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Validation of Educational Materials for a Mobile Application for Patients with Kidney Disease on Hemodialysis

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Abstract. Worldwide, chronic kidney disease (CKD) is a public health problem due to its high morbidity and mortality rates. For CKD patients, mobile health applications have functioned as a strategy that promotes patient care through valid and reliable educational materials. This is a prospective and descriptive three-stage study using content experts. Results created three visual and three audiovisual materials with acceptable evaluations. The design and validation of educational materials are a valid and reliable method for patient health education through mobile health applications.

Keywords. Educational materials, Chronic kidney disease, Hemodialysis, Mobile applications.

1. Introduction

Chronic kidney disease (CKD) is a non-communicable disease (NCD) and currently affects around 850 million people worldwide. The global burden of CKD is increasing and is expected to become the third most common cause of mortality by 2040. In addition to this burden, CKD is an important cause of catastrophic health expenses because hemodialysis and transplant costs represent two to three percent of the annual healthcare expenditures in high- and middle-income countries [1].

Research studies have shown that patients with CKD, mainly undergoing hemodialysis treatment, present physical, psychological, and social changes in their health, which generates low adherence to treatment; and consequently, serious complications that further affect their quality of life [2,3]. Thus, CKD becomes a public health problem that calls on health professionals to promote strategies aiming at empowering patients with CKD in the care management of their own health, specifically those undergoing hemodialysis treatment [4].

Initiatives have been implemented to improve care for this population, such as mobile health, which is the practice of care and public health supported by mobile

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devices, such as telephones and wireless devices, which include mobile health applications that connect people and strategies. These strategies include medical devices or sensors, medication reminders, and health information through trusted educational materials [5].

Specifically in healthcare, educational materials are instruments that have been used in health education to facilitate communication and improve the educational process. Educational materials can be visual, audiovisual, and audio, whose overall purpose is to help build the knowledge of the people involved [6]. It is important to mention that the impact these educational materials would have depends largely on the design and content, as well as their correct adaptation to the characteristics and needs of the recipients [7]. Therefore, educational materials must undergo a validation process to determine their reliability, following an ordered sequence of elements, such as the design and validation of the instrument, being subject to modifications, adoptions, and adaptations through an Expert Judgment process [8,9]. Given this scenario, the objective of this study was to design and validate educational materials for a mobile health application for patients with CKD on hemodialysis in order to promote their self-care.

2. Methods

This is a prospective study design, including search, design, and using expert judges for the validation process. Below, the three-stage process is described.

Stage 1. Search, synthesis, and analysis of the literature. A search of the literature related to educational materials for patients with CKD undergoing hemodialysis treatment was carried out through the major databases: Pubmed, EBSCO, Scopus, Medline, and Google Scholar. Literature in English, Portuguese, French, and Spanish were included. The keywords and descriptors of health science (DeCs) [10] and MESh [11] were "educational material", "chronic kidney disease", "knowledge", and "hemodialysis", using the Boolean operators (and, or and not). The articles were analyzed according to the IMRyD [12] criteria.

Stage 2. Design and recording of educational materials. The educational materials were prepared according to Pan-American Health Organization (PAHO) [6] Guide for the design, use, and evaluation of health educational materials, where visual and audiovisual educational materials were designed. Visual materials were designed to express messages through images, including those that are combined with written words and real objects. This stage considered the following aspects: 1) the selection and precision of the fundamental idea that we wanted to convey, and on which attention should be focused; and 2) the clear and faithful representation of the message in the image so that if the person did not know how to read, he/she properly would understand the message, and if he/she did read properly, the writing would reinforce the image.

Audiovisual materials were designed based on the premise that the material combines the projection of images with auditory stimuli, as they have the advantage of capturing messages through two sensory channels (sight and hearing). These materials were used to transmit knowledge about health topics, particularly those that involve movement, such as teaching techniques and procedures. The recording of the educational materials was in collaboration with the Bisonte Agency [13], which is a certified cinematography company. A script was designed for the recording of audiovisual visual materials, and their material, human, technical, and technological resources, were also determined.

