Cogitare Enfermagem

ORIGINAL ARTICLE

DEVELOPMENT AND VALIDATION OF TECHNOLOGY FOR TEACHING BASIC LIFE SUPPORT IN CARDIO-RESPIRATORY ARREST

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ABSTRACT
Objective: to develop and validate a multimedia application on a mobile platform for teaching basic support in cardiac arrest to undergraduate health care students. Method: methodological study conducted in two stages: development of the application and content validation by experts. The application was developed based on Contextualized Instructional Design, following the stages of analysis, design, development, and implementation. For the content validation, 11 experts evaluated the application regarding relevance, clarity, coherence, information, presentation, navigability, accessibility, and design. Results: The SBVida application was developed for mobile devices on the Android platform. An overall Content Validity Index of 0.87 was achieved. Conclusion: The SBVida application was developed and validated and can contribute to the preparation and further training of students and professionals from Nursing and other health fields.

DESCRIPTORS: Educational Technology; Cardiopulmonary Resuscitation; Education, Nursing; Information Technology; Validation Study.

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INTRODUCTION

Basic life support (BLS) in Cardiorespiratory Arrest (CRA) represents a set of sequential measures, also known as Cardiopulmonary Resuscitation (CPR) maneuvers, adopted during primary victim care[1-2]. CRA is defined as the absence of mechanical heart activity and can be identified by the absence of a palpable pulse in the great arteries, irresponsiveness, agonal breathing, or apnea[2].

During a situation of CRA in out-of-hospital environment, the early performance of emergency care is crucial for optimizing the victim's survival[3]. In this sense, the CPR maneuvers in the BLS are used to reverse the situation and involve recognition, activation of the emergency service, chest compressions, ventilation, and the use of automatic external defibrillator when appropriate[1,3].

Most victims in these cases are adults and survival rates are associated with the presence of other people close by who can act on the scene, using CPR until the arrival of the specialized health team[3-4]. Therefore, for an effective care, theoretical and practical training is necessary to develop skills that will facilitate the performance of lay rescuer or professional[1].

In health care settings, it is expected that professionals are trained to perform CPR maneuvers to apply compressions and ventilations efficiently[4]. However, some studies highlight that, when faced with CPA situations, some professionals still express doubts about providing high-quality CPR[5-7].

A study with 101 nursing professionals from a university hospital showed that 73.26% of the participants could not recognize unconsciousness as a clinical sign of CRA[8]. Another study with nursing teams showed that 40.8% of the professionals did not know how to recognize the sequence of care for a person in CRA[9].

Some studies recognize that the content about CPR care taught during nurses' training has been addressed in a brief and superficial way[1,5]. However, the literature has indicated a significant increase in the safety of offering the subject after theoretical-practical training and periodic reviews, favoring the effectiveness of CPR[1-2,6]. In this context, the mobile application has been used as a pedagogical tool to complement training and update knowledge[10-11].

Study[12] conducted with 225 Chinese Nursing students evaluated the motivation, practice, and performance of participants who used mobile app in learning cardiovascular health. The results showed high satisfaction, motivation, and improved performance after using the mobile app.

Another study[13] compared the accuracy and speed of compression in CPR between a group that received guidance through an app and another group that received the module in a face-to-face format. The practical evaluation, before and after the intervention, showed a significant effect (p= 0.000) on the accuracy and speed variables for both groups, indicating the use of the mobile app as an educational possibility.

Currently, it is possible to freely access some applications on CRA care, however, there is a lack of mobile devices designed and validated for Nursing/Health education[14-15].

Considering that the literature still lacks applied research for the creation and validation of virtual environments to complement learning, this study is justified. Its objective is to develop and validate a multimedia application on a mobile platform to teach basic support in CRA to undergraduate health care students.

METHOD

This is a methodological study for the development and content validation of a mobile application on BLS for healthcare students. The development and validation process occurred in a remote format, involving researchers from the Graduate Nursing Program of the Federal University of Juiz de Fora (UFJF) and the School of Nursing of the University of São Paulo (USP), between February 2020 and March 2021. The Equator SQUIRE 2.0 instrument was used to guide the methodology.

