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ELABORATION OF INFOGRAPHICS FOR TRAINING NURSES IN ULTRASOUND-ASSISTED EPICUTANEOUS CATHETERIZATION IN NEWBORNS

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ABSTRACT

Infographics, defined in Communication as multimodal texts, are examples of instructional material whose use in various areas, including health, has grown proportionally to technological development because they allow, from a detailed presentation, an easy understanding of the processes that involve technological innovation. This study aimed to develop instructional material for the training/qualification of nurses in ultrasound-assisted neonatal epicutaneous catheterization. A qualitative approach was chosen, applying the

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instructional design development method. The choice for infographics was motivated by the ease of understanding and dissemination in an electronic environment. The scripting of the contents was based on evidence mapped in a scoping review. In the modeling phase, three software were used. As a result, four infographics were produced, contemplating current recommendations on the technique studied, didactically divided into know-how-to-manage and know-how-to-care, obeying the stages of catheter insertion and maintenance. The material was later condensed into an animated version, a product capable of fostering the practice of using educational resources in the teaching-learning processes of nurses in the qualified care of critically ill neonates. Further research is suggested in the field of the development of evidence-based instructional materials, valuable even for those who manage permanent education practices.

Keywords: Catheters. Interventional Ultrasonography. Newborn. Continuing Education. Organization and Administration.

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INTRODUCTION

An epicutaneous catheter or peripherally inserted central catheter (PICC) is an intravascular device that, when inserted into a peripheral vein, after percutaneous puncture with an aseptic technique, will progress until it reaches the distal portion of the superior vena cava or proximal portion of the inferior vena cava, acquiring characteristics of a central route (Oliveira et al., 2023; Sá Neto et al., 2018).

The PICC is the most used central line in Neonatal Intensive Care Units in the world and its insertion can be considered one of the most performed complex care in these environments. The central location of the catheter tip enables safe infusion of various hyperosmolar infusions, irritating or vesicant drugs, and long-acting drug therapies (Oliveira et al., 2023; Li et al., 2019).

In Brazil, the traditional PICC technique was introduced in Neonatal Units in 1990 and nurses quickly assumed the role of responsible for the technique (Beleza et al., 2021). In 1998, Ordinance No. 272 of the Ministry of Health, which established minimum requirements for Parenteral Nutrition Therapy, recognized the competence of nurses to perform and ensure peripheral venous puncture, including the CCIP, as long as they are qualified to do so (Brasil, 1998). The first professional regulation would come in 2001, through Resolution No. 258 of the Federal Nursing Council (COFEN). recognizing the competence of nurses to insert CCIP, under the requirement of specific qualification (COFEN, 2001).

Over decades, innovations have been incorporated into the processes of insertion and maintenance of the CCIP, expanding its spectrum of use with quality and safety in Brazil, similar to what occurred in other countries. The contribution of neonatal care nurses and the growing legal support established for the activity of these professionals were also fundamental for this progress (Oliveira, 2023).

At the same time, the managerial efforts expended, through continuing education actions, to ensure that the nursing team developed clinical competence and technical skills with critical awareness proved to be a strategy of great value for the quality of care, as it enabled reviews, corrections of practices and protocol techniques and the incorporation of new technologies to the technique (Silva et al., 2022).

The use of bedside ultrasonography (USG), also known by the acronym POCUS (point of care ultrasound) for visualization, evaluation of patency and measurement of the depth and internal diameter of peripheral vessels, as well as for the location of the catheter

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tip at the cavoatrial junction, was a procedure evidenced by several studies as capable of adding quality and safety to the PICC technique (Gorsky et al., 2021; Barone; Pittiruti, 2020; Singh et al., 2020).

Despite the proven advantages, it is observed that the routine adoption of PICC techniques with the use of ultrasound is not yet a prevalent reality as a nurse's care in neonatal units worldwide, including those in Brazil. The most widespread USG-assisted technique, the modified Seldinger technique, with a catheter inserted into veins in the so-called ZIM zone, is usually performed by medical professionals (Naik; Mantha; Rayani., 2019; Rainey et al., 2019; Dawson, 2011).

To incorporate USG technology into epicutaneous catheterization, making it a routine practice in the care of newborns (NB) who require infusion therapy, it is possible to infer that organizational guidelines are needed, managerial actions that enable and ensure that innovative practices are developed with skill and competence by specialist nurses (Oliveira et al., 2023).

