e autoinstrucional para enfermeiros que realizam assistência às crianças em uso de cateter venoso central no domicílio e validar o conteúdo do curso por especialistas. **Método:** estudo metodológico, alicerçado no *Design* Instrucional pelo modelo ADDIE, desenvolvido em duas etapas entre setembro de 2019 e maio de 2020: construção do curso; e validação do conteúdo por um comitê de oito especialistas, recrutados pelo método bola de neve por meio eletrônico. Utilizou-se o Instrumento de Validação de Conteúdo Educativo em Saúde, com ponto de corte ≥0,8 para a validação de conteúdo. **Resultados**: elaboram-se 25 produtos tecnológicos para a produção final do curso: quatro planos de ação pedagógica, seis *storyboards*, nove recursos educativos em vídeo e 6 módulos do curso em formato *Sharable Content Object Reference Model*, aplicável em diferentes plataformas. Todos os módulos apresentaram Índice de Validade de Conteúdo ≥0,80 em todos os domínios e na avaliação global. **Conclusão e implicações para a prática:** o conteúdo de todos os módulos foi validado pelos especialistas. O curso contribui para a prática assistencial, permitindo atualização com base em conteúdo atual e validado cientificamente. Ele pode ser utilizado em outras propostas pedagógicas, desde que atendidas as premissas da Licença *Creative Commons* 4.0 Internacional.

Palavras-chave: Cateterismo Venoso Central; Criança; Cuidado Domiciliar; Educação Continuada; Enfermagem.

Resumen

Objetivo: construir un curso en línea y de auto instrucción para enfermeras que brindan atención a niños utilizando un catéter venoso central en el hogar y validar el contenido del curso por especialistas. **Método:** estudio metodológico, basado en Diseño Instruccional por el modelo ADDIE, desarrollado en dos etapas entre septiembre de 2019 y mayo de 2020: construcción del curso; y validación del contenido por un comité de ocho especialistas, reclutados por el método bola de nieve, electrónicamente. Se utilizó el Instrumento de Validación de Contenidos Educativos en Salud y se adoptó el punto de corte ≥0.8 para la validación de contenidos. **Resultados:** en siete meses, se elaboran 25 productos tecnológicos para la producción final del curso: cuatro planes de acción pedagógica, seis *storyboards*, nueve recursos educativos de video y 6 módulos del curso en formato *Sharable Content Object Reference Model*, aplicables en diferentes plataformas. Todos los módulos mostraron un Índice de Validez de Contenido ≥0,80 en todos los dominios y en la evaluación general. **Conclusión e implicaciones para la práctica:** el contenido de los módulos ha sido respaldado por especialistas. El curso contribuye a la práctica del cuidado, permitiendo la actualización a partir de contenidos actualizados y científicamente validados. Puede ser utilizado en otras propuestas pedagógicas, siempre que se cumplan las premisas de la Licencia *Creative Commons* 4.0 Internacional.

Palabras clave: Cateterismo Venoso Central; Niño; Servicios de Atención de Salud a Domicilio; Educación Continua; Enfermería.

INTRODUCTION

Central venous catheters (CVC) are vascular accesses used for various purposes in the treatment of patients, mainly for: intravenous infusion of vesicant solutions with high osmolarity or extreme pH; renal replacement therapy; concomitant incompatible solutions or complex/prolonged intravenous treatment regimens; history of failed or difficult peripheral venous access even under ultrasound guidance; parenteral nutrition; and hemodynamic monitoring.[1,2] They must be used with specific criteria due to the potential for complications, especially bleeding, dislocation, thrombosis, central catheter-related bloodstream infection (CRBSI) and death.[3-5] In this sense, it is essential to adopt good practices in CVC maintenance to prevent or treat its complications.

