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Original Article

Construction and validation of educational technology for the management of preoperative thirst

Construção e validação de tecnologia educacional para o manejo da sede pré-operatória

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ABSTRACT

Objective: to develop and validate images with educational messages for mobile phones to help with the management of preoperative thirst. **Methods:** methodological study, carried out in three phases: 1) collection of information from patients with preoperative thirst; 2) development of images with educational messages; 3) evidence of the validity of the content and appearance of the images by the *experts*. The Content Validity Index was calculated and the binomial test was applied. **Results:** a total of 27 images were produced with educational messages for mobile phones that provide information on thirst, its signs and symptoms, causal factors, methods used to relieve it, and its mechanisms of action. The overall content validity index was 0.96 and the overall appearance validity index was 0.94. **Conclusion:** images with educational messages for mobile phones are validated in content and appearance. **Contributions to practice:** are an important resource that will help in the adherence of thirst management.

Descriptors: Thirst; Text Messaging; Validation Study; Perioperative Nursing.

RESUMO

Objetivo: construir e validar imagens com mensagens educativas para telefones móveis na adesão do manejo da sede pré-operatória. **Métodos:** estudo metodológico, realizado em três fases: 1) coleta de informações dos pacientes com sede pré-operatória; 2) elaboração das imagens com mensagens educativas; 3) evidências de validade de conteúdo e aparência das imagens pelos *experts*. Calculou-se o Índice de Validade de Conteúdo e aplicou-se o teste binomial. **Resultados:** foram confeccionadas 27 imagens com mensagens educativas para telefones móveis que trazem informações frente à sede, em relação aos seus sinais e sintomas, fatores causais, métodos utilizados no seu alívio e seus mecanismos de ação. O índice geral de validade de conteúdo foi de 0,96 e o índice geral de validade de aparência de 0,94. **Conclusão:** as imagens com mensagens educativas para telefones móveis encontram-se validadas em conteúdo e aparência. **Contribuições para a prática:** consistem em um importante recurso que auxiliará na adesão de manejo da sede.

Descritores: Sede; Envio de Mensagens de Texto; Estudo de Validação; Enfermagem Perioperatória.

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Introduction

Thirst is frequently experienced by patients during the perioperative period, and is underestimated by health professionals, who choose to maintain prolonged fasting, depriving the patient of thirst relief. The preoperative fasting causes an increase in the prevalence of thirst in surgical patients, with rates ranging from 79.5% to 89.8% in adults[1]. Fasting is one of the main triggers of thirst in the preoperative period and leads to the patient being deprived of liquids and solid foods for a long time[2]. The American Society of Anesthesiologists (ASA) recommends eight hours of fasting for fatty foods, six hours for solids, and two hours for clear liquids[3]. This is unusual in Brazilian care practice since the fasting time can sometimes be up to 24 hours, supported by the institutional routine of prolonged and indiscriminate fasting.

In addition to practice, other factors affect and aggravate preoperative thirst, such as anxiety, the anesthetic-surgical procedure, the need for intubation, which influences the dryness of the oral cavity, the low temperature of the operating room, the use of opioids and anticholinergics, among other causes that lead to this condition[2]. The management of thirst remains a social taboo, due to the lack of updating among health professionals regarding new clinical interventions in the preoperative period. As a result, this generates fear and insecurity when it comes to adhering to new strategies for managing thirst.

Thus, by including thirst management in nursing care, to diagnose and establish relief measures that are carried out in a systematic and standardized way, the patient has a surgical experience with the least possible suffering[1].

Nursing is fundamental to the care and safety of surgical patients, as it recognizes the symptoms of thirst and identifies strategies to reduce them, thus demystifying institutional cultures of prolonged and indiscriminate fasting. As a result, healthcare professionals are looking to implement new clinical strategies and educational interventions, such as educational messages, educational games, and mobile phone apps[3-5].

There are strategies used to control and reduce preoperative thirst, although there is still no scientific consensus due to the fasting required. It is therefore important to understand the factors that influence thirst management and that are used in clinical practice. Among the possibilities are the administration of ice chips and popsicles, menthol and mentholated chewing gum, and gargling with cold water, both of which have a significant impact on reducing thirst and improving oral conditions[1,5-6].

