Original Article

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TEXT & CONTEXT NURSING TEXTO & CONTEXTO ENFERMERÍA

DEVELOPMENT OF EDUCATIONAL TECHNOLOGY FOR TRANSCUTANEOUS PACEMAKER MANAGEMENT IN OLDER ADULTS UNDERGOING MOBILE PRE-HOSPITAL ASSISTANCE

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ABSTRACT

Objective: to develop educational technology for nurses on transcutaneous pacemaker management in older adults undergoing mobile pre-hospital assistance.
Method: a methodological study developed with the Advanced Support Units of the Mobile Urgency Care Service of the 2nd Metropolitan Health Region of Paraná, Brazil, in three phases: 1) Pre-production – preparation of the video script; 2) Production – script validation by expert judges, storyboard development, voiceover recording and selection of images; and 3) Post-production – evaluation of the video by expert judges and diffusion. 51 specialist judge nurses took part in validation of the script; and 47 of them assessed the video. The data were collected between April and May 2022 using instruments with a Likert scale, via *Google Forms*. Descriptive statistics was applied for data analysis and a Content Validity Index of at least 0.78 was considered.
Results: the judges suggested less technical language, inclusion of a scene and a correction referring to the positioning of the transcutaneous pacemaker adhesive pads. A 2D video lasting 8 minutes and 30 seconds was produced, which addressed actions and care measures in managing pacemakers in older adults. The following items were considered adequate: language, images, voiceover, duration, guidelines proposed and memorization of the messages (CVI=1.0).
Conclusion: the educational technology developed was considered validated for nurses regarding the transcutaneous pacemaker management in older adults. The educational video can support decision-making in favor of patient and team safety and treatment efficacy, in order to qualify the assistance provided.

DESCRIPTORS: Technology. Nursing. Education in health. Bradycardia. Artificial pacemaker. Older adult. Emergency medical services.

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DESENVOLVIMENTO DE TECNOLOGIA EDUCACIONAL PARA MANEJO DO MARCA-PASSO TRANSCUTÂNEO EM IDOSOS NO ATENDIMENTO PRÉ-HOSPITALAR MÓVEL

RESUMO

Objetivo: desenvolver tecnologia educacional para enfermeiros sobre manejo do marca-passo transcutâneo em idosos, em atendimento pré-hospitalar móvel.
Método: estudo metodológico, desenvolvido junto às Unidades de Suporte Avançado do Serviço de Atendimento Móvel de Urgência da 2º Regional de Saúde Metropolitana do Paraná, Brasil, em três fases: 1) pré-produção – elaboração do roteiro do vídeo; 2) produção – validação do roteiro por juízes especialistas, elaboração do *storyboard*, gravação das narrações e seleção de imagens; 3) pós-produção – avaliação do vídeo por juízes especialistas e divulgação do vídeo. Participaram da validação do roteiro 51 enfermeiros juízes especialistas; e 47 deles avaliaram o vídeo. Coletaram-se os dados entre abril e maio de 2022, por meio de instrumentos, com escala de *Likert,* via *Google Formulários*. Aplicou-se estatística descritiva para análise dos dados e considerou-se Índice de Validade de Conteúdo de pelo menos 0,78.
Resultados: os juízes sugeriram linguagem menos técnica, inclusão de cena e correção referente ao posicionamento das pás adesivas do marca-passo transcutâneo. Produziu-se vídeo em 2D de 8 minutos e 30 segundos, que abordou ações e cuidados no manejo do marca-passo em idosos. Consideraram-se adequados os quesitos: linguagem, imagens, narração, tempo de duração, orientações propostas e memorizações das mensagens (IVC =1,0).
Conclusão: a tecnologia educacional desenvolvida foi considerada validada para enfermeiros quanto ao manejo do marca-passo transcutâneo em idosos. O vídeo educacional pode subsidiar a tomada de decisões em prol da segurança do paciente, da equipe e da eficácia no tratamento, de modo a qualificar a assistência.

DESCRITORES: Tecnologia. Enfermagem. Educação em saúde. Bradicardia. Marca-passo artificial. Idoso. Serviços médicos de emergência.