Technological advances related to infusion therapy and the need for prolonged treatment in chronic diseases have converged, in recent decades, on the demand for temporary or permanent home care for children with special health needs (CSHN).[6] In turn, CVC is a complex technology, which makes it challenging for families, caregivers, school and Primary Health Care (PHC) professionals.[3,7-10]

CSHN dehospitalization using technologies contributes to reducing costs, adverse events (such as infection) and premature losses associated with complications that may occur in the hospital environment.[11] On the other hand, technology, when transposed to the home environment, requires educational interventions from the perspective of health education to guide and prepare families/caregivers for care and PHC professionals to monitor and act in critical situations.[9-13]

PHC nurses are given the importance of maintaining continuity of care at home and monitoring patients' return to outpatient appointments post-discharge.[14] Therefore, these professionals need to constantly update themselves so that assistance to CSHN is qualified,[15,16] especially because using CVC as technological care in this home environment is not usual,[17] although increasing. One of the forms of continuing education are improvement courses in the Distance Learning (DL) modality, with digital educational resource production.[18]

Teaching technologies, such as digital resources, need to be supported by a pedagogical and scientific method to promote quality educational practices, based on evidence and that follow updates on nursing practices.[19] Educational material development aims to produce knowledge, share technical updates and improve nursing professionals' skills, who work in different care settings. When offering an online and self-instructional course, it is essential to define innovative methodological strategies so that the educational material under development contributes to a dynamic, engaging teaching-learning process that raise awareness of participants to the topic.[20-22]

Considering the need to improve knowledge for the care of CSHN who use CVC at home and to update innovative care practices, the idea of the question of this study was encouraged: how to develop an online and self-instructional course for PHC nurses who provide care to children using CVC at home?

The study aimed to construct an online and self-instructional course for nurses who provide care to children using CVC at home and to validate the course content by experts.

METHODS

This is a methodological study, of technological production, developed in two stages. The first comprised the construction of a course as technological production based on Instructional Design using the ADDIE model (acronym for Analyze, Design, Develop, Implement, and Evaluate).[23] According to the model used in this study, the first three phases comprise the conception (ADD) and the last two the (IE) course execution. Therefore, the method presented involves the conception that conditioned the course construction and validity by experts. In the second stage, the course content was validated by a committee of experts.

The product was developed in a shared environment (in-person and remote) aligned with a Graduate Program in Nursing – Professional Master's Degree at a public university in southern Brazil. The executing team was composed of four nurses (two doctors, one master's degree and one master's student) and three nursing students (scientific initiation scholarship holders). The stages took place from September 2019 to May 2020.

First step: course construction

To start construction, it is necessary to analyze the demand and need for a course (Analysis). This occurs through information collection through a review of scientific literature, aligned with the team's experiences in health services. Furthermore, using care and management indicators makes a diagnosis possible that can lead to an opportunity to improve teaching-learning for a specific target audience.[21,23-25]

Based on the analysis, the pedagogical design (Design) was created. It consists of establishing strategies and tools that need to be used, as well as the projection of professionals, costs and schedule for constructing the course.[23-25]

A curricular matrix was structured, which allowed defining and organizing a set of modules to support the educational objectives of the teaching-learning process. The matrix was created in the format of an editable table that organized the ordering of modules, based on content topic, educational objective and workload. Furthermore, it is permitted to carry out reviews, adjustments and updates to the matrix at any time during the design or execution of the course, as long as any unmet need or demand is identified by the team.

Once the curricular matrix was established, the next step was the elaboration of a Pedagogical Action Plan (PAP) for each module. PAP describes the pedagogical elements of how and to what extent the executing team wants to achieve interactivity and dynamism as it develops the content to be covered in the course, considering the online and self-instructional modality.

PAP conducted the theoretical constructs and guided actions for content development, in accordance with the course's educational objectives.[26] It was edited into a text document containing the following components: course title; total course

load; menu; module workload; module title; objective; skills covered in the module; information about authorship; learning objective; contents; activities/tasks; resources; references; how to cite the material; and update date.