In addition to systematized practices, it is important to use theories that foster the theoretical, philosophical, and methodological framework of health care actions. To theorize this study, the Self-Efficacy Theory[7], was chosen, which reflects that expectations are not only affected by patterns of knowledge but by verbal and visual encouragement, physiological sensations, and functional models of self-management.

One of the alternatives for applying it is the development of technologies, among which text messages are a great motivator of daily self-care practices, allowing greater contact between the professional and the patient, and establishing a relationship of trust and clarification of doubts[8].

The study is therefore justified by the possibility of highlighting the use of educational messages for mobile phones in the adherence to perioperative thirst, based on clinical practice, self-management of care, and self-efficacy, in addition to studies that corroborate the theme. Nursing care practices culminate in the use of care that enables patients to relieve thirst. Based on the application of interventions that promote greater adherence to the discomfort caused by thirst.

In addition, it aims to make a positive contribution to the various fields of health, supporting to professional training and scientific development, using a technology that helps in the process of health care. Based on this assumption, the research problem was defined: Do digital image messages to help care for pa-

tients with preoperative thirst show evidence of content and appearance validity?

This study aimed to develop and validate images with educational messages for mobile phones to help with the management of preoperative thirst.

Methods

Type of study

This is a methodological study[9], carried out from June to September 2023 in three distinct phases: 1) collection of information from patients with preoperative thirst; 2) development of images with educational messages; 3) evidence of content validity and appearance of the images by experts. The guidelines of the Revised Standards for Quality Improvement Reporting Excellence (SQUIRE 2.0) were adopted.

Data collection

Information on patients with preoperative thirst was collected in two ways in June 2023. The first was based on the information stored in the database of a larger study is related the research group to which the larger study is related, with the topics of non-adherence factors to preoperative mentholated interventions. The results of the larger study showed factors including lack of knowledge of the intervention or fear of canceling the procedure, which affected adherence, making it low or null. With this information, the decision was made to create informative images to answer these questions.

The second part of the information was gathered by searching the literature for studies on the data and presenting interventions for relieving perioperative thirst and the factors associated with these patients' low or non-adherence to the interventions. This phase consisted of a narrative review of the literature, where the following databases were used to survey the content: Virtual Health Library (VHL), Medical Literature Analysis and Retrieval System Online (MEDLINE) via PubMed, Google Scholar, and specialized literature on the theme, such as books.

International guidelines on preoperative patient management and articles related to the subject were initially used to create the texts that served as the basis for the educational messages. For the topics on general information, preoperative thirst, symptomatology, causal factors of thirst, methods used to relieve thirst, articles published in the last five years were selected, preferably those that presented information on the management of the main interventions for relieving thirst. The content survey sought to broaden understanding of the methods used to relieve perioperative thirst and their mechanisms of action, as well as explaining educational technologies as digital resources for adherence in symptom management. To organize the content, the technical manual[10] and primary and secondary evidence[5-6,11] were selected to anchor the theoretical part of the images.

After selecting the mentioned material, a detailed reading of the studies was carried out, to broaden the researchers' knowledge on the theme, selecting the main concepts and methods for the construction of the Images.

The development and validation of the images with educational text messages consisted of different phases, with the aim of improving development and validity. In the development phase, which took place in July 2023, the characters for the images were created: nurses, patients and interventions, fictitious patients to make up the educational images. In addition, in line with the previous stage, the content was diagrammed along with the images. The Adobe Photoshop CC 2023 application was used to create the images and, for this resource, the study relied on the professional collaboration of a designer with previous experience in designing health materials.

The messages were distributed in chronological order. The first image shows the "100SEDE" project, an extension project of the authors' research group, followed by a presentation of the fictional characters: two nurses (Nurse Ana and Nurse Bruno), two patients (Mrs. Raimunda and Mr. Beto) and two

methods for relieving perioperative thirst (Chicletol and Picotol). It should be noted that the images contained the educational texts selected earlier in the content survey stage.