Stage 3. Validation of educational materials by expert judges. The validation was carried out using the technique of expert judges where physicians and nurses specialized in nephrology, clinical psychologists, and nutritionists with more than five years of experience in treating patients with CKD undergoing hemodialysis were included. The sample included 12 expert judges through non-probabilistic snowball sampling. Through email, the invitation letter for the validation of the materials was sent to each judge, explaining the objective of the validation, and the instructions for filling out the instruments.

Two instruments were used for the validation of the educational materials designed by PAHO[6]. The first instrument for the validation of visual materials consisted of nine items, with a Likert-type scale and five response options, where five corresponds to total compliance and one indicates non-compliance. To determine the final score, the following cut-off points were considered: acceptable (40-45 points), need changes (21-39 points), and rejected (less than 20 points). Furthermore, at the end of filling out the instruments, the judges were asked to write comments and/or suggestions about the educational materials, in order to further improve the materials.

The second instrument, for the validation of audiovisual materials, consisted of 11 items, with a Likert-type scale and five response options, where five corresponds to total compliance and one indicates non-compliance. To determine the final score, the following cut-off points were considered: acceptable (48-55 points), need changes (28-47 points), and rejected (less than 27 points). To determine the reliability of the instruments, Cronbach's Alpha was used, where the instruments were considered reliable if a score greater than 0.6.

In accordance with Article 117 of the Regulations of the General Health Law on Research, this research was considered a low-risk investigation, the provisions of articles 13, 14, 16, and 116 of the regulations were followed for ethical compliance. In turn, the experts were invited to participate in the validation process through an invitation letter where the scope of the research, the voluntary nature of their participation, as well as the low risk, were explained to the participants.

3. Results

This study aimed to develop a three-stage process for the development of a mobile health application for CKD patients, specifically those undergoing hemodialysis. Below we describe the findings from these three-stage processes.

Stage 1. Reviewing the literature on educational materials for patients with CKD undergoing hemodialysis treatment, it was found that the topics most used and requested by patients were the following: Exercises for the maturation of the arteriovenous fistula, correct hand washing, relaxation therapies to prevent depression, physical self-assessment about arteriovenous fistula, physical activity, and care of hemodialysis catheter.

Stage 2. In accordance with the theme for the audiovisual materials, three audiovisual materials were created called: “hand washing”, “foot massage”, and “exercises for the maturation of my arteriovenous fistula”. In addition, three visual materials were created through images called: “physical self-assessment of my arteriovenous fistula”, “my physical activity”, and “care of my hemodialysis catheter”.

Stage 3. Regarding the validation by the judges, both educational materials “Exercises for the maturation of my fistula” and the audiovisual educational material

"hand washing" were considered acceptable, since both had an agreement of 100% on using it as it was proposed. The audiovisual educational material "foot therapy" was considered acceptable, since there was a 91.6% agreement between the judges to use it as it was. The visual materials "Physical self-assessment of my arteriovenous fistula", "My physical activity", and "Care of my hemodialysis catheter" were considered acceptable, since there was a 100% agreement rate among the judges.

Regarding the reliability of the instrument "PAHO guidelines for the evaluation of audiovisual material", a Cronbach's alpha of .896 was obtained, and for the instrument "PAHO guidelines for the evaluation of visual material, 1984", a Cronbach's alpha of .812. Therefore, it was determined that both instruments are reliable for the validation of the proposed educational materials.

4. Discussion

The aim of this study was to design and validate educational materials for a mobile health application for patients with CKD undergoing hemodialysis in order to promote their own self-care, where expert judges validated the instruments to determine validity, reliability, and usability. According to the judges' evaluation, the materials are suitable for implementation in the target population to which they were designed and directed. Based on the qualitative comments of the judges, some modifications were made to the audiovisual materials. For example, text boxes were increased in size for the videos' explanations.

In summary, the design and validation of educational materials for health promotion have been valid and reliable strategies for promoting increased knowledge of a certain population. In summary, the results of this research are consistent with what has been observed by previous studies on the design and validation of health educational materials. Similar to our study, Herrera and Céspedes [8] reported their validation process of educational material for patients with heart failure and submitted their educational brochure for evaluation by seven experts and ten adult patients with heart failure, after which they obtained an expert approval rate of 70%. On the other hand, Correa [14] reported submitting an educational booklet for technical validation by expert judges where an educational intervention for patients with coronary stent implantation was designed and reported an 89% agreement among judges.