DESARROLLO DE UNA TECNOLOGÍA EDUCATIVA PARA EL MANEJO DE MARCAPASOS TRANSCUTÁNEOS EN ANCIANOS EN EL SERVICIO DE MÓVIL DE ATENCIÓN PREHOSPITALARIA

RESUMEN

Objetivo: desarrollar una tecnología educativa para enfermeros sobre el manejo de marcapasos transcutáneos en ancianos, en el Servicio Móvil de Atención Prehospitalaria.
Método: estudio metodológico desarrollado con las Unidades de Soporte Avanzado pertenecientes al Servicio Móvil de Atención de Urgencias de la 2º Región de Salud Metropolitana de Paraná, Brasil, en tres fases: 1) Pre-producción – elaboración del guión del video; 2) Producción – validación del guión a cargo jueces especialistas, elaboración del *storyboard*, grabación de las narraciones y selección de las imágenes; y 3) Post-producción – evaluación del video a cargo de jueces especialistas y divulgación del video. Los participantes del proceso de validación del guión fueron 51 jueces especialistas y enfermeros de profesión; y 47 de ellos evaluaron el video. Los datos se recolectaron entre abril y mayo de 2022 por medio de instrumentos con una escala de *Likert,* a través de *Formularios Google*. Se aplicó estadística descriptiva para el análisis de los datos y se consideró un Índice de Validez de Contenido de al menos 0,78.
Resultados: los jueces sugirieron lenguaje menos técnico, incluir una escena y correcciones referentes a la ubicación de los parches adhesivos del marcapasos transcutáneo. El video se produjo en 2D y duró 8 minutos con 30 segundos, analizando acciones y precauciones en el manejo de marcapasos en ancianos. Los siguientes elementos se consideraron adecuados: lenguaje, imágenes, narración, duración, pautas de orientación propuestas y memorización de los mensajes (IVC=1,0).
Conclusión: la tecnología educativa que se desarrolló fue considerada validada para enfermeros en relación con el manejo de marcapasos transcutáneos en ancianos. El video educativo puede asistir en el proceso de toma de decisiones en pos de la seguridad del paciente y del equipo de atención, al igual que para la eficacia del tratamiento, a fin de calificar la asistencia provista.

DESCRIPTORES: Tecnología. Enfermería. Educación en salud. Bradicardia. Marcapasos artificiales. Ancianos. Servicios médicos de emergencia.

INTRODUCTION

The aging process brings with it common physiological changes such as bradyarrhythmias, which are commonly related to syncope in older adults. In this context, bradyarrhythmias of cardiogenic origin stand out, accounting for 20% of the cases in the aged population, which has the worst prognosis. Thus, patients with altered level of consciousness, hypotension, pulmonary congestion and chest pain caused by bradyarrhythmias should seek care urgently[1]. Cardiac arrhythmias or dysrhythmias are one of the most common causes observed in the care of elderly patients aged at least 65 year old, treated in emergency units in the United States of America[2].

A study carried out in England investigated a significant sample of 1,275,174 adults and aged people. Through the analysis of the *Royal College of General Practitioners* and the *Research and Surveillance Center* databases, prevalence of cardiovascular diseases was observed in 87.5% of the those aged 60-69 years old, in 74.2% between 70 and 79 years old and in 56% among those aged ≥ 80 years old[3]. A cross-sectional study carried out in the urban region of a medium-sized city from southeaster Brazil pointed to cardiovascular diseases (70.3%) as predominant among the clinical conditions self-reported by the older adults[4]. It was concluded that cardiovascular diseases represent significant numbers on the health issues of the aged population in Brazil and in the world[5].

In Brazil, a study carried out with data from the Mortality Information System (*Sistema de Informações sobre Mortalidade*, SIM) showed that, although mortality due to cardiovascular diseases has decreased over the years, it is still the leading cause of death in the country[6]. An estimated 17.9 million people died due to cardiovascular diseases in 2016, representing 31% of all deaths[7].

In this perspective, bradycardia is a frequent finding among the cardiovascular complications assisted by the pre-hospital service. The initial treatment consists of using drugs such as atropine, dopamine and epinephrine. In cases of patients who do not respond to the initial therapy or when there is no clinical indication, such as unstable patients or in high-degree block, artificial stimulation with a Transcutaneous Pacemaker (TCPM) should be considered immediately[8].

Using a TCPM saves time, is not invasive and is well tolerated by conscious patients diagnosed with second- or third-degree Atrio-Ventricle Block (AVB), despite being considered a painful intervention[9]. This device can be a differential in Mobile Pre-Hospital Assistance (MPHA), in the health unit, and in places that are difficult to access such as rural areas or that do not offer the possibility of inserting a provisional Transvenous Pacemaker (TVPM) device[2]. The main advantage is stabilizing the patient's clinical condition.

A study carried out in the United States highlights that, when setting up the stimulation device, nurses must do so according to the stimulation mode, current and prescribed frequency. Therefore, it is important to increase the current level slowly, while evaluating capture in patients who are conscious, in order to decrease discomfort[2].