For the content validity and appearance evidence stage of the images with educational messages, the researchers from the Research Group on Patient Safety, Practices and Technologies in Nursing and Health indicated the names and contacts of professionals eligible for the study, from all regions of the country, who indicated other professionals through snowball sampling[12]. Invitations were sent via *e-mail* and in instant messaging groups to 55 professionals and 11 responded, making up the sample of this study. These professionals had expertise in validation studies, with the theme and with assistance and teaching[13].

After agreeing to take part in the study, the *expert* evaluators were sent a *link* to access the educational images, and an instrument developed in *Google Forms* was sent with the Free and Informed Consent Form, the characterization of the experts and the validation instruments.

Data was collected using two validated instruments[14-15], for content, the Educational Content Validation Instrument in Health (ECVIH) was used, which contains 18 items divided into three domains that verify objectives, structure/presentation and relevance. For the validation of appearance, the Instrument for the Validation of Appearance of Educational Technologies in Health (*Instrumento para Validação de Aparência de Tecnologias Educacionais em Saúde*, IVATES) was used. In addition, the instruments have a space reserved for recording observations or recommendations.

Data analysis

The Content Validity Index (CVI) was used to analyze evidence of the validity of the content and appearance of the educational images. The CVI measures the proportion or percentage of experts who attribute relevance to the instrument or item, and an index above 0.80 was considered valid.

The binominal test was used to determine whether the proportion of agreement between the experts was statistically equal to or greater than 0.80, assessed using SPSS, version 24.0. The significance level was 5%[12,16].

Ethical aspects

The study was submitted for evaluation and approved by the Research Ethics Committee of the *Centro Universitário Inta*, under the Certificate of Presentation for Ethical Appreciation: 59903421.3.0000.8133 and opinion number 5,746,428/2022.

Results

A set of 27 images with educational messages, in the form of a carousel, consisting of at least one set of two or more images, entitled: "100SEDE', available at: https://acesse.one/kmQmG.

The theoretical content developed for the images was organized with general information about preoperative thirst, the symptoms, the causal factors of thirst, methods used to relieve thirst, developed in a clear and easy-to-understand way for readers, presenting informal language, based on the literature.

With regard to the profile of the experts, all 11 had *expertise* in validation studies, thirst management or perioperative Nursing, in addition to having experience in caring for surgical patients, where: one (9%) had a master's degree and 10 (91.0%) a doctorate in Nursing, nine of them worked as teachers, and all had more than five years of training.

The images with educational messages for mobile phones were organized in sequence and helped with the adherence to interventions for thirst management (Figure 1).