Among the primary actions would be included, in addition to the systematization of nursing care anchored in institutional protocols and the registration of the control of all stages of the process, Permanent Health Education (EPS) practices aimed at the unit's nursing team. (Gorski et al., 2021; Duwadi; Zhao ; Budal, 2019).

PEH, a strategy that aims at qualification and professional development in health care and management, instituted as a national policy by Ordinance No. 198/GM/MS (Brazil, 2004), is based on actions that are significant to organizational needs, necessarily linked to legal precepts, which aim to transform the performance of health workers (Silva et al., 2022; Barcellos et al., 2020).

Thus, it is possible to argue that the creation and use of educational materials can contribute to the process of professional training of nurses in the implementation and management of eco-assisted CCIP and gain importance in the face of the incessant innovations added and the scarcity of didactic materials on the subject (Oliveira, 2023).

In current socio-educational practices, which include PHE practices, multimodal texts, understood as of great expression within the universe of information and communication technologies, are increasingly used thanks to significant and recurrent technological changes, a reality in several areas, including health. In this context, infographics stand out, visual representations of knowledge or information, structured with their own meaning and purpose (Nasaré; Fukushima; Santos, 2024).

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In Communication, infographics are considered examples of multimodal texts because they are composed of at least two modalities of linguistic form, the image and the text, and can also integrate other resources, including multimedia. Multimodal texts are also called multisemiotic, because the adequate comprehension (production of meanings) of their text depends on the identification of the effects of meaning produced by the use of the association of this writing with audiovisual elements (Barbosa; Araújo; Aragon, 2016; Barata, 2010).

The use of infographics has increased in direct proportion to technological development, since they allow the analysis of an innovation in detail, in its various phases, and are easy to absorb and understand. In addition, the dissemination/availability in accessible environments such as the web (Maia et al., 2019) even facilitates the choice of distance education (EAD) as a PHE strategy. However, there are few studies dedicated to its conception, preparation and dissemination in the health area.

In view of the above, it is justified to carry out this study, which aimed to develop instructional materials of the animated infographic type to assist in the training/qualification of nursing professionals in the technique of epicutaneous catheterization aided by ultrasound, applying the method of development of instructional design (Filatro; Piconez, 2004).

METHODOLOGY

This is an applied research of technological production, with a qualitative approach, aimed at developing instructional material of the animated infographic type, aimed at the training of neonatal nurses, applying a method of development of instructional design (Filatro; Piconez, 2004).

For the preparation of the infographics, the evidence was mapped in a scoping review (Oliveira et al., 2023), part of a doctoral thesis (Oliveira, 2023), whose project was approved in a Research Ethics Committee Opinion number 5,148,551.

The methodological choice to carry out this research as one of the phases of a doctoral thesis was based on the scarcity of multimodal teaching materials on the subject studied based on scientific evidence. Therefore, its goal was to ensure the wide dissemination of evidence-based practices, stratified in the aforementioned review, relevant content, with the potential to integrate didactic materials from training programs for nurses

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in CCIP/USG in RN, vascular access techniques rarely performed in Brazilian neonatal units (, 2023).

Visual aesthetics and graphic design are increasingly valued for the dissemination of information, including in the scientific field, where the growing use of multisemiotic texts, such as infographics, stands out (Nasaré; Fukushima; Santos, 2024; Maia et al., 2019).

In the educational field, computer graphic resources have provided the introduction of various semiotic modes and resources (such as verbal text, static or moving image and sounds) in the creation of hypertexts aimed at the elaboration of digital didactic materials (Barbosa; Araújo; Aragão, 2016).

Still in the current context, infographics have been gaining visibility in several segments, including the continuing education of health professionals, in the face-to-face or distance modality, thanks precisely to their basic characteristics: easy to understand and disseminate in an electronic environment, serving both as a key mode of explanation and support material (Maia et al., 2019).