Furthermore, it is indicated that, during the procedure with the TCPM, professional nurses should check vital signs, assess the level of consciousness, observe improvements in skin color and temperature, continuously monitor the electrocardiogram (ECG) and analyze the electrical and mechanical captures, which indicate contraction of the heart, confirmed by palpation of the radial artery pulse[2].

Therefore, the development of educational technology for nurses on transcutaneous pacemaker management in aged patients undergoing MPHA, based on recommendations for evidence-based practices and current clinical guidelines, can contribute to professional qualification, with changes in the assistance practice.

In view of the above, this study aimed at developing educational technology for nurses on transcutaneous pacemaker management in older adults undergoing mobile pre-hospital assistance.

METHOD

This is a methodological and descriptive study developed through three phases: Pre-production (Phase 1); Production (Phase 2); and Post-production (Phase 3)[10]. In turn, the methodological stages were adapted[11]. The study was carried out with nurses from the Advanced Support Units (*Unidades de Suporte Avançado*, USAs) of the Mobile Urgency Care Service (*Serviço de Atendimento Móvel de Urgência*, SAMU) from the 2nd Metropolitan Health Region of the state of Paraná – Brazil.

This study was conducted in accordance with ethical precepts, following the resolutions set forth by the National Council for Health and Research involving human beings.

Sample calculation was performed to ensure representativeness of the population (N=88 SAMU nurses, from the 2nd Metropolitan Health Region of the state of Paraná), based on the known-size population formula. The calculation indicated a minimum sample equal to or greater than 26 nurses. A total of 51 nurses participated in validation of the script and 47 of them collaborated with the subsequent phase, evaluating the video prepared, from April to May 2022.

The inclusion criteria for the participants were being a professional nurse with work/experience in urgency/emergency and MPHA, working in the SAMU USAs from the 2nd Metropolitan Health Region of Paraná, having a specialist, MSc or PhD degree in one or more areas of interest, with an emphasis on Urgency and Emergency and/or Intensive Care, and having at least one year of experience in the area. The exclusion criteria were as follows: being on leave for health treatment, maternity leave or other leave during participation in the research.

Phase 1 – Pre-production

The Pre-production phase started from the definition of the topic to be developed: Actions and care measures for TCPM management in aged patients undergoing MPHA. Subsequently, the objective of the educational video was defined, which translates into assisting nurses in TCPM management in aged patients with bradycardia. Thus, the contents to be made available in the videos were defined in this phase, based on an integrative review and in the form of a published article[12], as well as on consultations in guides, guidelines and cardiology guidelines from national and international cardiology societies, which supported elaboration of the video script. This phase was designed by the researchers, without the participation of any media professional.

Phase 2 – Production

In the Production phase, the video script content was validated using an assessment instrument with a Likert scale, created on *Google Forms*. Invitations were sent to the 88 nurses representing the eight municipalities of the 2nd Metropolitan Health Region of Paraná, East Macro-region, who were invited to participate as expert judges. Of these, 37 did not respond and 51 agreed to participate.

The participants in this phase were nurses working in Advanced Support Units (USAs) with expertise in Urgency/Emergency and MPHA and of both genders, regardless of ethnicity, class, gender or social group. They were invited to participate in validation of the content through an invitation letter, sent via email, along the Free and Informed Consent Form (FICF), which was electronically filled-in and signed in case of acceptance. The judges answered the adapted validation instrument[13] in a virtual/remote way, in order to assess clarity, pertinence, consistency and objectivity.

For data analysis, descriptive statistics was used to identify the characteristics inherent to the participants and, subsequently, it was sought to account for the answers in terms of frequencies, percentages and confidence intervals for proportion. A Content Validity Index (CVI) analysis was performed to measure the experts' agreement regarding representativeness of each item of the data collection instruments applied in this study, with items that obtained CVI > 0.78 being considered valid[14].

The script content validation instrument proposed for the video consisted of 17 items divided into three domains: objectives, structure/presentation and relevance, in which the judge gave each item an answer conditioned to conception of the information, assigning them scores related to "Totally adequate", "Adequate", "Partially adequate" or "Inadequate".

The "Totally adequate" or "Adequate" answers were assigned values of 1 and the "Partially adequate" and "Inadequate" answers were scored with zero. The evaluation process was carried out for each item, reaching a minimum agreement level of 80% for the current study. If any instrument item did not reach the minimum percentage, the necessary adjustments would be made and a new validation round would be carried out only with the corresponding items, until reaching 80% or higher agreement.