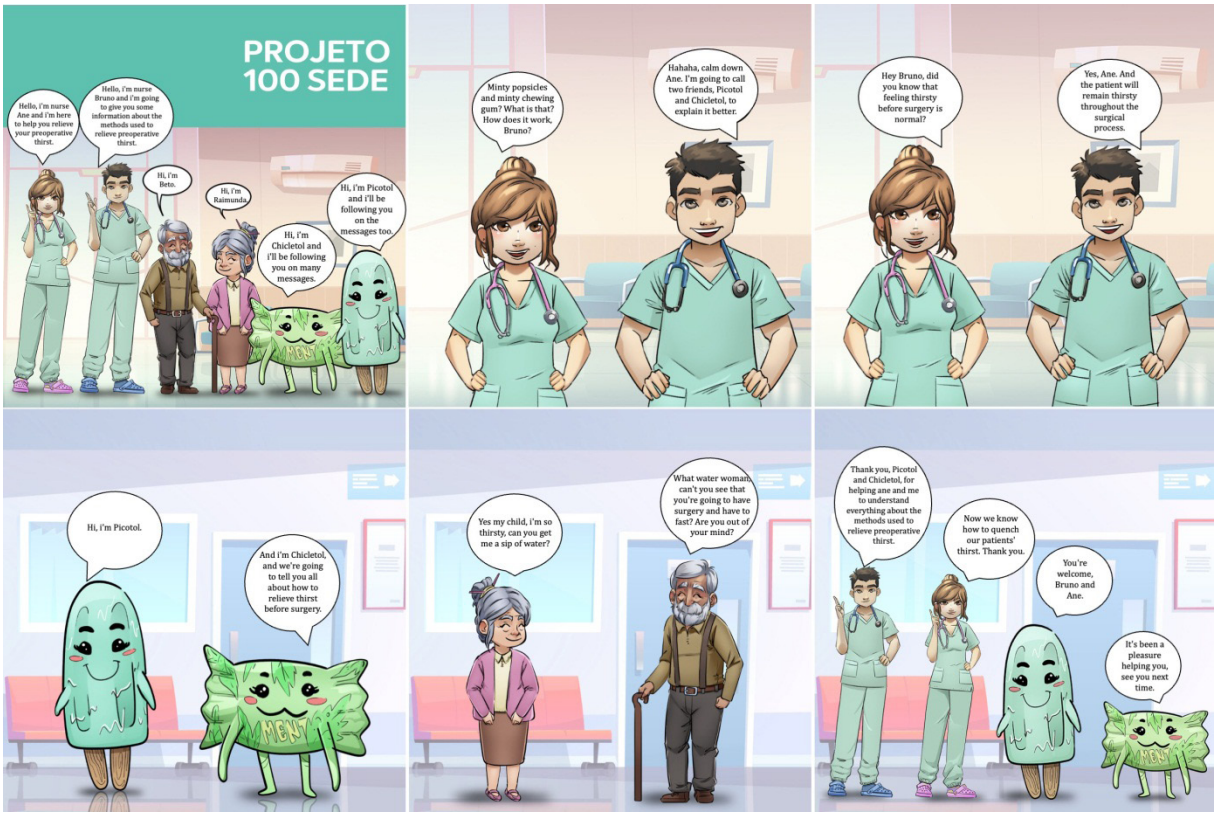

Figure 1 – Images with educational messages. Itapipoca, CE, Brazil, 2024

Regarding the process of analyzing the evidence of content and appearance validity, the experts who validated were from the five regions of Brazil, their main areas of activity were teaching (88.9%) and research (66.7%), with a predominance of doctors and masters with experience in validation studies. Two rounds of content and appearance validation were carried out because after the first stage of checking for evidence of validity, changes suggested by the experts were incorporated.

The p-value > 0.05, indicates a proportion greater than or greater than 0.8 of experts who considered the items relevant in relatation to: objectives, structure and presentation, and relevance (Table 1).

It should be noted that in the first round of validation, the experts suggested the need to correct some terms and change the language of the messages, which was done and then re-evaluated (Figure 2).

After the implementation of these changes and the new round of validation, the results reaffirmed the evidence of content validity of the images with educational messages.

Regarding the process of verifying evidence of appearance validity, Table 2 shows the data from this process.

Table 1 – Educational Content Validation Instrument results in the 1st and 2nd rounds. Itapipoca, CE, Brazil, 2024

Items evaluated	1ª round		2ª round	
	CVI	p*	CVI	p
Objectives: purposes, goals or aims				
1. Contemplates the proposed theme	0.81	0.78	0.95	0.97
2. It is suitable to the teaching-learning process	0.82	0.79	0.97	0.98
3. Clears up any doubts about the theme	0.76	0.78	0.89	0.91
4. Provides reflection on the theme	0.78	0.77	1.00	1
5. Encourages behavior change	0.97	0.98	0.97	0.98
Structure/Presentation: organization, structure, strategy, coherence and sufficiency				
6. Adequate language for the target audience	0.82	0.79	1.00	1
7. Appropriate language for the educational material	0.82	0.79	0.95	0.97
8. Interactive language, allowing active involvement in the educational process	0.82	0.79	0.92	0.89
9. Correct information	0.78	0.77	0.97	0.98
10. Objective information	0.78	0.77	0.97	0.98
11. Enlightening information	0.81	0.78	0.97	0.98
12. Necessary information	0.81	0.78	0.92	0.89
13. Logical sequence of ideas	0.81	0.78	0.95	0.97
14. Current topic	1.00	1	1.00	1
15. Suitable text size	0.82	0.79	0.95	0.97
Relevance: significance, impact, motivation and interest				
16. It stimulates learning	0.81	0.78	1.00	1
17. It contributes to knowledge in the area	0.82	0.79	0.97	0.98
18. Awakens interest in the theme	0.81	0.78	0.97	0.98
Global CVI	0.82		0.96	