Visual identity also becomes important as course design, as it relates to educational objectives. When it comes to these aspects, logography, typography, chromography, pictography and iconography were developed. Design contributes to the process of interactivity, dynamism and participant motivation to remain in front of the screen asynchronously in self-instructional courses.[24]

As the module's PAP was discussed and in relation to the executing team agreement as well as the agreed visual identity, storyboard development began (Development). Storyboards organize the content and establish the degree of interactivity with participants, including the different resources used and which were described in PAP.[20,23-25]

After the content validity process (also foreseen as Development), the storyboards are migrated to other software to transform into learning objects (course modules), considered as the last action to finalize the course design (ADD). For this transformation into modules, the Articulate Storyline® software was used, which generated files in native format (*.STORY). This tool allowed us to improve content presentation, with the incorporation of a variety of graphic elements. This program added information and technical parameters that are operated by Learning Management Systems (LMS) to make it possible to make course modules available on virtual learning environment (VLE) platforms.[22,27]

Second step: course validity by experts

The process of validating the course content by an expert committee makes up the Development phase using the Instructional Design model. Between six and twenty experts were stipulated, as recommended in the literature on content validity processes.[28-30] The final sample comprised eight experts.

Experts could be from any health or education institution in Brazil, as long as they were a nurse, had the title of expert in the field of nursing (*lato sensu*) or a (*stricto sensu*) master's/doctoral degree in nursing, education or health sciences, with experience with pediatric central venous catheterization, home care, PHC or hospital infection control and experience as a participant, tutor, lecturer or content writer in a DL course.

For the content validity process by the expert committee, the Educational Content Validation Instrument in Health (ECVIH) was used, consisting of 18 questions distributed across three domains: a) objectives; b) structure/presentation; and c) relevance, in addition to its overall assessment.[31] A descriptive question was included in this instrument, with the aim of recording criticisms and/or recommendations, with the purpose of carrying out a qualitative content assessment and enabling the updating and improvement of storyboards and PAP. Seven questions characterizing experts were also included. Every instrument was edited and programmed in Google Forms®.

The snowball method was applied to obtain the expert committee.[30] The initial recruitment for the committee occurred through a simple random draw of two nursing professors working in the Department of Nursing of the study setting, being professors of assisted practices in pediatric hospital units and PHC. A message was sent by email to those selected individually, with an invitation to join the Expert Committee, containing access to the electronic form that was structured into sessions: eligibility criteria; Informed Consent Form (ICF); appointment of new experts; electronic addresses for accessing PAP; and storyboards to complete the ECVIH and expert characterization.

Initially, the two experts were unable to validate the content due to overload of academic activities, requiring a new draw to carry out the snowball method.[30] Each expert nominated up to three professionals to form the committee. Control over the return of responses occurred every five days. Invited experts who did not respond within the first period (ten days) received up to three new messages, except for those who reported that they were not interested or were unable to participate in the study.

Validity data collection took place from April to May 2020, totaling 39 days. All participants registered the electronic acceptance of ICF, and completed the data collection instrument in its entirety.

The responses were initially stored on Google Forms®, and extracted from the cloud to Microsoft Excel® for data storage and processing. Subsequently, the data were imported into the Statistical Package for the Social Sciences® to carry out statistical analysis.

When validating the ECVIH content, a Likert scale was adopted that ranged from zero to two for each of the 18 components assessed for each storyboard and PAP. To achieve a satisfactory Content Validity Index (CVI), a minimum agreement of 0.80[28,29] was considered for domains and overall ECVIH assessment. Although each item/question presents its CVI, it was not considered to define the need for a second round with experts. In these situations, descriptive suggestions were analyzed and incorporated, if relevant in authors' judgment and associated with the literature on the topic. Material validity was achieved with the participation of eight experts in a round of validity considering the overall assessment and by domains (CVI≥0.80).

The CVI of each item, domain (objective, structure/presentation, relevance) and ECVIH overall was calculated. The results were presented in tables. The descriptive information derived from the criticisms and/or recommendations for improving the teaching materials were organized according to each storyboard and PAP. Each expert was identified by the letter "E" followed by the ordering number in the database, (for example, "E1", "E2", "E3",... "E8"). To characterize experts, descriptive statistics was used.

