

ORIGINAL RESEARCH

Design and validation of educational material included in a health education strategy aimed at individuals with cardiovascular diseases implemented via WhatsApp

Diseño y validación del material educativo incluido en una estrategia de educación en salud dirigida a personas con enfermedades cardiovasculares e impartida vía WhatsApp

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Abstract

Introduction: Cardiovascular disease (CVD) is the leading cause of death worldwide. Cardiac rehabilitation programs (CRP) have demonstrated advantages for patients with CVD; however, few maintain their participation over time due to poor adherence, which could be impacted by the lack of structured education programs.

Objectives: To design and validate educational material included in a health education strategy implemented via WhatsApp aimed at individuals with CVD who participate in a CRP.

Materials and methods: Mixed methods study based on the research-creation process and developed in two stages: design and elaboration stage of the educational strategy and validation stage of the educational material, which included a technical validation (participation of 8 health professionals) and a target audience validation (participation of 6 patients with CVD users of a phase 2-CRP). This study followed the guidelines of the Pan American Health Organization for the elaboration and validation of educational material in health care.

Results: The first version of the strategy included 26 educational pieces (17 images, 5 audios, and 4 videos), and 96.3% of them were rated as “use as is”. Considering the content and form suggestions made by the experts, the second version included 31 educational pieces (22 images, 5 audios, and 4 videos). Following the validation of the target audience, the final version of the material consisted of 30 pieces (21 images, 4 audios, and 5 videos).

Conclusion: The present study allowed us to design and validate educational material targeted at CRP users which, through its patient-centered nature and easy dissemination via a widely used social network, becomes a tool that can help to improve adherence to these programs.

This clinical trial was registered in the Australian New Zealand Clinical Trials Registry under code ACTRN12622001446752.

Resumen

Introducción. Las enfermedades cardiovasculares (ECV) son la principal causa de muerte en el mundo. Se ha comprobado que la rehabilitación cardíaca ofrece beneficios a los pacientes con ECV; sin embargo, pocos perduran en el tiempo debido a la pobre adherencia, lo cual podría estar influenciado por la falta de programas de educación estructurados.

Objetivos. Diseñar y validar el material educativo incluido en una estrategia de educación en salud impartida vía WhatsApp dirigida a personas con ECV usuarios de un programa de rehabilitación cardíaca (PRC).

Materiales y métodos. Estudio de métodos mixtos basado en el proceso de investigación-creación y desarrollado en dos etapas: etapa de diseño y elaboración de la estrategia educativa y etapa de validación del material educativo, la cual incluyó una validación técnica (participación de 8 profesionales de la salud) y una validación por público objetivo (participación de 6 pacientes con ECV usuarios de un PCR-fase 2). Se siguieron los lineamientos de la Organización Panamericana de la Salud para la elaboración y validación de material educativo en salud.

Resultados. La versión 1 de la estrategia tenía 26 piezas educativas (17 imágenes, 5 audios y 4 videos), de las cuales 96.3% se calificaron en “dejar como está”. Teniendo en cuenta las sugerencias en contenido y forma hechas por los expertos, en la versión 2 se incluyeron 31 piezas educativas (22 imágenes, 5 audios y 4 videos). Posterior a la validación de público objetivo, la versión final del material consistió de 30 ítems (21 imágenes, 4 audios y 5 videos).

Conclusión. En el presente estudio fue posible diseñar y validar material educativo dirigido a usuarios de un PRC que, al estar centrado en el paciente y ser de fácil difusión vía una red social ampliamente utilizada, se convierte en una herramienta que puede ayudar a mejorar la adherencia a estos programas.

Este ensayo clínico fue registrado en el Australian New Zealand Clinical Trials Registry bajo el código ACTRN12622001446752.