*p>0,05 Agreement Binomial test; CVI: Content Validity Index

Aspect evaluated	Item	Suggestions
Content	3	You have to make the language more suitable for the target audience.
	4	Some terms need to be better described, for example: clear liquids.
	9 and 10	Correct words and terms on the theme.
	7. Appropriate language for the educational material	- Replace the term "things" with products, except in the image that talks about the receivers; - Replace the term "increases PH". Ex: makes the mouth less acid.
	11. Enlightening information	Give examples of fatty foods, solids, and clear liquids.
Aesthetic aspect	5. The shapes of the illustrations are appropriate to the type of material	The Characters should be in different positions.
	10. The number of illustrations included in the educational material is adequate	Insert another character referring to the target audience (Patient) and put the characters' names in Portuguese.

Figure 2 – Suggestions made by experts on the content and appearance of Educational Images. Itapipoca, CE, Brazil, 2024

Table 2 – Instrument for validating the appearance of educational technologies in health, in the 1st and 2nd rounds. Itapipoca, CE, Brazil, 2024

Items evaluated	1st round		2nd round	
	CVI	p*	CVI	p
1. The illustrations are suitable for the target audience	0.81	0.79	0.94	0.96
2. The illustrations are clear and easy to understand	0.82	0.80	0.94	0.92
3. The illustrations are relevant to the target audience's understanding of the content	0.93	0.95	0.95	0.97
4. The colors of the illustrations are appropriate for the type of material	0.97	0.98	0.97	0.98
5. The shapes of the illustrations are appropriate to the type of material	0.81	0.79	0.96	0.97
6. The illustrations portray the everyday life of the target audience of the intervention	0.81	0.79	0.96	0.97
7. Arrangement of the figures is in harmony with the text	0.85	0.83	0.98	0.99
8. The figures used elucidate the content of the educational material	0.83	0.85	0.95	0.96
9. The illustrations assist in presenting the theme and follow a logical sequence	0.85	0.83	0.93	0.95
10. The number of illustrations included in the educational material is adequate	0.85	0.83	0.99	0.99
11. The size of the illustrations included in the educational material is adequate	0.82	0.80	0.99	0.99
12. The illustrations help to change the behavior and attitudes of the target audience	0.82	0.80	0.93	0.92
Global CVI	0.84		0.94	

*p>0,05 Agreement Binomial Test; CVI: Content Validity Index

After the second round of validation, the Global CVI of ECVIH and IVATES are 0.96 and 0.94 respectively. This reaffirms the evidence of content and appearance validity of educational images for mobile phones by expert nurses.

Discussion

This study presented an innovative method by developing and presenting evidence of the validity of content and appearance of educational images for mobile phones to contribute to patient knowledge of mentholated strategies to alleviate thirst and preoperative discomfort. This helped to adhere to an approach that is simple, feasible, practical, inexpensive, effective, and based on scientific evidence. In addition, it strengthens the scientific evidence in counteracting the cultural custom that it is not possible to intervene in preoperative thirst[5-6].

The educational images were considered valid in terms of content and appearance to permeate the scientific information, adapting it to popular language for patients in the preoperative period who are fasting for a long time and who need interventions to manage unpleasant symptoms, such as thirst. In this context, thirsty patients must receive measures that are effective in the literature for managing thirst, such as mentholated measures, according to studies with preoperative patients[1-2,5-6].

The legislation that protects good perioperative practices states that nurses and their teams are responsible for accompanying patients during the preoperative process. It is believed that this study is the first to relate the theme of preoperative thirst management to educational technology, such as educational messages, to improve care[3].