The study was approved by the Research Ethics Committee (Opinion 4,905,440) and met the guidelines and regulatory standards for research with human beings.

RESULTS

The results are presented considering the two stages of study development.

Course construction

The pedagogical design of the course "Care of central venous catheters in children's homes: professional training course" was based on online and self-instructional modality, with a workload of 40 hours. It consisted of a curricular matrix, four PAP, six storyboards and six file packages called Sharable Content Object Reference Model (SCORM) to be made available in VLE as course modules.

The curricular matrix was organized into six modules, with the presentation of a table containing the module title, educational objective and module workload in the course. Among the course modules, four addressed content and training activities (Modules 2 to 5). Two other modules contained only activities called diagnostic (Module 1) and evaluative (Module 6). It is worth noting that these two modules are intended to assess knowledge before and after approaching the content, without the need to develop a PAP. Questions were developed to resolve complex situations in the home, school and/or health unit environment.

Once the curricular matrix was defined, the elaboration of four PAPs began, which support developing Modules 2 to 5. PAPs were based on scientific research in the literature in the area of infusion therapy and home care, associated with executing team members' experiences with the course topics and educational objectives. PAP describes the various resources that were used to make this teaching-learning process meaningful, dynamic and interactive, such as videos, flowcharts, two avatars (a nurse character from the hospital area and another from PHC) and scientific literature for mandatory and/or complementary reading.

As each PAP was made available, the executing team discussed the competencies to be covered, learning objectives, content, activities and resources, according to the necessary and important care related to CVC at home for CSHN. Products such as PAP addressed the planning of contents of course modules, namely: Module 2 - Skin microbiology and types of central venous catheters; Module 3 - Dressing and maintenance of central venous catheters and infusion system; Module 4 - Complications related to central venous catheter use; Module 5 - Home care for children with central venous catheters.

In parallel with PAP, the visual identity of the teaching materials and the course's learning resource map were defined. On the Canva® platform, logography, typography, chromography, pictography and iconography were structured. For each course module, a file was generated, called a storyboard. Then, the six storyboards were transferred to Microsoft Power Point® visual presentation editor to be made available for access in slideshow mode (*.ppsx).

Content and activities were developed in the storyboards as well as video, audio, characters, vectors, images and illustrations taken from public banks. The storyboards were stored on Google Drive® with an electronic address for viewing and downloading, but not allowing editing and/or comments.

According to PAP, nine educational resources (ER) were planned in educational video format. From the script of the nine educational videos, two animated videos were created, one on Powtoon® and the other on Canva®. The other videos had scenes recorded in January 2020 at the Realistic Simulation Center of a hospital in southern Brazil with the researchers themselves as actors. These videos were edited in different formats in DaVinci Resolve® and Video Maker® softwares, and were later converted to Moving Picture Experts Group (MPEG) 4 Part 14 (*.MP4) or MOV format, the latter being an extension of Apple® Quick Team. The videos were published on a research group's YouTube® channel and organized into a playlist for course use, considered a dynamic and interactive teaching-learning resource.

The educational videos were titled as follows: ER1 - Course presentation (one minute and 46 seconds); ER2 - Skin: what you need to know (one minute and 50 seconds); ER3 - Hand hygiene with soap and water (one minute and five seconds); ER4 - Hand hygiene with 70% alcohol (51 seconds); ER5 - Hand hygiene test with luminol (one minute and 15 seconds); ER6 - Central venous catheter dressing (three minutes and nine seconds); ER7 - Flushing the lumen of central catheters (25 seconds); ER8 - What not to do when maintaining the catheter (24 seconds); ER9 - Puncture of the fully implanted catheter (one minute and 28 seconds). The total time of the videos was 12 minutes and 13 seconds.

Regarding training activities, four questions related to theoretical content were prepared and presented at the end of each module (2 to 5). Both the diagnostic activity (Module 1) and the evaluative activity (Module 6) had eight questions supported by three complex situations that occur at home, school and/or health unit environment.