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Introduction

Cardiovascular disease (CVD) is the leading cause of mortality and morbidity worldwide.¹ It has been reported that modifiable CVD risk factors, such as hypertension (HT), dyslipidemia, diabetes mellitus (DM), smoking, psychological stress, sedentary lifestyle, alcohol consumption, high waist/hip ratio and unhealthy diet, increase the risk of developing heart disease, the main outcome being acute myocardial infarction.²

One of the support strategies for the treatment of individuals with CVD is cardiac rehabilitation programs (CRP), which involve activities that allow these individuals to improve their physical^{3,4} and mental status,⁵ as well as to promote their social independence.⁶ This is achieved by having personalized physical activity and health education as pillars, resulting in a positive impact on their quality of life,⁷⁻⁹ their reintegration into the workplace,^{10,11} and their functional capacity.^{12,13} However, studies have reported that these benefits are not sustained in the long term by many patients who participate in CRPs,¹⁴⁻¹⁶ possibly due to poor adherence to these programs, lack of follow-up, the presence of comorbidities, and the existence of structured health education processes.^{17,18}

Recent scientific literature does not clearly describe the health education processes or interventions that should be used in this population, so each CRP must establish a route to follow for its proper implementation.¹⁹⁻²¹ Moreover, some authors, such as Molina *et al.*,²² point out that the importance of health education in the prevention of cardiovascular events is still not recognized, suggesting that the development and implementation of health education actions could increase the effectiveness of treatments, thus reducing the risk of comorbidities and complications. It has also been described that the use of health education programs or interventions improves health-related quality of life in patients with CVD and may even lead to a reduction in the scores obtained in scales predicting cardiovascular events due to their effect on risk factors.^{19,21}

It has been reported that the use of information and communication technologies for the development and implementation of health education interventions is effective, particularly in secondary prevention activities, since, besides facilitating clear and timely access to health information by patients, these technologies make it possible to guide and supervise users at any time and from any place.²³⁻²⁵

A variety of social networks are available, but WhatsApp²⁶ is popular and convenient for medical education as it allows smartphone users to send text messages, share audiovisual content, create groups, and have multiple users participate and monitor the conversation. It is also easily accessible (even for people with relatively low levels of literacy), can be used at any time, and does not involve additional data plan costs.^{23,25,27}

In view of the above, the objectives of the present study were to design and validate the educational material included in a health education strategy implemented via WhatsApp aimed at individuals with CVD and users of a CRP.

Materials and methods

Study type

Mixed-methods sequential explanatory design study^{28,29} based on the research-creation process.^{30,31}

Procedure

This study was carried out in 2 stages: design and elaboration stage of the educational strategy to be implemented via WhatsApp, which was developed from February to December 2020 in 5 phases (Figure 1), and validation stage carried out from July to November 2021. The health education material was developed and validated taking into account the guidelines of the Pan American Health Organization (PAHO).³²

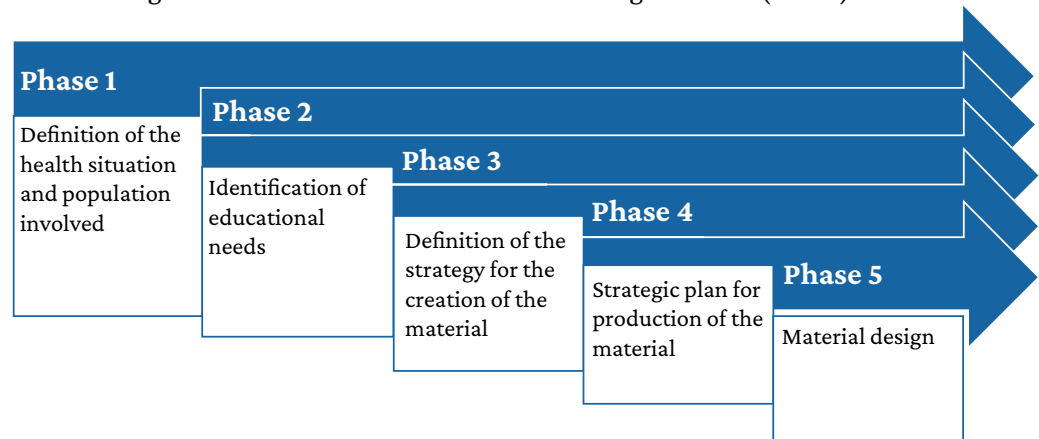


Figure 1. Phases of the design and validation process.