The idea is that health education for patients in the preoperative period using educational technologies is an advance in nursing knowledge and professional autonomy in clinical practice. In this sense, technologies should not compete with or replace verbal communication, but should be incorporated as a strategic resource for Nursing education. Adherence to educational technologies stimulates the patient's

autonomy and self-care when they are included in teaching and learning processes aimed at their improvement[17]. In this context, by providing more humanized and didactic care, verbal information is complemented by illustrations, which are an important resource in patient care.

In this study, the layout of the images was essential, since it worked in a coherent and logical sequence of information, thinking about the whole graphic process, so that it can involve readers, in a way that they feel at ease when viewing and reading the educational images[18].

The use of text messages on cell phones is one of the great advances in technology that can be used in health promotion programs and increase access and adherence to treatments and health interventions[19]. To contribute to adherence and improving treatment, as in this study, similar data can be found in the literature, such as the use of an app with text messages that contributed to adherence to HIV antiretroviral therapy[20], and another study that validated educational messages for the secondary prevention of coronary artery disease[21].

Educational text messages for mobile phones, such as the one in this study, when directed at patients show that their use can increase pharmacological and non-pharmacological adherence[22]. Just like the results found in this study regarding the use of educational messages. Similarly, it is used to manage fatigue with neurological disorders[8], such as guided and educational restructuring for sleep, guided as a behavioral intervention[23], in adherence to treatment and glycemic control in patients with Type 2 Diabetes Mellitus[24], and the prevention of cervical cancer in women living with HIV[25].

According to the above, educational text messages are reliable strategies for use as an educational resource. It is therefore important to note that a committee of experts analyzed the evidence of the validity of the content and appearance of the messages created to ensure that they were reliable and could be used with the surgical patient population. The literature reviews showed that the implementation of preventive strategies and more accurate diagnoses can be achieved through the use of legitimate, valid, and reliable instruments[26-27].

In this study, the items showed evidence of validity and content and appearance in their final version, however, in items 3, 4, 9, and 10 of the ECVIH, the cut-off score used was lower than expected, however, after implementing the experts' suggestions, which was to make the language clearer and more suitable for the target audience and correct the terms in the educational images, the item obtained a higher CVI and was validated, thus corroborating another study that required this reformulation[28].

Study limitations

The limitations of this study were the lack of validation of content and appearance by the target audience, as well as the slowness in obtaining responses in a suitable timeframe from the experts contacted to validate the study.

Contributions to practice

By providing a collection of free images, this study presents advantages and advances knowledge. A digital tool that can be used in Nursing care for education and health in educational and health institutions as a method of continuing education. In addition, the results of this study may support future research examining the effects of adherence to mentholated interventions on patients in the preoperative period.

Conclusion

The images with the educational messages for mobile phones about preoperative thirst met the proposed objective and were considered valid regarding content and appearance. They also provide information about thirst, its signs and symptoms, causal factors, methods to relieve it, and its mechanisms of

action. The images were presented in a clear, simple, and attractive way, with relevant information for the target audience.

Authors' contributions

Conception and design or analysis and interpretation of data; writing of the manuscript or relevant critical review of the intellectual content; final approval of the version to be published; agreement to be responsible for all aspects related to the accuracy or integrity of any part of the manuscript: Soares FMM, Santos MIT.

Writing of the manuscript or relevant critical revision of the intellectual content; final approval of the version to be published: Rodrigues ABFL, Lima GK, Braga FLS, Bezerra KC.

Conception and design or analysis and interpretation of data; drafting of the manuscript or relevant critical revision of the intellectual content; final approval of the version to be published: Mendes IC.