After validating the script content based on the text and the recommendations made by the expert judges, a storyboard was prepared, whose purpose was to guide the creative process in the other production stages. In this way, creation of the storyboard was based on the model proposed by Braga et al.[11], by a hired audiovisual company, with the researchers' support and supervision.

Subsequently, the visual elements were created with the objective of presenting all the information in a clear and appealing way in the video. In this sense, it was decided to use animations because they are more playful and timeless. Then, the images/illustrations were created by the audiovisual company's team in *Adobe Photoshop*, with suggestions from the researchers. To carry out this stage, two face-to-face meetings and three online meetings were held with the audiovisual team to discuss, plan and define the images/drawings/animations approved by the researchers.

Based on the storyboard, the voiceover was recorded in an acoustically isolated studio, for later edition by a professional in the sound area, and the video was edited by the hired team under the researchers' directions, together with audiovisual technicians experienced in producing educational videos.

After the scenes were duly animated and exported, *Adobe Premiere* was used to edit and finalize the material, combining animated scenes, voiceover, soundtrack and final credits. Once the scenes were completed, the pilot video was exported to a *YouTube* channel in "unlisted" mode, which allowed the participants of this study to view the video by sharing the link.

Phase 3 – Post-production

The educational video was evaluated in the Post-production phase. Once the edition steps were concluded, the video was submitted to evaluation by expert judges, through a questionnaire prepared and adapted from a model[14]. All 51 nurses participating in the previous phase, with expertise in TCPM and experience in MPHA, were invited, with 47 of them answering the questionnaire. They had the task of evaluating the video and filling out a questionnaire, appreciating the criteria of language, images, voiceover, adequacy in terms of duration, guidelines proposed and memorization of the messages. The instrument was created by means of answer options inherent to nine items, in which each judge gave to each item an answer conditioned to conception of the information, assigning them scores related to: Totally agree, Agree, Disagree and Totally disagree.

To analyze the evaluation results, the Content Validity Index (CVI) was considered, which was calculated based on the mean of the content validation indices for all scale indices. The "Totally agree" or "Agree" answers were assigned values of 1 and the "Disagree" and "Totally disagree" answers were scored with zero. Items whose agreement between judges was equal to or greater than 0.80 were considered valid[15].

RESULTS

In Phase 1, Pre-production, the video script was prepared based on an integrative literature review, the results of which were published in a journal in the area[12], which supported creation of the script. It was decided to divide the script into four blocks: 1) General knowledge about TCPM in older adults; 2) Nursing care in the use of TCPM in older adults; 3) TCPM management during care; and 4) Possible complications and limitations in using TCPMs.

The script preparation process covered diverse information based on an integrative review of the developed literature[12], as well as on consultation with guidelines and guides, so that Nursing care measures were listed related to using TCPMs.

The following are the main Nursing care measures covered in the video regarding use of the TCPM: monitor the patient; explain the procedure to the patient; discuss with the medical team strategies for analgesia and sedation; observe improvements in skin color and temperature; perform the electrocardiogram (ECG); obtain large caliber peripheral venous access in the upper limbs; administer supplemental oxygen, if necessary; prepare the skin, avoiding burns and improving adhesiveness and removing any transdermal patch, residue or hair; and apply the adhesive pacemaker pads on the patient in accordance with the manufacturer's recommendations, not placing the adhesive pads on wounds, drains, over a pacemaker implant, defibrillator or on top of bones. In patients with breasts, place the pads under the organ and against the chest wall; and analyze electrical and mechanical captures.

The video also highlighted the importance of nurses evaluating signs such as improvements in the level of responsiveness, elevation of blood pressure and improvements in oxygen saturation and skin color, which indicate improvement in cardiac output. Care measures related to recording the date and time in which the stimulation was initiated in the medical records were also pointed out; as well as current required to obtain the capture; selected electrical stimulation frequency; patient's response to the capture; drugs administered during the procedure; date; hour; and reason for concluding stimulation. Finally, if applicable, arrange transfer to specialized care on an urgent basis.

In Phase 2, the video script was submitted to content validation by expert judges. As for the characterization of the study participants in this phase, there was predominance of women (n=27; 57.4%) aged between 35 and 45 years old (n=29; 61.7%). Referring to the highest academic degree, there was predominance of graduate studies, MSc or PhD degrees (n=42; 77.4%). In relation time working in the SAMU, the interval of up to five years (n=56.9%) and fifteen years or more (n=19.1%) prevailed; however, the participants stated having professional experience in PHA (n=43; 91.4%). Regarding the city of operation, the municipality of Curitiba prevailed (n=30; 63.8%).