Source: Elaboration based on Hernández-Sánchez.³³

Stage 1. Design and development of the educational strategy

The phases of this stage are described below:

Phase 1. Delimitation of the problem: To define and identify the population involved in this study, the scientific literature and health indicators were reviewed, a questionnaire was designed for the researchers, and a problem tree was created.

Phase 2. Identification of educational needs: International guidelines on cardiac rehabilitation education were reviewed to select the topics to be addressed, and the pedagogical competence of the educational strategy was formulated.

Phase 3. Definition of the educational strategy content and the pieces that would make up the strategy: The duration and frequency of delivery of the educational strategy was established.

Phase 4. Search for applications to create educational pieces: The general characteristics of the educational material were decided upon.

Phase 5. Production of the educational material: The first version of the educational material was produced.

Stage 2. Validation of the educational material

This stage was divided into two phases that were developed using a mixed approach:³⁴

Phase 1. Technical validation: It was carried out by 8 health professional experts with more than 2 years of experience in health education processes and CRP, who quantitatively and qualitatively evaluated the first version of the pieces (images, audios, and videos) included in the educational material of the health education strategy developed in stage 1.

A form prepared in accordance with the model proposed by PAHO was filled out for quantitative evaluation.³² The form and the contents of each image, audio, and video

piece included in the educational strategy were evaluated on a 1-5 Likert scale, with 1 being the lowest and 5 the highest score. In addition, several cut-off points were set based on the type of resource to define the behavior to be followed with each resource (Table 1). According to the type of resource and the number of criteria established, the highest score that each piece could obtain depending on its typology was: audio: 45 points, image: 40 points, and video: 55 points.

The qualitative evaluation was carried out through a focus group with experts (video call) and face-to-face semi-structured interviews with users, during which they were asked about their perception of the material. From these results, the adjustments to be made to the pieces were determined in order to produce the second version of the educational material.

Table 1. Criteria for quantitative evaluation of educational material and established cut-off points.

	Video	Audio	Image
Criteria	<ul style="list-style-type: none"> - Image and sound are synchronized - There are elements that make it appealing - There are elements that summarize the content or message - A specific topic is presented in a comprehensive manner - The messages are easily understood - Images are clearly visible - Sound elements are heard properly - Messages are presented objectively - There are elements that encourage participation - There is no information overload - Duration is not too long 	<ul style="list-style-type: none"> - Sound level is appropriate - Language is clear - Messages are mutually strengthened - There are elements that make it appealing, e.g., music and a pleasant pitch - A single topic is addressed - Secondary aspects (music, sound effects, etc.) do not divert attention from the main message - Messages are presented objectively - There are elements that encourage audience participation - Community members can access it easily 	<ul style="list-style-type: none"> - A specific topic is presented - The topic is easily understood - Colors and images contribute to emphasizing the topic - The message is objective - The message does not allow for ambiguous interpretations - The material does not contain unnecessary elements - The size of the elements favors good visualization - The image encourages discussion of the topic it addresses - It can be easily transported
Cut-off points	Use as is (48-55 points) Improvements required (28-47 points) Rejected (less than 28 points).	Use as is (40-45 points) Improvements required (21-39 points) Rejected (less than 21 points)	Use as is (35-40 points) Improvements required (16-34 points) Rejected (less than 16 points)

Phase 2. Target audience validation: It was carried out with the participation of 6 patients with CVD, users of a phase 2 CRP of a health care institution in Bucaramanga, who were selected by convenience sampling taking into account the following inclusion criteria: having a smartphone and knowing how to use WhatsApp, Google Forms, and Zoom. The selection process was initiated by the CRP administrative assistant, who explained to the patients the objective of the study and the specific stage in which they were going to participate. Once they agreed to participate, she shared their contact information (cell phone and WhatsApp number) with the researchers to validate the inclusion criteria by means of test messages.