Instructional design is the method of planning in teaching-learning that includes activities, strategies, evaluation systems, methods and instructional materials to facilitate human learning based on the known principles of learning and instruction (Filatro, 2023; Filatro; Piconez, 2004). Primarily, the method was structured for the production of various analog teaching materials, such as books and booklets (Filatro, 2023; Filatro; Piconez, 2004)

Nowadays, several scholars use instructional design to generate digital products, benefiting from the Internet to incorporate elements such as informal learning, autonomous learning and cooperative learning into real educational situations (Filatro; Piconez, 2004) in order to meet society's demands for a new model of interdisciplinary and transversal science and education (Pereira; Azevedo; Carolei, 2021).

The steps of the method adopted are graphically represented in Figure 1 and detailed below.

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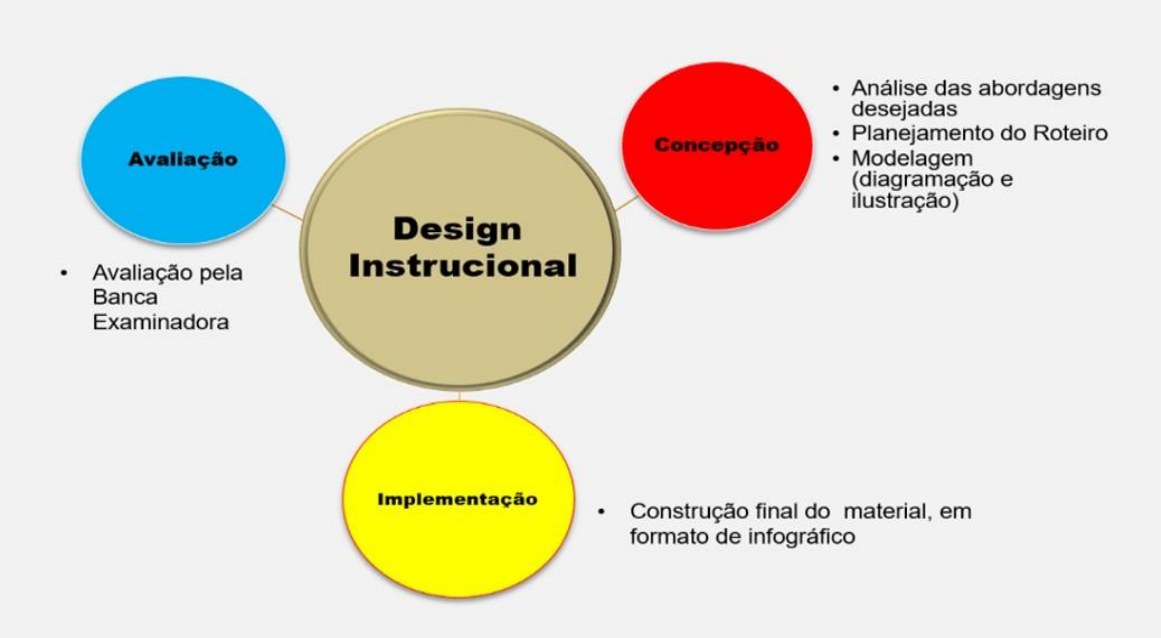
Figure 1 – Elaboration of educational material, following the phases of instructional design



Source: based on the literature consulted (Niterói, 2023).

In the conception phase, analysis subphase, the selected contents were those from the 22 articles reviewed, which made it possible to map nurses' care in the process studied, focusing on evidence related to innovations incorporated into the CCIP, including the use of USG (Oliveira et al., 2023). All this content has been previously reviewed and corrected. A synoptic table with the stratification of care was elaborated.

To elaborate the synoptic table mentioned above, we took into account not only the descriptive division of the phases that make up the epicutaneous catheterization technique (pre-insertion, insertion and maintenance), but also the definition of nursing care management as a phenomenon that involves a dialectical relationship between "know-how-to-manage" and "know-how-to-care". In this theoretical construction, it is understood that the dialectic of the term determines a game of non-dichotomous relationships, which results in a dynamic, situational and systemic process, where the knowledge of management and care are articulated, enabling the existence of an interface, in the professional practice of nurses, between these two objects (Christovam; Harbor; Oliveira, 2012).

In the planning subphase, the reading of the written material, composed of the synoptic table and the theoretical foundation that guided its preparation, served not only for the graphic designer involved in the process to become familiar with the reference but also for the idealization of the script to be followed. The contents were again summarized and

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organized for arrangement in different infographics, following the one applied in the elaboration of the synthesis tables (Christovam; Harbor; Oliveira, 2012).