As for the evaluation of the video script by blocks, it was found that they were considered adequate in terms of purpose (98.08%), presentation structure (98.90%) and relevance (99.23%). Based on these results, the script content was considered validated by the expert judges, with an overall CVI of 98.73%. The assessments that obtained the most answers were "Totally adequate" and "Adequate", with CVI values above 0.9 (90.38%) for all items, indicating agreement between the judges' answers (Table 1).

Table 1 – Distribution of the expert judges' answers to the items of the script content validation instrument for creating the educational video on nurses' actions and care measures in transcutaneous pacemaker management in older adults undergoing mobile pre-hospital assistance. Curitiba, PR, Brazil, 2022. (n=51)

Questions	*TA n	†A n	‡PA n	§I n	II CVI
Objectives					
1. The information/content is consistent with the everyday needs of the technology target audience	30	21	0	0	1.0
2. The information/content is important for the quality of life and/or work of the technology target audience	32	19	0	0	1.0
3. It invites and/or instigates behavioral and attitudinal changes	22	24	4	1	0.90
4. It can circulate in the scientific environment of the area	34	17	0	0	1.0
5. It meets the objectives of institutions that serve/work with the technology target audience	25	26	0	0	1.0
¶S-CVI			**0.98**		
Structure/Presentation					
6. The technology is appropriate for the target audience	30	21	0	0	1.0
7. The messages are presented in a clear and objective way	29	21	1	0	0.98
8. The information presented is scientifically correct.	34	17	0	0	1.0
9. The material is appropriate to the sociocultural level of the proposed target audience	25	26	0	0	1.0
10. There is a logical sequence of the content proposed	31	20	0	0	1.0
11. The information is well-presented in agreement and spelling	27	22	2	0	0.96
12. The writing style corresponds to the target audience level of knowledge	29	21	1	0	0.98
¶S-CVI			**0.98**		
Relevance					
13. The topics portray key aspects that need to be strengthened	31	20	0	0	1.0
14. The technology allows generalization and transfer of learning to different contexts	31	19	1	0	0.98
15. The technology proposes knowledge construction	34	16	1	0	0.98
16. The technology addresses the subject matters necessary for the target audience's knowledge	31	20	0	0	1.0
17. The technology is suitable for use by any professional with the target audience	24	27	0	0	1.0
¶S-CVI			**0.99**		
¶S-CVI (Overall)			**0.98**		

Key: *TA: Totally Adequate, †A: Adequate; ‡PA: Partially Adequate; §I: Inadequate; II CVI: Content Validity Index; ¶S-CVI: Content Validity Index – Scale.

After validating the script content, the storyboard was elaborated through the services of a hired audiovisual communication company, with supervision by the researchers. In this stage, materials were produced that described what happens in each part of the video script, interspersing voiceover and scenes with text, images and animations. As for the visual aspects, as a way to differentiate the screens, the use of colors equivalent to those of the SAMU was maintained, choosing a blue background to favor the users' attention on the content.

As for the evaluation of the video by the expert judges, it is noted that suggestions were made, which were accepted and incorporated into the final version of the video, such as using less technical language and adding necessary images for better understanding the text. In addition, creation of

a second image with another example of an electrocardiogram tracing and highlighting the spike, wide QRS and wide T wave in both images, to ease learning for those who will watch the video and creation of an image with a summary of the Nursing care measures. In another assessment carried out by an expert judge, it was verified that the audio and subtitles were different in terms of the place to apply the adhesive pads.

In the field of considerations, it was also evidenced that the video is extremely necessary, as it includes language that is easy to understand and grants visibility to nurses because they are qualified health professionals for transcutaneous pacemaker management in the older adults undergoing MPHA.

The main scenes of the videos are presented in figures 1 and 2.

Figure 1 – Scenes from blocks 1 and 2 of the video: Nurses' actions and care measures in transcutaneous pacemaker management in older adults undergoing mobile pre-hospital assistance. Note: Screenshot of the video scenes.