The patients evaluated the second version of the educational material as follows: during the quantitative phase, they filled out the same form used for the technical validation; during the qualitative phase, each person answered the following question during a semi-structured interview: “Do you see any areas in the resource that should be improved?” The results of this phase made it possible to create the final version of the educational material.

Data analysis

Data regarding the quantitative evaluations of both versions of the educational material were described using means.^{35,36} As for the qualitative evaluations, the focus group audios and semi-structured interviews were transcribed and coded for descriptive analysis, grouping the suggestions made for each image, audio, and video piece evaluated, thus defining the improvements to be made to each one of them, independently of whether the result of the quantitative evaluation was “use as is”.

Ethical considerations

The study followed the ethical principles for biomedical research involving human subjects established in the Declaration of Helsinki³⁷ and the scientific, technical, and administrative standards for health research of Resolution 8430 of 1993 issued by the Colombian Ministry of Health.³⁸ It was also approved by the ethics committee of the Universidad de Santander as per minutes No. FI74-21 of June 8, 2021, and all participants signed an informed consent. Data were protected in accordance with Law 1581 of 2012.³⁹

Results

Design and development of the educational strategy

In order to design the educational strategy, and based on the established problem, the competence to be developed was defined as “strengthening knowledge of cardiovascular risk factors, pharmacological treatment, nutritional recommendations, and physical activity among individuals attending a phase 2 CRP, to promote the adoption of healthy lifestyles and improve adherence to rehabilitation”.

To plan the structure of the educational strategy, the 4 main CVD risk factors (HT, DM, smoking, and dyslipidemia) were selected,^{12,40} addressing one per week, for a total of 4 weeks. The strategy was designed so that each working day of the week would address a different aspect of the risk factor under discussion: day 1: pathophysiology of the disease or condition (for smokers, composition and harmful effects were also addressed); day 2: pharmacological treatment (for smokers, psychotherapy, and other interventions for smoking cessation were mentioned); day 3: nutritional recommendations; day 4: physical activity recommendations; day 5: motivational element aimed at making the patient end the week with a message that inspires, encourages, and motivates them to modify their lifestyles (Table 2).

Table 2. Validation process by experts and target audience of the strategy and educational material.

Week	Day	1 st version	Score	Recommendation	Comments from experts	2 nd version	Score	Recommendation	Comments from target audience	Final version
Week 1: Arterial Hypertension	Monday Pathophysiology	Img01	38	Use as is	Explain that hypertension is a chronic disease that can be controlled, but not cured. Include normal blood pressure figures and warning values.	Img01	37	Use as is	Prevention should be adapted to all age groups. The language should also be more inclusive and differentiate the range of normal blood pressure based on age, gender, or race.	Img01
	Tuesday Pharmacology	Img02	38	Use as is	Change side effects to unwanted effects.	Img02	35	Use as is	Change the title of “undesirable aspects” to “side effects that may occur when taking HT medication,” and add: if the symptoms are severe, consult your physician.	Img02
	Wednesday Nutritional recommendations	Img03	37	Use as is	Emphasize the importance of consuming sodium. It is suggested to divide the image in two.	Img03	40	Use as is	Use a symbol that shows positive and negative aspects and adjust the food images accordingly.	Img03
		Img04	40	Use as is	No modifications	Img04	40	Use as is	No modifications	Img04
	Aud01	44	Use as is	Emphasize the importance of consuming sodium.	Aud01	45	Use as is	No modifications	Aud01	Aud01
		Thursday Physical activity recommendations	Vid01	53	Use as is	Replace terms with images, e.g., free weight.	Vid01	53	Use as is	No modifications
	Friday Motivational	Img04	39	Use as is	Specify the place where the patient can go to when they are experiencing grief, so that they know there is an expert who can provide them with more personalized care.	Img05	38	Use as is	Adjust the color scale.	Img05
		Challenge #1 was created at the suggestion of experts.	Img06	35	Use as is	No modifications	Img06	35	Use as is	No modifications