For an effective assessment of the knowledge acquired by participants in the course, it was decided to keep these two modules (before and after the content) with the same presentation format: same story, number of questions and workload. The difference in these two modules occurs in relation to fictitious names, geographic location, sequential presentation of complex situations and ordering of correct answers to questions as well as feedback at the end of each question, which did not occur in diagnostic activity. For the purposes of certification of participants in the course, the percentage of correct answers equal to or greater than 70% in assessment activity of Module 6 was considered, in accordance with institutional regulations for approval of activities involving teaching-learning.

Course validity by experts

The next step involved the content validity process of the 19 products aggregated into the course's six modules by a committee with eight experts, who endorsed the items in accordance with ECVIH.

All experts were female, with an average age of 35.1±8.7 years, with 3 (37.5%) doctors, 3 (37.5%) masters and 2 (25%) with *lato sensu* specialization. In relation to the workplace, 5 (62.5%) experts were involved in the area of higher education, while 3 (37.5%) work in health services, with an equitable distribution between public and private institutions. The length of experience as a nurse reached a median of 8.5 (4-14.5) years, with a predominance of work in the following areas: child health (7; 87.5%); parenteral

nutrition (3; 37.5%); hospital infection control (2; 25%); home care (1; 12.5%); and PHC (1; 12.5%).

Table 1 expresses the results of validating the content of the six course modules by experts.

The overall CVI was above <0.90 for all modules (1 to 6). The content of Modules 1 and 6 was analyzed together as there were no differences in content presentation of clinical cases, number of questions, workload and feedback. Regarding agreement in the three domains, the content of seven items reached full agreement (1.00) out of the total of 18 items analyzed.

Experts, when validating module content, indicated improvements according to the identified needs, discussing these notes through the discursive question. In Module 2, it was suggested to enlarge the font size and highlight the colors of the letters to encourage the course participant (E1), in addition to indicating the adequacy of some content and its sequence (E1, E2, E4). In Module 3, an item from "domain 1 - Objectives" presented CVI<0.80, but experts did not indicate what could be updated or improved in relation to the content in this module. In Module 4, experts suggested the inclusion of a work as a reference (E4), while the other added a greater number of figures and interactivity (E7), but there was no specific description of what and where to include. All suggestions were incorporated into the module to ensure quality, updated material and correct information.

In Modules 1 and 6, which contain complex situations to assess knowledge retention before and after the course, it was proposed to test and review the screen presentation sequence (E1). Another expert mentioned the need to review one of the answers to the activity (E4). However, after the review carried out by the team, it was found that the question was correct and no changes were necessary.

In relation to the favorable notes described, experts classified the content as: rich and informative (E1); very appropriate

Table 1. Content validity of course modules. Porto Alegre, Rio Grande do Sul, Brazil, 2020.

Variables	CVI Modules 1 and 6	CVI Module 2	CVI Module 3	CVI Module 4	CVI Module 5
Overall CVI*	**0.99**	**0.92**	**0.95**	**0.96**	**0.96**
Domain 1 - Objectives	**1.00**	**0.98**	**0.93**	**1.00**	**0.95**
Includes the proposed topic	**1.00**	**1.00**	0.75	**1.00**	**0.88**
Adequate for the teaching-learning process	**1.00**	**0.88**	**0.88**	**1.00**	**1.00**
Clarifies doubts about the topic covered	**1.00**	**1.00**	**1.00**	**1.00**	**0.88**
Provides reflection on the topic	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**
Encourages behavior change	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**
Domain 2 – Structure/presentation	**0.99**	**0.88**	**0.96**	**0.93**	**0.95**
Language suited to the target audience	**0.88**	0.75	**0.88**	**0.88**	**0.88**
Appropriate language for educational material	**1.00**	**0.88**	**1.00**	**1.00**	**1.00**
Interactive language, allowing active involvement in the educational process	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**
Correct information	**1.00**	0.63	**0.88**	0.75	**0.88**
Objective information	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**
Clarifying information	**1.00**	**1.00**	**1.00**	**0.88**	**0.88**
Necessary information	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**
Logical sequence of ideas	**1.00**	**0.88**	**1.00**	**0.88**	**1.00**
Current topic	**1.00**	**0.88**	**0.88**	**1.00**	**1.00**
Appropriate text size	**1.00**	0.75	**1.00**	**0.88**	**0.88**
Domain 3 – Relevance	**1.00**	**1.00**	**0.96**	**1.00**	**1.00**
Encourages learning	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**
Contributes to knowledge in the area	**1.00**	**1.00**	**0.88**	**1.00**	**1.00**
Arouses interest in the topic	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**