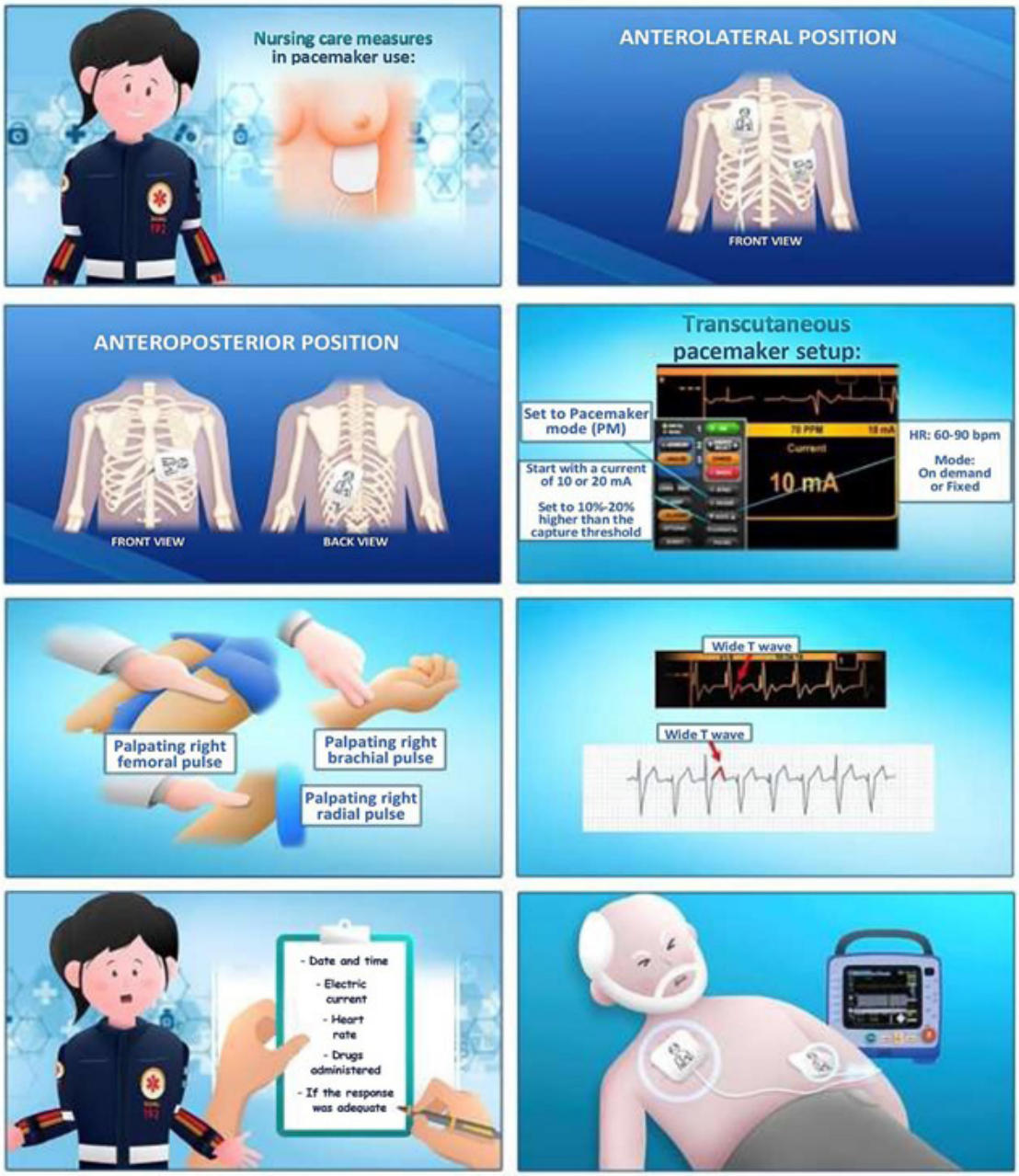

Figure 2 – Scenes from blocks 3 and 4 of the video: Nurses' actions and care measures transcutaneous pacemaker management in older adults undergoing mobile pre-hospital assistance.
Note: Screenshot of the video scenes.

For recording the video, a female voice was chosen for voiceover, represented by the SAMU nurse character. In all, the video lasted 8 minutes and 30 seconds.

Regarding the issue of the video easing transcutaneous pacemaker management in older adults undergoing mobile pre-hospital assistance, 34 expert judges (72.3%) totally agreed and 13 expert judges (27.7%) agreed. The values obtained in all the "Totally adequate" or "Adequate" answers generated a CVI of 1 (100%) for all items, indicating agreement between the participants' answers (Table 2).

After the judges' evaluation, the video was released to "public" mode on the *YouTube* channel on the following link: https://youtu.be/7sbIxXPNteM[16], and registered with the National Film Agency (*Agência Nacional do Cinema*, ANCINE) with product number B22-002743-0000.