For validation of the application, health professionals who had scientific production on the theme in the last five years and/or at least specialization around Urgency/Emergency or Intensive Care were randomly selected by the Lattes curriculum. From the total of 23 professionals, 11 accepted and participated in the entire evaluation process. Specialists who discontinued the evaluation at some point during data collection were excluded.

The research was developed in two phases, the first related to the development of the application, and the second related to the content validation by experts[16].

The first phase, or the production process of the mobile application, was based on Contextualized Instructional Design (CID), following the stages of analysis, design, development, and implementation[16]. In the analysis stage, a survey was carried out with the target population about the educational gaps related to the theme and access to cell phones and applications on mobile devices. In this stage, 168 undergraduate nursing students from UFJF were approached. For the development of the instructional design, elements such as: educational objectives, tools, and the sketches for the pre-visualization of the contents were defined.

For the development stage and the idealized structure, the technical support of professionals around computer science and graphic design was counted on. The design matrix was used to produce the logo, graphic scenarios, menu with its icons, theoretical content, audiovisual materials, and tests. The test questions were adapted from a validated scale[17]. The audiovisual materials were produced by the main researcher with the use of her cell phone camera and edited using the VSDC Free Video Editor program. After edited, they were made available on a YouTube channel called SBVida. The Expo and React Native frameworks were used to configure the application, allowing the implementation step on the Android Operating System.

In the second phase, for the content validation, data were collected through an online questionnaire sent to the specialists' e-mail, who answered about sociodemographic and application evaluation data. For the evaluation and validation of the application content in the Android Operating System, the educational aspects, the didactic resources, and the interface of the virtual environment were considered, evaluated in the following topics: theme relevance; clarity of concepts; coherence of content; amount of information; presentation of images/videos/interfaces connections (links); validity of information; navigability; accessibility, and screen design.

The application was evaluated using a five-point Likert scale, as follows: one = strongly disagree; two = disagree; three = neither disagree nor agree; four = agree; and five = strongly agree. A space for suggestions and comments was inserted after the evaluation of each item. All items that received a score of one or two in the first round of evaluation were revised and forwarded to the experts for further evaluation.

Data were entered into an Excel® spreadsheet and analyzed by relative and absolute frequencies. To calculate validity, the Content Validity Index (CVI) was used, with a minimum acceptable agreement of 0.80. The items whose CVI did not reach 0.80 were submitted to new rounds of evaluation until consensus was reached by the specialists.

The research was initiated after approval by the Ethics Committee on Human Research of the Federal University of Juiz de Fora under Opinion Nº. 3318209.

RESULTS

In the analysis stage, of the 168 nursing students approached, 44 agreed to answer the questionnaire. Of these, most were women (n=40, 90.9%), studying between the first and fifth year of the course, and with a mean age of 19.8 years. The elements of instructional design that made up the application matrix can be seen in chart 1.

Chart 1 - SBVida Mobile Application Instructional Design Matrix. Juiz de Fora, MG, Brazil, 2020-2021

Units	Objectives	Tools	Contents	Evaluation
Introduction to BLS.	Evaluate prior knowledge.	Objective questions about BLS.	Questionnaire application.	Pre-test.
Out-of-hospital adult CRA victim care.	Mediate the learning of the content.	Manuals and instructional videos.	Illustrations, textual summaries, and short videos.	Access to the application content.
Recognition and care of the victim in CRA and performance of the BLS maneuvers.	Provide information on the identification and care of adult cardiac arrest.	Chain of survival; triggering the emergency service. use of automatic defibrillator. CPR maneuvers. identification of shockable cardiac rhythms.	Interactive Icons. Theoretical Material. Instructional Video.	Post-test.

Source: authors (2020-2021).

For the development of the SBVida mobile application, following the steps of design, development and implementation, a main page was created, called home, where the application is presented to the user. The home screen aims to direct the user to the central interface of the application, where the user will find the main menu that will allow navigation by icons. After the first access to the application, there is an automatic programming that directs the user to perform the pre-test, entitled Basic Life Support. If the user is unable or does not want to do it at that moment, he or she can choose to access the application through the main menu at any time (Figure 1).