Source: research database.
Notes: *CVI: Content Validity Index.

and objective with appropriate language (E3); very interesting (E8); excellent quality of videos (E7); very appropriate and clear approach (E5); and information is updated and based on the most reliable scientific references (E6), highlighting the correct adequacy of assessment of complex situations (E3, E5, E6 and E7).

With the overall CVI and domains >0.80, all products (storyboards and PAP) were checked and updated, according to the notes described by experts for the final step of constructing the course. Then, the content was migrated to the Articulate Storyline® program, which allowed the content to be improved to adapt to screen size and resolution, offering optimized solutions for touch screen devices.

The characters (avatars) in this program received audio from 83 recordings in MPEG (*.MP3) format, with the aim of providing a dynamic and interactive dialogue with participants. Of these audios, 28 audios were from nurse Catherine's avatar, and another 55 from nurse Marcelo's avatar.

As a final product, the modules were exported into SCORM file packages that can be made available in AVA, as shown in Figure 1.

In short, the course construction involved the preparation of four PAP, six storyboards in (*.ppsx) format, nine ER in video format (totaling 19 initial products), which were validated and transposed into six course modules in SCORM format (generating 25 final products).

DISCUSSION

The literature highlights that digital technology construction and use for technical and scientific improvement and professional updating in nursing have seen a considerable increase in recent years.[22,32] The digital revolution has transformed access to information and knowledge into a dynamic process, given the speed of production and dissemination of knowledge. Among the various modalities, DL training through training courses stood out.[18,20-22,32]

Establishing pedagogical strategies are essential to contribute to dynamic teaching, while developing participant engagement and awareness on the subject.[20-22,33,34] It is understood that creating educational strategies, to follow the generation of new practices based on evidence, is necessary to achieve consistent improvements in care.

This study sought to contextualize the construction of a professional training course through Instructional Design, which was validated by experts. The topic is based on CSHCN management in their home, which requires technological care. In this regard, there is a need for investment in educational actions to reflect on the importance of professional training and updating of nurses in PHC for monitoring and agile care in crucial situations for maintaining children's lives.[9,10,35]

When constructing DL courses, PAP and storyboards are commonly used as teaching materials,[21,32-34,36] which are important