Table 2 – Distribution of the expert judges' answers to the items of the educational video's evaluation instrument on nurses' actions and care measures in transcutaneous pacemaker management in older adults undergoing mobile pre-hospital assistance, Curitiba-PR, Brazil, 2022. (n=47)

Questions	*TA n	†A n	‡D n	§TD n	¶CVI
1. Evaluate the assertions about the educational video you watched. It has easy-to-understand language	36	11	0	0	1.0
2. It uses the visual resources properly: the images chosen are easy to understand	33	14	0	0	1.0
3. It uses the audio resources properly: voiceover is clear and understandable	32	15	0	0	1.0
4. The content was distributed appropriately for the length of the video	28	19	0	0	1.0
5. It keeps the audience involved throughout the video	29	18	0	0	1.0
6. It conveys the guidelines proposed	35	12	0	0	1.0
7. It eases memorization of the messages	30	17	0	0	1.0
8. It can ease transcutaneous pacemaker management in older adults undergoing Mobile Pre-Hospital Assistance	34	13	0	0	1.0
9. All the information about nurses' care measures in transcutaneous pacemaker management is correct	31	16	0	0	1.0
****S-CVI**			**1.0**		

Key: *TA: Totally Agree; †A: Agree; ‡D: Disagree; §TD: Totally Disagree; ¶CVI: Content Validity Index; **S-CVI: Content Validity Index – Scale.

DISCUSSION

One of the important issues to be considered in the creation of educational technology is clear, accessible and understandable language for the target audience. In the current study, 36 judges totally agreed (76.6%) and 11 agreed (23.4%) that the video language was clear and easy to understand for nurses, reaching a CVI of 100% for this item.

In relation the voice and tone of the video voiceover, a female voice with clear, calm and accessible language was chosen, as recommended in the production of educational materials in health, with the purpose of improving understanding of a given topic[17], The participating evaluators considered that this characteristic was adequate in the current study; therefore, the video voiceover was used efficiently and understandably.

Furthermore, the subtitles provide informational content, responsible for complementing the images and raising interest in the video content, and are not placed in the background, as they add context. In addition to that, they are responsible for increasing the number of people who watch this type of post.

In a study whose objective was to create and validate a booklet for vertical HIV prevention, aimed at pregnant women, during the methodological stages, the authors showed the need to change the language, based on the expert judges' evaluation[18]. This language adaptation in the materials proposed to the target audience is important. In this perspective, a study developed by the American Academy of Orthopedic Surgery stands out, which evaluated the readability level of the online materials available to improve orthopedic patients' health-related learning, finding that 80% failed to present understandable language for the target audience[19].

Thus, in this study, technical terms were replaced by easy-to-understand words for better understanding the text, following the expert judges' suggestions, substituting "carotid pulse" with "radial pulse" and "amperage" with "electric current".

Emphasis is made on the importance of educational technologies presenting, in addition to content with correct information and based on scientific evidence, clarity for the target audience in an objective way. These aspects are reinforced in a study that created and validated an educational video for older adults about the risk of falls, in which the authors highlighted the importance of adapting the language used in the educational technology to the target audience[20].

The video content production process was based on the integrative literature review[12]and on consulting guidelines and guides, which generated a list of Nursing care measures related to using TCPMs, which were included in the video. The following stand out as examples of information addressed in the educational video: proper installation of the device; easing electrical and mechanical captures; and care measures related to possible complications. A TCPN applies stimulating impulses to the heart, when in contact with the chest skin, by means of transcutaneous adhesive pads. This stimulation is non-invasive and can be performed by Advanced Life Support (ALS) professionals[2,6].

As mentioned, the TCPM implantation procedure is fast and can be performed even in PHA, helping to stabilize the clinical condition of a critically-ill patient. However, there may be some complications and limitations in the process, such as the following: capture failures; interference; pain; device failure to recognize what the transcutaneous pacemaker is capturing; and skin burns, including third-degree burns, due to inappropriate or prolonged use of the transcutaneous pacemaker[8,20]. To reduce the risk of these complications, it is important to reassess the patients 30 minutes after initiating the electrical stimulation[8].

In relation to skin burns, a study is pointed out that reported keeping the pads in one patient for 12 hours and in another for 36 hours, which generated skin lesions, until the temporary TVPM was applied. However, the authors point out that the manufacturers suggest that the pads should be replaced daily. Therefore, it is clear that TCPMs can be associated with severe burns and should be used for the shortest possible time, leaving it to nurses to assess integrity of the patient's skin[21–22].

Thus, for being a complex and specific care measure, knowledge, design and clarity of professional competencies become essential in the care of patients with pacemakers. In a study on professional competencies in pacemakers, the authors emphasize that nurses should know how the device works, as well as how to identify the electrocardiographic tracings and the pathophysiological process of the disease that affects the patient[23].