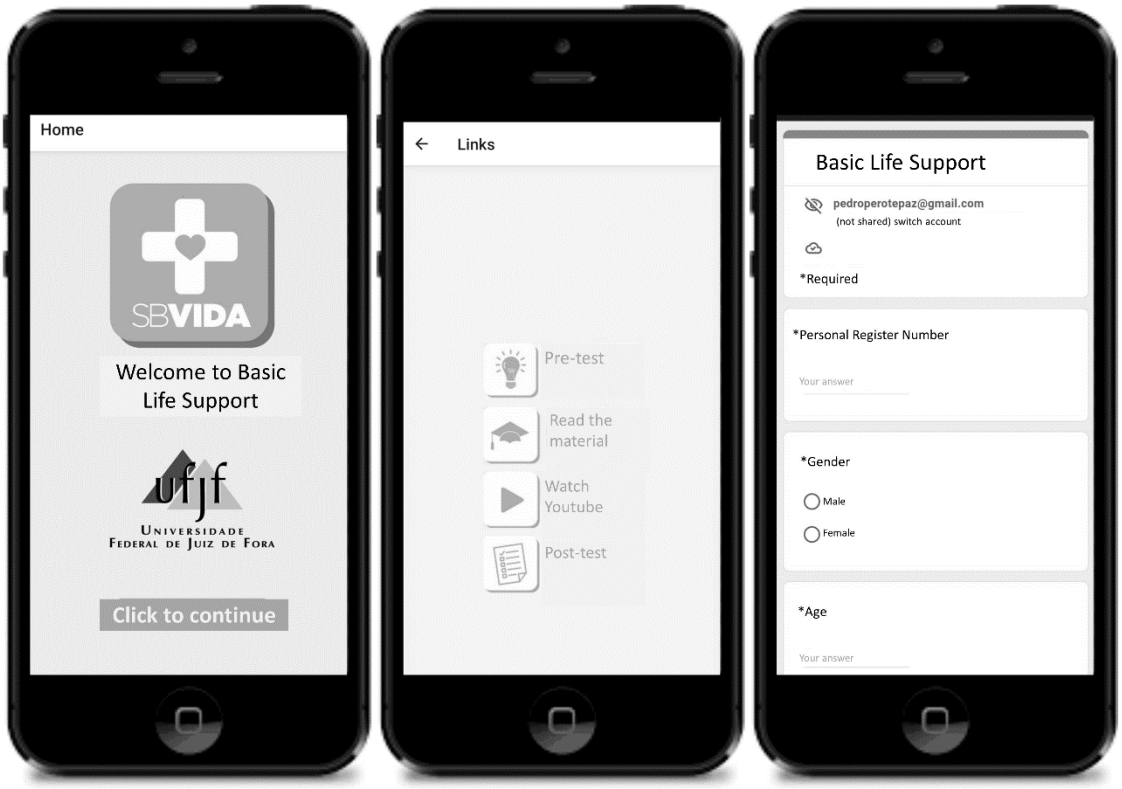

Figure 1. Access menu navigated by icons. Juiz de Fora, MG, Brazil, 2020-2021

Source: authors (2020-2021)

After global exploration of the application and assimilation of the theme, the user can take the post-test. At the end, a comparative chart will be generated, which makes it possible to evaluate the level of prior knowledge and the acquired knowledge. It should be noted that the post-test has the same questions as the pre-test, and can be used to measure, by means of simple frequency, the impact of user learning.

It should be noted that the application presented here is the final version validated by 11 specialists. Of these, six (54.6%) were female, aged between 30 and 40 years, with master or doctoral degrees, seven (63.7%) worked in intensive care or urgency/emergency units, five (45.5%) had professional experience between 11 and 20 years and eight (78.3%) lived in the Southeast region of Brazil. Some specialists made suggestions to improve the application, which were incorporated into the final version, such as the creation of a logo and manuals.