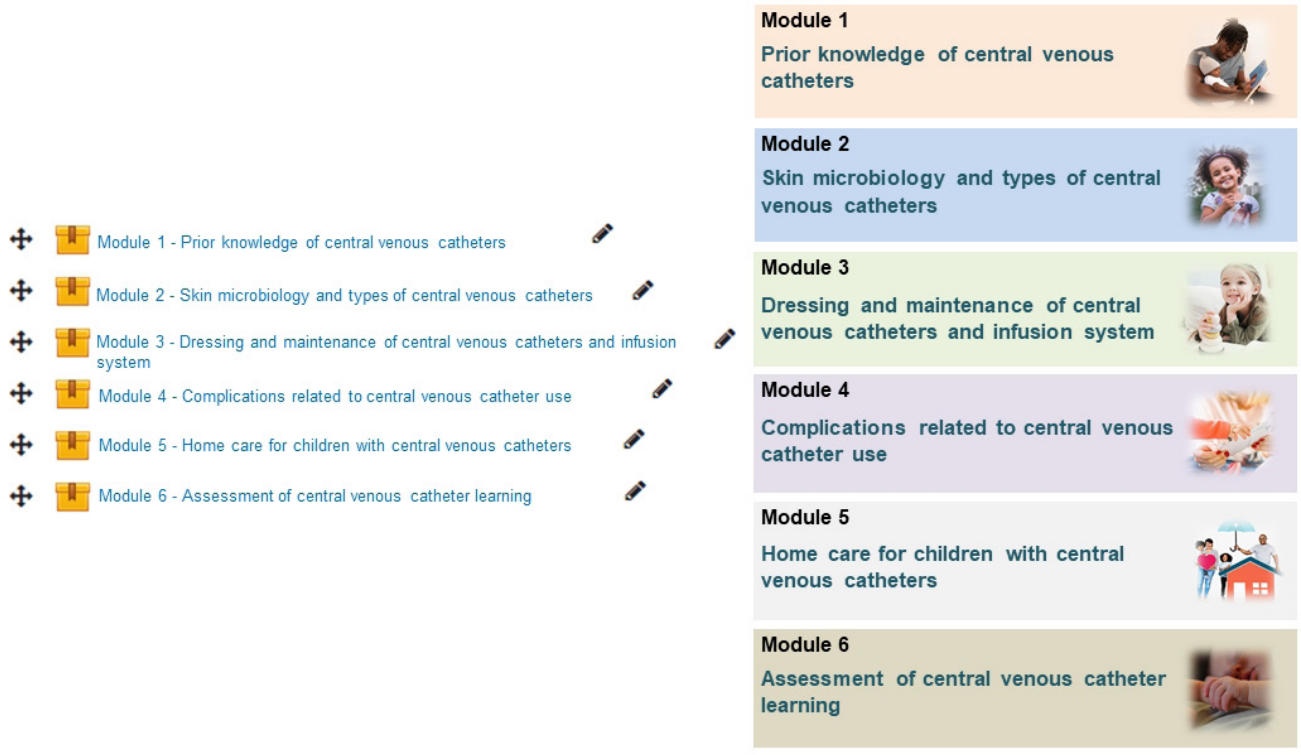

Figure 1. Course modules on central venous catheter care in children's homes: professional training course. Porto Alegre, Rio Grande do Sul, Brazil, 2020

in organizing and structuring content and activities.[23-25] The creativity employed by design concepts associated with the presentation of content in a logical sequence is fundamental for significant participant learning in self-instructional courses.[20-22,25]

The course planning was outlined in four PAP, which allowed: defining the objectives to be achieved by course participants on the topic of CVC in CSHN at home; list the contents to be developed; select the types of resources to compose the educational objects used in each module; and establish strategies to assess (self)progress by users and feedback in training and assessment activities. These steps are common to courses' pedagogical planning or ER such as videos and booklets, in which planning must consider elements specific to distance learning and digital technology, such as selection of media and the context in which they will be used.[19-21,32-34,37,38] These guidelines were considered and included in the course construction step.

Creating two avatars (digital characters), which represent nurses at different levels of complexity, sought to achieve an approach close to the reality of care for users with CVC. This decision is in line with the recommendation that teaching resources need to present clear pedagogical objectives, being dynamic, attractive, interactive and relevant to course participants' reality.[19-22,32]

For producing ER in the format of videos for DL, it is recommended that they have a maximum duration of between ten and fifteen minutes,[39] as after this period the maintenance of the attention of those watching becomes compromised. This instruction was followed, and among the nine educational videos, ER6: Central venous catheter dressing had the longest duration, lasting three minutes and eight seconds. The clinical cases (diagnostic and evaluative activities) addressed CVC in the homes, considering the training developed in Modules 2 to 5. They were based on a study[38] that proposed using fictitious situations in learning, with summarized data close to reality.