Once the scripting was completed, the last subphase of the conception began, called modeling, which included the layout of the material, with simulation of the graphic arrangement of all the elements that make up the infographics, taking into account aesthetic and functional criteria (choice of dimension per "sheet", type and size of font, dominant colors, illustrations, photos and images), all with the aim of obtaining a good and cohesive presentation of the content and a better communication between all the involved in the nursing education process.

All modeling itself was done by an experienced graphic designer. However, the process had the collaboration of the author of the thesis (Oliveira, 2023) and supervision by her advisors. The graphic designer was provided with photos and images made available on the Google Images portal, to assist in the work, as well as the construction of infographic versions based on color palette and fonts that were harmonious with other materials included in the thesis.

Some simulations were performed by the author in the free version of the Canva™ application, with the objective of discussing the modeling with the graphic designer. Canva™, a graphic design platform produced in Australia, enables the creation of various multimodal materials, contains specific tools for making infographics (Archanjo; Santos, 2020). The author also used Paintbrush™ to resize some images in these simulations. The professional modeling was carried out by the graphic designer with the help of Indesign™, Illustrator™ and Photoshop™ software, all from Adobe™.

In the next phase, of implementation, the construction of the material was processed in editing mode, by the same graphic designer, in the aforementioned software, using all the necessary information to achieve the objective proposed when the educational material was conceived. For the final compilation, containing four infographics (Figures 2 to 5), a link was generated in order to ensure the archiving and future dissemination of this material in digital media, with accessibility. Accessibility is understood as the degree of practicality of access to the information provided in a digital educational material, which equips target readers to perceive, understand, operate and interact with the material (Souza; Silva, 2023).

The final phase, of evaluation, consisted of the appraisal, by the doctoral thesis examining board, of the infographics presented, which took place in two stages:

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qualification and thesis defense. Regarding the infographics, there was no request for corrections.

Figure 2 – Infographic 1: Care for NB submitted to CCIP/USG: Care Management and know-how-to

Source: research data. Art: Graphic designer Claudio RV Rocha (Niterói, 2023).

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Figure 3 – Infographic 2: Direct care of the newborn in the pre-insertion phase

Source: survey data. Art: Graphic designer Claudio RV Rocha (Niterói, 2023).

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Figure 4 – Infographic 3 – Direct care for the newborn in the insertion phase

Source: survey data. Art: Graphic designer Claudio RV Rocha (Niterói, 2023).

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Figure 5 – Infographic 4: Precautions related to maintenance and removal of CCIP

Source: survey data. Art: Graphic designer Claudio RV Rocha (Niterói, 2023).

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RESULTS

After the approval of the thesis, the work was finalized with the export of the product to Canva™, to be generated by the authors an animated version, not yet released, bringing together all four infographics, with a duration of 1min and 32s, editable by the authors, until its dissemination, for animation, duration time and insertion of audio and text resources, interesting options for taking advantage of the material in permanent education dynamics.

With the animated synthesis version ready, the analysis of similarities was carried out through searches for materials in Google Images using the keywords in Portuguese "catheter", "ultrasound" and "newborn", connected by "and", and their counterparts in English and Spanish. No similar materials were found, only infographics in Portuguese and English, dealing with specific practices, such as a *guideline* in English on selection criteria for venous devices, with authorship and declared references, and an infographic in Portuguese on concepts, legislation and maintenance of the PICC in adults, such as dressings and preventive measures for catheter-related infection.

New searches were made, now with the English acronyms "PICC", "POCUS" and the Portuguese term "Infographics" (and their counterparts in English and Spanish), with the Boolean connector "and". Infographics with authorship and references declared only in English and Spanish were identified. However, none of them contained content similar to the product of this research.

As an example, in English, infographics were found that addressed, for example, the use of US to guide peripheral venous puncture, flowchart of catheter indications in patients with chronic nephropathy, US in clinical evaluation in adult urgency and emergency, and standard acoustic windows in echocardiography. In Spanish, it was possible to access the website of the *Colegio de Enfermería de Burgos*, which provides a section called *Evidence-based Infographics*, as well as pages of the Salusone application called *Scientific Infographics*. In both digital environments, the infographics, made available with authorship and references, which presented some approximation with the theme addressed here, dealt with basic concepts and care with central venous catheters in adults, such as new dressings, fixations, and salinization.