References

1. Nascimento LA, Conchon MF, Garcia AKA, Lopes MVO, Fonseca LF. Clinical validation of the nursing diagnostic proposition perioperative thirst. Rev Latino-Am Enfermagem. 2023;31:e3975. doi: https://doi.org/10.1590/1518-8345.6621.3975
2. Oliveira CB, Garcia AKA, Nascimento LA, Conchon MF, Furuya RK, Rodrigues R, et al. Effects of carbohydrate use on preoperative thirst: a randomized clinical trial. Rev Bras Enferm. 2022;75(5):20210355. doi: https://doi.org/10.1590/0034-7167-2021-0355pt
3. Sun Z, Sun X, Huo Y, Mi M, Peng G, Zhang C, et al. Abbreviated perioperative fasting management for elective fresh fracture surgery: guideline adherence analysis. BMC Musculoskelet Disord. 2022;23:688. doi: https://dx.doi.org/10.1186/s12891-022-05574-5
4. Hovadick ACA, Santos JC, Nunes LB, Torres HC. Behavioral intervention by SMS/Whatsapp to improve food habits in T2DM patients: a descriptive study. Braz J Dev. 2020;6(3):10130-9. doi: https://doi.org/10.34117/bjdv6n3-042
5. Garcia AKA, Furuya RK, Conchon MF, Rossetto EG, Dantas RAS, Fonseca LF. Menthol chewing gum on preoperative thirst management: randomized clinical trial. Rev Latino-Am Enfermagem 2019;27:e3180. doi: https://dx.doi.org/10.1590/1518-8345.3070.3180
6. Silva TTM, Teixeira FC, Araújo SCM, Pinheiro TBM, Costa IKF, Medeiros KS, et al. Use of a menthol popsicle in managing postoperative thirst in patients undergoing radical prostatectomy: a randomized clinical trial. SAGE Open Med. 2023;11:20503121231202231. doi: https://doi.org/10.1177/20503121231202231
7. Tapp D, Plaisance A, Boudreault N, St-Pierre I, Desbiens J-F, Poitras S-C, et al. Development of a bilingual interdisciplinary scale assessing self-efficacy for participating in Medical Assistance in Dying. Can Med Educ J. 2023;14(4):157-9. doi: https://doi.org/10.36834/cmej.76161
8. Wong AWK, Tomazin R, Walker K, Heeb Desai R, Hollingsworth H, Newland PK, et al. Text messaging intervention for fatigue self-management in people with stroke, spinal cord injury, and multiple sclerosis: a pilot study. Disabil Health J. 2023:101549. doi: https://dx.doi.org/10.1016/j.dhjo.2023.101549
9. Polit DF, Beck CT. Fundamentos de pesquisa em enfermagem: avaliação de evidências para a prática da enfermagem. Porto Alegre: Artmed; 2018.
10. Joshi GP, Abdelmalak BB, Weigel WA, Harbell MW, Kuo CI, Soriano SG, et al. 2023 American Society of Anesthesiologists Practice Guidelines for Preoperative Fasting: carbohydrate-containing clear liquids with or without protein, chewing gum, and pediatric fasting duration—a modular update of the 2017 American Society of Anesthesiologists Practice Guidelines for Preoperative Fasting. Anesthesiology. 2023;138:132-51. doi: https://doi.org/10.1097/ALN.0000000000004381
11. Andriotti LA, Fonseca LF, Nascimento LA, Franco MES, Ramos HCF. Prevalence of defining characteristics of the proposed nursing diagnosis of perioperative thirst. Rev Enferm UERJ 2022;30:62764. doi: https://dx.doi.org/10.12957/reuerj.2022.62764
12. Arango HG. Bioestatística teórica e computacional. Rio de Janeiro: Guanabara Koogan; 2009.

13. Ayre C, Scally AJ. Critical values for lawshe's content validity ratio: revisiting the original methods of calculation. Meas Eval Couns Dev. 2014;47(1):79-86. doi: https://dx.doi.org/10.1177/0748175613513808

14. Leite SS, Áfio ACE, Carvalho LV, Silva JM, Almeida PC, Pagliuca LMF. Construction and validation of an Educational Content Validation Instrument in Health. Rev Bras Enferm 2018;71(suppl 4):1635-41. doi: https://dx.doi.org/10.1590/0034-7167-2017-0648

15. Souza ACC, Moreira TMM, Borges JWP. Development of an appearance validity instrument for educational technology in health. Rev Bras Enferm. 2020;73((suppl 6):e20190559. doi: https://doi.org/10.1590/0034-7167-2019-0559