Two rounds were carried out among the experts to obtain the degree of agreement higher than 0.80. The overall CVI of the scale resulted in 0.87 as can be seen in table 1.

Table 1- Content Validity Index per item of the SBVida mobile application. Juiz de Fora, MG, Brazil, 2020-2021

Item	CVI item
Relevance	1

Clarity of concepts	0.90
Coherence of contents	0.90
Quantity of information	0.82
Presentation of images/videos/links	0.82
Validity of information	0.82
Navigability	0.82
Accessibility	0.90
Screen design	0.90
Overall scale CVI	0.87

(n=11)

Source: authors (2020-2021).

DISCUSSION

The use of teaching technologies by mobile devices has expanded in the health field, influencing the modes of care. Among the possibilities, apps that produce guidelines, monitor diseases, signs and symptoms, and even direct protocol conducts in varied clinical situations stand out[18-20].

In this sense, research[21-23] highlights that, in health, educational applications can streamline and complement teaching. These applications can be used in a face-to-face or remote interface through theoretical content, tests, videos, animations, and interactive games.

Experimental research conducted in Korea with 66 undergraduate nursing students assessed knowledge, skills, and self-efficacy in clinical practice through the prior use of an application with and without interactivity. The experimental group, which used the interactive application, showed significantly higher results ($p<0.001$) in knowledge, skills, and perceived self-efficacy in procedures such as vital signs, intravenous medication, gastric gavage, and endotracheal suction[24].

In the field of undergraduate nursing education, the possibility of accessing an educational application at any time, reviewing and training knowledge can stimulate the development of cognitive skills essential to care[13,25]. It is inferred, therefore, that the integration of educational applications to clinical practice and teaching can mobilize cognitive skills such as critical thinking, clinical judgment, and decision-making in health[5,26].

A study used the application Cuidar Tech Neo (" Care Tech Neo") with the objective of stimulating the clinical judgment and decision-making of neonatology nurses. From the study, it was identified that the professionals considered the device as an auxiliary tool in the Nursing process through the crossing of clinical indicators [17].

Regarding BLS, a study tracked the existence of 3,890 apps on the subject from the Google Play Store and Apple App Store. However, only five of these apps were validated with sufficient usability and medical accuracy related to international guidelines for the care of CRA[27].

Applications that teach interventions in situations involving imminent risk of death should be based on the best available evidence. In addition, rigorous validation of content by experts and ensuring usability standards are indispensable[27-28].

In this direction, the SBVida Mobile Application was structured based on the recommendations of the American Heart Association and validated by specialists in Intensive Care and Urgency/Emergency[28-29]. As for the usability, it provides information and indicators that guide conducts for the identification of a possible victim in CRA and directs to the CPR procedures until the implementation of more complex conducts in a specialized care unit.

It is noteworthy that the content validity achieved by the application was adequate, elucidating the utility as relevant, clear in its concepts, consistent in content and information, in addition to appropriate interface, access, navigability, and design. In the field of cardiac emergencies, other studies on the development and validation of multimedia applications have reached adequate scores and valid contents[11,19]. The literature has established a minimum score of 0.8 as ideally adequate to validate the specific and general contents of an instrument or prototype[30].

It is noteworthy that the study was limited to the creation and content validation of the application through expert evaluation, lacking application in a representative sample of the target population for appearance validation. In addition, the application requires a web-based platform, which may restrict its use by people with limited computer skills and no internet access.

CONCLUSION

Through DIC and content analysis, the SBVida application was, respectively, developed and validated. According to the specialists, the application is relevant, clear in its concepts, coherent in its contents and information, with adequate interface, access, navigability, and design.

It is considered that the SBVida app is suitable for studies assessing the validity of appearance among the population of interest and contributes as an innovative digital tool for teaching BLS to Nursing and Health students.

The SBVida mobile application may contribute to the dissemination of knowledge about BLS and to the further training of students and health professionals in a practical and interactive way. Furthermore, it may be used in research with the objective of comparing knowledge before and after an educational intervention on BLS.

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