5. Conclusions

The design of educational materials must follow a systematic approach for application design and should undergo an evaluation process by expert judges on the subject to ensure that the materials are reliable for use.

The results of this research provide guidelines for the creation of a mobile health application for patients with CKD in hemodialysis treatment as a strategy to promote self-care through validated and reliable educational materials.

References

[1] Organización Mundial de la Salud. La OPS/OMS y la Sociedad Latinoamericana de Nefrología llaman a prevenir la enfermedad renal y a mejorar el acceso al tratamiento [Internet]. Washington; 2020 [acceso en 2023 sep. 20]. Disponible en: https://www3.paho.org/hq/index.php?option=com_content&view=article&id=10542:2015-opsoms-sociedad-latinoamericana-nefrologia-enfermedad-renal-mejorar-tratamiento&Itemid=0&lang=es#gsc.tab=0

[2] Antonio GV, de Avila ML, Tenahua I, Morales FA, López C. Depresión y calidad de vida en pacientes con tratamiento de hemodiálisis. Journal Health NPEPS, 2021: 6(2): 93-99. DOI: http://dx.doi.org/10.30681/252610105482

[3] Barros HL, Herazo BY, Aroca MG. Calidad de vida relacionada con la salud en pacientes con enfermedad renal crónica. Rev Fac Med. 2019; 63(4): 641-647. DOI: https://revistanefrologia.org/index.php/rcn/article/view/154

[4] Costa AG, Pinheiro GM, Medeiros SM, Costa OR, Cossi SM.Calidad de vida en pacientes con insuficiencia renal crónica en Hemodiálisis. Enferm glob. 2016; 15(43):59-73. DOI: https://doi.org/10.6018/eglobal.15.3.213891

[5] Organización Mundial de la Salud. Las apps móviles y su aplicación en salud [Internet]. Ginebra; 2021. [acceso en 2023 sep. 24]. Disponible en: https://www.ehcos.com/la-revolucion-del-mhealth-en-salud/#:~:text=El%20mHealth%20es%2C%20seg%C3%BAn%20definici%C3%B3n,digitales%20y%20otros%20dispositivos%20inal%C3%A1mbricos%E2%80%9D.

[6] Organización Panamericana de la Salud. Guía para el diseño, utilización y evaluación de materiales educativos de salud. Washington; 1984. Disponible en https://iris.paho.org/bitstream/handle/

[7] Hernández M, Jaramillo L, Villegas J, Álvarez L, Roldan M, Ruiz C, et al. La educación en salud como una importante estrategia de promoción y prevención. Rev Cubana Med Gen Integr. 2012; 28(3): 299-308. DOI: https://doi.org/10.30554/archmed.20.2.3487.2020

[8] Herrera HP, Céspedes VM. Diseño y validación de material educativo dirigido a adultos con falla cardíaca. Rev. cienc. cuidad. 2020; 17(1): 31-42. DOI: https://doi.org/10.22463/17949831.1366

[9] Solano MH, Casas C, Guarín A. Experiencia de validación de material educativo para pacientes anticoagulados en un servicio de consulta externa. Repert med cir. 2019; 28(2): 97-104.DOI 10.31260/RepertMedCir.v28.n1.2019.917

[10] Descriptors in Health Sciences. Descriptors in Health Sciences, DeCS 2022. Disponible en: 10.31260/RepertMedCir.v28.n1.2019.917

[11] Medical Subject Headings. Medical Subject Headings MeSH, 2022. Disponible en: https://www.ncbi.nlm.nih.gov/mesh/

[12] Orozco U. Recommendations for writing a scientific article: principles and general structure. *Journal of Agricultural Research and Sustainable Development* 2018; 5: 7-18. DOI: https://doi.org/10.1016/j.ecolecon.2022.107582

[13] BISONTE (2023). Agencia de marketing y producción audiovisual. Instagram: https://instagram.com/agenciabisonte?igshid=OGQ5ZDc2ODk2ZA==

[14] Correa-Tello KJ. Diseño y validación de material para una intervención educativa en pacientes con implante de Stent coronario. Perspectivas Educativas. 2014; 7(1): 159-70. DOI: https://revistas.ut.edu.co/index.php/perspectivasedu/article/view/674