Table 2. Validation process by experts and target audience of the strategy and educational material. (Continued)

Week	Day	1 st version	Score	Recommendation	Comments from experts	2 nd version	Score	Recommendation	Comments from target audience	Final version
Week 2: Diabetes mellitus	Monday Pathophysiology	Img05	39	Use as is	The definition of type II diabetes should include “is caused by insulin resistance and inadequate insulin production” as a key part of the definition.	Img07	38	Use as is	Add the name of the pancreas over the image to better understand it.	Img07
	Tuesday Pharmacology	Img06	37	Use as is	Another image should be included with the treatment goals indicating the values to be achieved.	Img08	38	Use as is	Modify the glycosylated hemoglobin value from 6-7%. Add fasting glycemia values. List medications in a single line.	Img08
	Wednesday Nutritional recommendations	Img07	38	Use as is	State “all types of sugar, including honey or sugarcane, should be eliminated or reduced”.	Img09	40	Use as is	No modifications	Img09
		Aud02	43	Use as is	The audio should clearly stress the importance of not self-medicating, given that even some herbal infusions can cause serious side effects on your health.	Aud02	43	Use as is	No modifications	Aud02
	Thursday Physical activity recommendations	Vid02	53	Use as is	Show images of strength training.	Vid02	53	Use as is	No modifications	Vid02
	Friday Motivational	Img08	40	Use as is	Include information on support networks.	Img10	40	Use as is	No modifications	Img10
						Challenge #2 was created at the suggestion of experts.	Img11	35	Use as is	No modifications

Table 2. Validation process by experts and target audience of the strategy and educational material. (Continued)

Week	Day	1 st version	Score	Recommendation	Comments from experts	2 nd version	Score	Recommendation	Comments from target audience	Final version
Week 3: Smoking	Monday Pathophysiology	Img9	38	Use as is	Fix the size and font to improve its appearance. Not only include information on the harm caused by the common cigarette, but also on the harm caused by electric cigarettes and other similar devices.	Img12	40	Use as is	No modifications since explaining what an electronic cigarette is is not the purpose of the resource.	Img12
	Tuesday Pharmacology	Img10	38	Use as is	It is important to mention the psychotherapeutic dimension, which is a fundamental basis for smoking cessation.	Img13	38	Use as is	Change title to unwanted effects.	Img13
	Wednesday Nutritional recommendations	Img11: Plato saludable	39	Use as is	Compare grams with centimeters or teaspoons to make it easier to understand.	Img14	40	Use as is	No modifications	Img14
		Aud03	44	Use as is	Improve voice pitch.	Aud03	45	Use as is	No modifications	Aud03
		Img12: Leer etiquetas	37	Use as is	Include the nutritional table	Img15	40	Use as is	Make a video explaining the image.	Vid03
		Aud04	44	Use as is	Name other foods that have the same effects and are cheaper.	Aud04	45	Use as is	Make a video explaining the image.	
	Thursday Physical activity recommendations	Vid03	54	Use as is	Appropriate	Vid03	55	Use as is	No modifications	Vid04
	Friday Motivational	Img13	38	Use as is	Appropriate	Img16	35	Use as is	No modifications	Img15
					Challenge #3 was created at the suggestion of experts.	Img17	35	Use as is	No modifications	Img16

Table 2. Validation process by experts and target audience of the strategy and educational material. (Continued)