16. Almanaresh E, Moles R, Chen TF. Evaluation of methods used for estimating content validity. Res Social Adm Pharm. 2019;15(2):214-21. doi: https://doi.org/10.1016/j.sapharm.2018.03.066

17. Barcellos SR, Joras AR, Constanzi AP, Souza EN. Construction and validation of an educational booklet for patients in the postoperative period of cardiac surgery: a methodological study. Rev Bras Enferm 2023;76(6):e20220621. doi: https://doi.org/10.1590/0034-7167-2022-0621

18. Subih MM, Saleh FA, Malak MZ. Medication adherence among patients with cardiovascular diseases: a cross-sectional study. J Res Nurs. 2023;28(4):272-82. doi: https://dx.doi.org/10.1177/17449871231175737

19. Avelino-Silva VI, Barros MTL. Assessment of novel technologies in healthcare – off-label use of drugs and the ethics of implementation and distribution of COVID-19 vaccines. Einstein (São Paulo). 2021;19:e6840. doi: http://dx.doi.org/10.31744/einstein_journal/2021ED6840

20. Lima ICV, Galvão MTG, Pedrosa SC, Farias OO, Silva CAC, Cunha GH. Instant messaging application for the care of people living with HIV/aids. Rev Bras Enferm. 2019;72(5):1161-6. doi: http://dx.doi.org/10.1590/0034-7167-2017-0698

21. Vieira LV, Souza VL, Barros ALBL, Lopes JL, Oliveira LFTS, Santos MA, et al. Secondary prevention in coronary artery disease: development and content validity of educational messages for mobile phones. Rev Esc Enferm USP. 2022;56:e20220330. doi: https://doi.org/10.1590/1980-220x-reeusp-2022-0330en

22. Huo X, Krumholz HM, Bai X, Spatz ES, Ding Q, Horak P, et al. Effects of mobile text messaging on glycemic control in patients with coronary heart disease and Diabetes Mellitus: a randomized clinical trial. Circ Cardiovasc Qual Outcomes. 2019;12(9):e005805. doi: https://dx.doi.org/10.1161/CIRCOUTCOMES.119.005805

23. Chodosh J, Mitchell MN, Cadogan M, Brody AA, Alessi CA, Hernandez DE, et al. Improving sleep using mentored behavioral and environmental restructuring (SLUMBER): a randomized stepped-wedge design trial to evaluate a comprehensive sleep intervention in skilled nursing facilities. Contemp Clin Trials. 2023;126:107107. doi: https://doi.org/10.1016/j.cct.2023.107107

24. Gerber BS, Biggers A, Tilton JJ, Smith Marsh DE, Lane R, Mihailescu D, et al. Mobile Health Intervention in Patients With Type 2 Diabetes. JAMA Netw Open. 2023;6:e2333629. doi: https://doi.org/10.1001/jamanetworkopen.2023.33629

25. Ciceron AC, Berg CJ, Clausen M, Jeon MJ, Abroms LC, Le D. Development of a cervical cancer prevention text-messaging program for women living with HIV. Health Educ Res. 2023;38(6):587-96. doi: https://doi.org/10.1093/her/cyad024

26. Li C, Xu X, He L, Zhang M, Li J, Jiang Y. Questionnaires measuring patient participation in patient safety—A systematic review. J Nurs Manag. 2022;30(7):3481-95. doi: https://dx.doi.org/10.1111/jonm.13690

27. Goekcimen K, Schwendimann R, Pfeiffer Y, Mohr G, Jaeger C, Mueller S. Addressing patient safety hazards using critical incident reporting in hospitals: a systematic review. J Patient Saf. 2023;19:e1–8. doi: https://dx.doi.org/10.1097/PTS.0000000000001072

28. Oliveira MPS, Alves MES, Montezeli JH, Milhorini CR, Costa DKC, Gastaldi AB. Validation of health educational technology for visitors of burned adults admitted to intensive care. Concilium. 2023;23(7):96-110. doi: https://dx.doi.org/10.53660/CLM-1220-23E02