In addition, nurses working in this area face complex care that requires skill and more effective decision-making[24]. Nurse working in Urgency and Emergency MPHA still face various challenges regarding the activities in this health system. The absence of effective legislation leads to a decrease in these professionals' autonomy in pre-hospital assistance, as there is no technical opinion from the Federal Nursing Council (*Conselho Federal de Enfermagem*, COFEN) on nurses' role in TCPM management, indicating an important gap.

The script validation phase allowed the participants to evaluate each block of items present in the questionnaire, in order to know how each person evaluated the study, how it was validated and how each block was important in elaboration of the video. When carefully analyzed, each item was validated through the answers with satisfactory agreement among the participants, which collaborated to prepare a solid instrument capable of meeting the demands for creating an educational video. The suggestions and considerations made by the expert judges contributed to finalizing the data referring to the script. The notes made by the participants in the script itself and the validation instrument proved to be extremely fruitful and positive[13].

Evaluation of the video by the expert judges was very satisfactory in all aspects (language, images, voiceover, video duration, guidelines proposed) and important, as these evaluators have sufficient expertise and critical capacity to improve the educational video proposal.

A recent study showed that an educational video on the role of Nursing in obstetric cardiorespiratory arrest can be used as a tool for multiplying knowledge among professors in different courses such as undergraduate Nursing courses, within the Urgency and Emergency curricula, or for students and health professionals who are interested in the theme[25].

When creating the video, 2D animation was chosen because it presented the theme addressed in a more dynamic way, with figurative illustrations and that might be used as a learning tool. This result is corroborated by a study carried out in Brazil[26], where the use of animation ensured effectiveness of multidimensional learning and non-verbal communication. A number of researchers[27] state that video is multimedia with a wide possibility of dissemination, easy access and that, once made available on digital platforms such as *YouTube*, it becomes a reference for students, allowing flexibility in the study schedule.

It is noted that, regarding the length of instructional videos, the literature points out that it is not recommended that they exceed 15 minutes, as they can become tiring and induce dispersion of the viewer's attention[17]. Thus, following this recommendation, the current video proved to be adequate according to the expert judges' evaluation, lasting eight minutes and 30 seconds.

Studies of this nature reinforce that Nursing needs to invest in the creation and validation of audiovisual educational technologies for care, in order to assist in the practice of professional activities with dynamism, creativity, reliability and commitment to health and the assistance provided. The reality for which it is designed and developed should also be considered, with the objective of enabling and enhancing nurses' actions[28].

The ease of seeing, reviewing and analyzing an audiovisual product, the possibility of watching, pausing and stopping it when convenient, are characteristics that confer an effective means to communicate with most people[28]. Therefore, audiovisual educational technologies are presented as an interesting resource to be used to promote health, education and knowledge for those who watch it.

In this sense, this study innovates the form of guidance, teaching and study for Nursing professionals, with the possibility of encompassing other professionals who are interested in the topic, being made available on a long-range platform with free access, therefore emerging both as an educational and social technology.

The limitations of this study are related to the scarce number of scientific articles on Nursing care measures in TCPM management in older adults undergoing Mobile Pre-Hospital Assistance, as well as to the non-participation of technical judges in the video evaluation process. Despite this, it is believed that this paper can assist professionals in the clinical practice and support new studies, including the evaluation of this educational technology regarding the knowledge, attitude and practice of nurses who had access to the video, either through before-and-after studies or by means of clinical trials, for example.

CONCLUSION

The educational technology developed in 2D animation video format was considered suitable for nurses regarding transcutaneous pacemaker management in older adults. It includes general knowledge about TCPMs, Nursing care measures, stages for managing TCPMs, complications and limitations for using these devices in older adults.

In all questions, the technology developed, 2D animation video, reached high agreement levels among the judges, which shows the feasibility of identifying nurses' actions and care measures in transcutaneous pacemaker management in the older adults undergoing pre-hospital assistance. It is

a strategy to support decision-making in favor of patient and team safety and treatment efficacy, in order to qualify care, making it possible to replicate it in other health settings.

This educational technology can be employed as a strategy for teaching health professionals in the Advanced Support Units (USAs) from the Mobile Urgency Care Service (SAMU), especially for nurses and undergraduate Nursing students interested in the theme, with a view to autonomy in managing transcutaneous pacemakers.

In addition, it provides visibility and strengthens nurses' appreciation by using clinical reasoning in the everyday practice. Furthermore, it stimulates Nursing professionals' critical thinking, which favors an approximation between theory and practice, with scientificity. Thus, it is expected that this educational technology, in 2D animation video format, can actively collaborate for the proper use of TCPMs in older adults undergoing MPHA, in order to increase the success rates in the treatments and reduce those of complications related to improper use of the devices.

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NOTES

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There is no conflict of interest.

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