Week	Day	1 st version	Score	Recommendation	Comments from experts	2 nd version	Score	Recommendation	Comments from target audience	Final version
Week 4: Dyslipidemia	Monday Pathophysiology	Img14	39	Use as is		Img18	38	Use as is	No modifications	Img17
	Tuesday Pharmacology	Img15	34	Improvements needed	The image has too much content.	Img19	38	Use as is	Modify the size, type and font color of the undesired effect for each group of drugs.	Img18
	Wednesday Nutritional recommendations	Img16	36	Use as is	Summarize the text and change the font color.	Img20	40	Use as is	Redesign the resource, listing the four groups in a table, reducing the font, and putting the most relevant information in bullets.	Img19
		Aud05	44	Use as is	No modifications	Aud05	45	Use as is	No modifications	Aud04
	Thursday Physical activity recommendations	Vid04	52	Use as is	No modifications	Vid04	55	Use as is	No modifications	Vid05
	Friday Motivational	Img17	38	Use as is	No modifications	Img21	36	Use as is	No modifications	Img20
				Challenge #4 was created at the suggestion of experts.	Img22	35	Use as is	No modifications	Img21	
Total resources	1 st version: 26 pieces: 17 images, 5 audios, and 4 videos 2 nd version: 31 pieces: 22 images, 5 audios, and 4 videos Final version: 30 pieces: 21 images, 4 audios, and 5 videos									

Img: image; HT: hypertension; Aud: audio; Vid: video.

The design and elaboration of the educational material was carried out using free versions of graphic design and audiovisual material creation applications such as Canva and Powtoon. The first version of the educational material comprised 26 educational pieces: 17 images, 5 audios, and 4 videos.

Validation of educational material

Technical validation

The group of experts that validated the first version of the strategy included 3 physical therapists, 1 family physician, 1 nutritionist, 1 psychologist, 1 nurse, and 1 public health professional. Among these professionals, 7 had a master's degree, 5 were involved in teaching, 4 conducted research, 3 worked in health care, and 3 had more than 5 years of experience in CRP.

Table 2 presents the results of the quantitative evaluation of the technical validation. According to the established cut-off points and the average score obtained for each educational resource, it was determined that the behavior to be followed was "use as is" for all resources except for image 16, which addressed information on the pharmacological treatment of dyslipidemia and was considered to "need improvements".

The resources were modified considering the suggestions made by the experts of the focus group, all of which were related to improving the clarity of the texts (elimination of ambiguities) to promote the discussion of the topics addressed. Therefore, the design and font were modified and information was added to improve the quality of the resources. In addition, a weekly challenge to be sent on Fridays was included, thus obtaining the second version of the educational strategy, which consisted of 31 educational pieces: 22 images, 5 audios, and 4 videos (Table 2).

Target audience validation

The mean age of the 6 patients with CVD who participated in this phase was 57 ± 7.8 years and coronary artery disease was the most common CVD ($n=3$). The other diagnoses were atrial fibrillation, cardiogenic syncope, and valvular heart disease. Regarding risk factors, the most prevalent was HT ($n=5$), followed by dyslipidemia ($n=3$), and DM ($n=2$). Based on the mean score obtained in the quantitative assessment, the recommendation for all the resources was “use as is”. Furthermore, based on the suggestions made by these patients in the semi-structured interviews, each resource was modified to improve its quality (Table 3) and facilitate its understanding by potential patients, thus obtaining the final version of the strategy, which is made up of 30 educational pieces (21 images, 4 audios and 5 videos) and can be accessed at <https://repositorio.udes.edu.co/handle/001/9929>.

Table 3. Codes emerging from the qualitative analysis.

Category	Emerging codes	
	Experts	Target audience
Positive aspects of the material	E7-L86: the topic is very well documented on promotion and prevention.	P4-L205-207: the motivational resources are clear and appealing. I think the sentences are good.
	E8-L88: well-structured material in both form and content.	P4-L212: resources on smoking are clear and user-friendly.
	E1-L89: material that is easy on the eye.	P5-L242: training videos are clear and interesting.
	E3-L90: relevant strategy that is relevant, appropriate, and pertinent to the population.	P6-L289,290: resources are good and useful for raising awareness of disease prevention, even at an early age.
Aspects to be improved	E4-L16: summarize stages of grief. E4-L85: summarize text.	P2-L62: explain the medical terms, e.g. hypotension
	E2-L52: adjust the font size and style to improve its appearance.	P3-L127,128: reduce the amount of nutritional resource information and improve image agreement.
	E4-L46: matching audio and video. Screen images on strength training.	P1-L16-18: use more eye-catching colors in motivational resources.
	E4-L48: the motivational component must be more dynamic.	P1-L11,12: replace some image resources on nutrition with explanatory videos.
	E2-L81: condense the text and change the font color.	
Suggestions	E1-L65: it should be made clear in the audio that these are general recommendations, but please contact the nutritionist for personalized treatment.	E3-L143: include normal blood pressure and glycemia figures.
	E2-L75: clearly identify the professional to whom the patient can turn to in each strategy.	