Brazilian studies emphasize that teaching materials help in educational actions, as long as they are prepared with care and scientific and technical rigor, especially when they go through a validity process conducted by experts.[31,33] In this way, the relationship between theory and practice is ensured in this process when the committee of experts contributes to critical and reflective analysis of teaching materials. It is noteworthy that, when invited, they have the ability to analyze the universe that the course proposes to the target audience as well as being able to indicate (un)necessary elements.[19,21,31,33,34,40]

Experts who endorsed an online course on neonatal pain emphasized the importance of constructing content and making ER available independently, giving users the freedom to choose where they want to start.[41] This characteristic was considered in the course on screen here, as all teaching materials were planned and constructed with the purpose of being reused according to the installed need, ensuring that users have the autonomy to select the order of content they want to view and learn in the course.

All teaching materials achieved content validity higher than the minimum value recommended in scientific literature (CVI ≥0.80). The content expressed in the products generated as course PAP storyboards and ER (videos) demonstrated the technical-scientific quality for the care practice of CSHN with CVC at home, as they obtained an overall CVI ranging from 0.92 to 0.99 in the first and only round of validity.

A study that validated digital ER for occupational health and safety in PHC used the same instrument (ECVIH) and found overall CVI values between 0.88 and 0.96, which express the product adequacy for offering to the target audience.[33] Other studies also presented CVI values >0.80, such as one that validated an educational video for teaching deaf students about cardiopulmonary resuscitation and another on encouraging breastfeeding.[36,37]

A course in the area of mental health with the aim of providing nurses with the necessary tools to care for the emotional and psychosocial well-being of adult patients admitted to clinical-surgical units had the participation of eight experts. They validated four modules that obtained CVI from 0.93 to 0.98, highlighting the descriptive suggestions as opportunities for improvement for the course qualification.[40]

CVI is also widely used to validate educational objects aimed at patients and families. In Malaysia, a study that developed a food and breastfeeding education package for women with gestational Diabetes Mellitus achieved an overall CVI of 0.99, with 1.00, 0.98 and 1.00 for the objective, structure and relevance domains, respectively.[42] A web page with educational information for families with patients in the Intensive Care Unit was validated with acceptable CVI values ≥0.83.[43] In Brazil, an educational booklet for liver transplant recipients was validated, obtaining CVI 0.98 with experts and 0.99 with patients.[44]

The CVI method for validating educational tools and objects is widely used due to its efficiency, time and cost savings and ease of implementation.[42] Specifically on studies that use the ECVIH as a means to validate ER in health, they are still restricted, due to the temporality related to the publication (2018) and the inclusion of this scale in studies of this modality. However, the components of ECVIH domains are important, as they provide a basis for various aspects related to educational content, allowing the delivery of appropriate ER to the target audience.[24,33,37] The criticisms and suggestions described by experts contributed to improving resource quality, being debated by the team and implemented, when applicable.

The course has adequate content to promote the production of quality nursing knowledge in CVC management in CSHN at home. Experts' contribution in assessing the teaching materials that make up the course was fundamental in improving the professional training course quality, as they used an instrument to validate ER in health.

CONCLUSION AND IMPLICATIONS FOR PRACTICE

Developing innovative tools that support evidence-based professional training is one of the challenges faced by nurses. The course contributes to nurses' care practice in PHC, allowing updating based on current and scientifically validated content. It was built and validated as an online and self-instructional course addressing CVC care for CSHN at home. To achieve this, seven months were spent constructing the products (PAP, storyboards and videos) and 39 days for content validity, which resulted in 6 course modules in SCORM format for use in VLE. All course modules reached the acceptable value assigned by ECVIH (≥0.80), therefore having the contents validated by experts.

Non-participation of all experts invited to validate the content, non-assessment of layout and pedagogy as well as non-geographical representation of the country were the limitations considered. It is suggested, for proposals similar to this, course validity by the target audience and the inclusion of pedagogues and Instructional Design professionals as expert committee members, in order to validate aspects beyond content. To this end, the development and validity of instruments that address the layout and pedagogical aspects of online courses are recommended.

The study contributes by describing the methodological path for developing a self-instructional online course and its content validity, which can serve as a basis for new proposals. The course can be reused, as well as one or more modules independently, in other pedagogical proposals, as long as the authors are informed in accordance with the Creative Commons Attribution 4.0 International License premises.

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