Once the similarity analysis was completed, the link https://www.canva.com/design/DAF_0JdNeyY/khZ9ZxMRpbmDHBb5T5HioQ/watch?utm_content=DAF_0JdNeyY&utm_campaign=designshare&utm_medium=link&utm_source=editor was generated. The goal was to make the animated infographic, not yet released,

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accessible after its publication. The option for Canva™-was due to the possibility of unlimited sharing, by smartphones, tablets and personal computers, and measurability (access statistics), a feature offered by the tool in its free version, which, in addition, is easy to handle even by non-professionals.

It should be emphasized that those users who access Canva™ through the animated infographic link will have the option to make modifications to the material. By using the "Canva" command followed by "edit video" you can change, for example, the type of animation, the presentation time of each infographic, as well as insert textual content. You can share the modified material. The use of tools such as Canva™, by enabling user edits, can expand the possibilities of applicability of audiovisual instructional materials (Archanjo; Santos, 2020).

DISCUSSION

Today's society requires a new type of health professional, who seeks multiple skills, including the field of practices driven by technological innovations, exploring the ability to learn and adapt to new situations. To achieve these competencies, nurses need knowledge to use new care technologies (Ornelas; Monteiro, 2023), innovations in information and communication, not only as a means of improving the efficiency of systems, but, mainly, as pedagogical tools effectively at the service of evidence-based nursing.

It is possible to argue that, in the field of PHE, methods such as instructional design equip teachers, researchers and professionals to materialize the web as a natural learning environment and help them to rethink their PHE's actions, adding to them, among others, distance education strategies and dissemination of instructional materials in electronic media (Filatro, 2023). There are authors who defend the importance of standardizing care through the development of protocols and routines in the unit and, consequently, periodic training of the team, with a focus on standardized operational routines and the supervision and analysis of the performance of professionals in their execution (Bandeira Valois et al., 2018). In this scenario, multimodal tools are of great value, easy to understand and disseminate (Nunes: Sena; Days, 2024; Maia et al., 2019).

By proposing educational activities and developing educational technologies, professors, researchers and professionals in the nursing area contribute to disseminate knowledge based on structured planning, providing advances and/or correcting gaps

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detected within the reality of care in its sociocultural context, feeding the teaching-learning process that surrounds nursing care (Silva; P; Vettori, 2022).

Meeting the daily demands of care, ensuring the transmission of knowledge capable of ensuring the provision of safe and quality care is what, in principle, makes nurses understand themselves as an inseparable part of the process of knowledge construction focused on clinical nursing and multidisciplinary practice, whether within institutions that provide health services, or in those dedicated to teaching and research (Author, 2023).

Training and qualification activities contribute to technical improvement, based on scientific knowledge and critical thinking, for the prevention of errors and adverse events. By extension, developing instructional materials for use in such activities contributes to PHE In the case of the PICC technique assisted by USG, it is revealed as a practice that enables the integration of new technologies in highly complex environments, and ways of providing care, favoring autonomy and professional empowerment (Silva et al., 2022).

CONCLUSION

This study, part of a research, was carried out with the objective of preparing instructional material of the animated infographic type, based on scientific evidence, a theme still little explored in national and international studies. The generated product brings together four infographics that summarize the care of nurses for NBs submitted to PICC aided by USG.

It is hoped that this study can foster and expand the practice of using educational resources in the teaching-learning processes of nurses in the qualified care of critical newborns, promote critical thinking and reflection on the subject, in addition to contributing to the dissemination of instructional materials, based on scientific evidence, in digital media. The implementation of training, training, and other approaches to continuing education on PICC among nurses and caregivers is key to the prevention of catheter-related complications.

The need to standardize care is highlighted, through the elaboration of protocols and technical routines in the unit, and the periodic training of the team, focusing on standardized operational routines and supervision of the performance of professionals in their execution.

The choice to carry out a qualitative research, which did not include a statistical validation phase, can be considered a limitation of the study. Further methodological

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research is suggested in the context of the development of instructional materials, potentially valuable for nursing professionals, particularly those who manage permanent education practices.

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