E: expert; P: patient; L: line.

Discussion

This research aimed to create and validate educational material included in a health education strategy directed at CVD patients participating in a phase 2 CRP and designed to be implemented via WhatsApp.

Studies have reported that developing and validating the educational material used in health education interventions aimed at patients could have a positive impact on their level of knowledge of both the disease and its treatment.^{19,41-44} For example, Arantes *et al.*,¹⁹ in a study conducted in 56 patients from Ribeirão Preto (Sao Paulo, Brazil) with coronary artery disease undergoing percutaneous coronary intervention, compared the results of the implementation of an educational program vs. usual care in terms of health-related quality of life (assessed with the SF-36 questionnaire), finding that patients who participated in the educational program showed a statistically significant improvement in the emotional role domain after one year of follow-up ($p=0.05$).

It is noteworthy that our research proposed the design of an educational strategy with a multidisciplinary approach. This is similar to the educational booklet for patients with head and neck cancer undergoing radiotherapy proposed by da Cruz *et al.*,⁴¹ who validated the design of the booklet by working with various professionals. For example, they resorted to experts in the field and professionals in literature and advertising, who evaluated the objectives, structure, presentation and relevance, resulting in a comprehensive and multidisciplinary document.

Likewise, Moura *et al.*⁴⁴ created a booklet for the prevention of metabolic syndrome in adolescents with the participation of 6 health professionals and 7 professionals with experience in design. Their objective was to have specialized knowledge of the topics addressed in the educational material, factors that supported the inclusion in our study of a multiprofessional team for the elaboration and validation of the educational strategy.

Regarding the relevance of validating educational material, Brütting *et al.*⁴⁵ evaluated the quality, readability, and comprehensibility of educational brochures for melanoma patients, demonstrating that there is an important need to create visual educational materials that emphasize self-care and that are easy to understand for the target population, in addition to being of good quality. In turn, Lipari *et al.*⁴⁶ evaluated the comprehensibility, feasibility, and readability of online DM educational materials and concluded that they are not user-friendly and require improvement, suggesting that educational materials should be designed with the aim of increasing comprehensibility and feasibility.

Our visual educational material satisfactorily met these criteria because most of the pieces in the validation results were categorized as “use as is” and the adjustments made were derived from suggestions made by the experts and the target audience to complement the information. Some examples are “controllable but not curable chronic disease” or “the material is easy to understand”, “the message was clear and specific”, “it presents important elements to adopt new healthy lifestyle habits”, as emphasized by the target audience.

In line with the above, Arismendi-Bustamante *et al.*,⁴⁷ who conducted a study to validate a game designed to promote healthy lifestyle habits and fruit and vegetable consumption in children between 7 and 12 years of age, concluded that the importance of educational material lies in the fact that it should generate a change in the behavior of the target audience. For this reason, in our study, validation by target audience was considered a fundamental step for the strategy to be of mass use and easy to implement. Furthermore, such validation allows adjusting the material following the suggestions of

the end users, which could contribute to achieving favorable changes in these patients, such as a better adherence to the treatments for these diseases, such as CRPs.

Several authors have used the guidelines described by PAHO³² for the development and validation of health education materials. For example, Herrera-Guerra *et al.*,⁴⁸ in a study in which they designed and submitted an educational brochure aimed at adults with heart failure for validation by experts (n=7) and by the target audience (n=10), found that, according to the score obtained, 71.5% of the experts and 60% of the patients reported that the material could be used as it was. In contrast, Martínez-Rincón & Cano-Ordoñez⁴⁹ conducted a study in which 8 experts validated a booklet aimed at patients with acute myocardial infarction and found that the scores on all criteria were in the range of 21 to 39, indicating that the material “needed improvements”.

In our study, the score obtained in the quantitative evaluation of the technical validation ranged between 48 and 55 points in 96.3% of the educational pieces, so it was concluded that they could be used as they were. This was reflected in the results of the validation stage by the audience, in which all the items of the educational material were valid. In this sense, the fact of using the PAHO³² guidelines allowed us to develop the content in an organized manner and with a pedagogical approach, which was incorporated into the version that was validated until the final version was obtained. In a subsequent study by this group, the impact on changes in knowledge about risk factors will be evaluated.

In our study, WhatsApp was chosen as the mechanism for dissemination of the health education strategy because of its wide accessibility and ease of use. Also, the decision to implement the strategy through this application was based on the results of studies such as the one by Tang *et al.*,⁵⁰ who conducted a quasi-experimental trial in a hospital in Klang Valley (Malaysia) with an intervention group (n=47) and a control group (n=47) to measure the effect of sending text messages for a month with information on risk factors, signs and symptoms, and prevention of coronary artery disease. They found that WhatsApp is an effective health intervention to increase the knowledge of patients with coronary artery disease and, subsequently, increase their adherence to healthy lifestyles.

Similarly, Muntaner *et al.*²⁵ evaluated the feasibility and effectiveness of a 10-week WhatsApp intervention to improve health-related fitness components and CVD risk factors vs. a face-to-face intervention in adults from Balares Island, Spain. For this purpose, they selected a sample of 32 participants who were assigned to one of three groups: training (n=16), mobile (n=7) and control (n=9), concluding that the use of this application resulted in slight changes in some health-related fitness components and CVD risk factors, but that, compared to the training group and the mobile group, the WhatsApp-based physical activity intervention was less effective than the face-to-face intervention.

Along the same lines, Gallagher *et al.*⁵¹ described the use of mobile technology in 282 adult patients (mean age 66.5 years) with coronary artery disease treated in 9 hospitals and community centers in metropolitan and rural areas of New South Wales (Australia), showing that 91.1% used at least one technological device and 70.9% used mobile technologies (tablets or smartphones); these authors noted that individuals under 56 years of age are more likely to use any type of technology. Similarly, Piette *et al.*²⁴ conducted a literature review in which they analyzed evidence on whether mobile health (mHealth) tools, including interactive voice response calls, short message service or text messaging, and smartphones, can improve lifestyle habits and cardiovascular disease management, finding that these tools could bridge the gap between what patients need and what their health systems can provide given cost constraints.

It should be noted that health education is a dynamic process that should be adjusted to the age, needs, and CRP phase in which the users are, so the development of participatory and creative educational programs according to the capabilities of human talent and institutional support allows empowering people to better manage their health.

Limitations of the study include the small number of patients who participated in the target audience validation because the research was conducted during the COVID-19 pandemic and a significant number of CRP users were not knowledgeable in the use of video call platforms. Moreover, since this was a low-budget study, it was not possible to use digital tools that provided greater versatility, and graphic design professionals were not involved, as recommended in previous studies.⁴⁴

Finally, it is important to keep in mind that the implementation of the strategy presented here could be limited to a population group because in low-income countries, such as Colombia, Internet access is not as widespread as in developed countries. Also, digital illiteracy in this region is high, which is an obstacle to taking full advantage of the opportunities that the use of these tools offers in the context of health care.^{52,53}

Conclusion

The present study made it possible to design and validate educational material aimed at users of a CRP. Because it is patient-centered and easily disseminated via a widely used social network, this material becomes a tool that can help to improve adherence to CRPs, which will result in a longer duration of their benefits. Given these good results, it is recommended to use this material in future research and to test its efficacy in research and clinical practice.

Conflicts of interest

None stated by the authors.

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