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Mobile persuasive technology for the teaching and learning in surgical safety: Content validation

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ABSTRACT

Background: Patient safety is a fundamental component of high-quality delivery of health care. However, despite scientific advances, surgical patients continue to face risks. Among the most common complications in surgery are operations on the wrong patient, performance of the wrong procedure or operation on the wrong surgical site, lack of adequate or required equipment, failure to prevent blood loss, and surgical items left inside patients. In this context, the planning and development of innovative educational strategies is important for prevention of adverse events and the improvement of surgical patient safety culture.

Objective: To describe the process of validating the content of mobile technology for education about surgical safety.

Methods: Content validation using the Delphi technique was carried out from December 2015 to January 2016 at a Federal University in South Brazil. Content development and animations were produced by the authors from a verification list for safety surgery and a safety surgery protocol. Twelve judges assessed five variables (Content, Language, Illustration, Layout and Motivation), for consensus on content validation. They evaluated quality of each item, using a rating scale consisting of five levels (1 to 5).

Results: Two assessment rounds were done, with a mean content validity index (CVI) of 0.95 and 1.0 and a kappa index of > 0.83 and > 0.92, respectively. The judges provided positive comments about each phase of the study, most of comments highlights were: choice of very relevant subject matter, excellent quality of the material and the motivation that the material can provide to the target audience.

Conclusion: The study validated the content of learning technology by general consensus of judges with a high level of concordance among evaluated items. The application was considered adequate for educating students and health professionals about surgical safety.

1. Introduction

Patient safety is the main component for quality in health care, as stated by the World Health Organization (WHO) (World Health Organization, 2017) and, more recently in Brazil, by the National Health Surveillance Agency (Brazil, 2013). However, despite recent scientific and technological developments, health care is still considered unsafe (Wacher, 2013; Leape, 2009; Weiser et al., 2008).

In the surgical area, the situation is even more worrisome because of the high proportion of individuals undergoing surgery each year: one in every 25 people (Weiser et al., 2008; World Health Organization, 2017), but although the goal of surgeries is to save lives, different adverse events involving surgical patients occur daily with a death rate from 0.5% to 5% (World Health Organization, 2017; Kable et al., 2002; Mendes et al., 2013). In this context, major errors in the operating room include fail to identify patients, wrong surgical site, lack of adequate or required equipment, failure to prevent blood loss, and surgical items left inside patients (Treadwell et al., 2014).

Currently, the WHO strongly recommends the safety surgery checklist as an efficient strategy to avoid adverse events and surgical complications, considering that its application in the operating room can reduce errors and deaths (World Health Organization, 2009; Treadwell et al., 2014).

In this direction, the proposal of this study may contribute for improvements in the educational process of future nurses on surgical safety. Also, our proposal corroborates with the recommendations of the WHO that suggest the inclusion of the safety surgery topics in the curricula of all health courses (Wegner et al., 2016) particularly from

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the beginning of the courses, a period in which students performed clinical stages and had contact with patients (Killam et al., 2013; Vaismoradi et al., 2014).

However, even 5 years after the publication of the Brazilian national patient safety program, the Brazilian hospitals still face many difficulties to implement surgical safety checklist in the perioperative period, which, together with the gaps in teaching about surgical safety in universities, can put patients at different risks. For this reason, the development of an innovative educational strategy, mediated by mobile devices, as persuasive technologies, can cause changes in behaviors and attitudes regarding surgical safety and the strengthening of safety culture among nursing students.

Development and implementation of mobile learning technologies have emerged as a way to transform learning and teaching and to promote new attitudes and behaviors (Dodt et al., 2013; Fogg, 2007). This perspective emerged from the concept of computer as persuasive technology (Captology) that emphasizes the design, search for, and analysis of interactive products (e.g., wireless technology, mobile applications) developed to promote attitudes and behavior changes among people (Fogg, 2003). The relevance of this type of technology is justified by an emotional meaning due to its omnipresence and ability to support problem solving and provide information at the fingertips, without time or space restrictions (Fogg, 2007).

From these considerations, we propose the development of iSafety®, an online learning application for teaching and learning about surgical safety. This mobile application is under development and has three animations that present in detail the 3 steps for applying the safe surgery checklist. However, to achieve the proposed goals, this learning technology content needs to be validated. Content validation is based on systematic examination of conceptual abstractions by observation and measurement of responses, according to a judgment of experts, which indicates whether the instrument has an adequate sample of items to measure universe of the content (Wynd et al., 2003; McGlynn and Asch, 1988; Polit and Beck, 2013).

Considering the importance of the development of innovative educational technologies in the area of surgical safety, and considering the importance of the content validation process to achieve objectives of these technologies development, our study describes the validation process of a technology application content designed for learning and teaching about surgical safety.

2. Methods

The study was approved for Ethical and Research Committee of the Federal University of Santa Catarina (CAAE: 25453013.6.0000.0121). All participants were guided about the objectives of the study, about how to participate and signed the consent form. To guarantee anonymity, judges were only identified by alpha numerical codes throughout the study (J1 to J12).

2.1. Design

This is a content validation study (Polit and Beck, 2013) with Delphi technique (Keeney et al., 2011), developed in eight steps: development of content and animations (September 1 to December 15, 2015); elaboration of the instruments for data collection; invitation to judges by email; sending of content and first-round instrument by e-mail (December 15 to December 31, 2015); tabulation of results; adjustments (content and animations) according suggestions; sending of adjusted content and second-round instrument (January 1 to January 15, 2016); tabulation and analysis of results.

The composition of the judges' group should be carefully observed, considering the recommendations of a minimum sample size of 6 and a maximum of 20 judges (Rubio et al., 2003).

Studies using the Delphi technique have been used for a number of purposes and can be useful in the design and validation of educational materials. This technique aim is to obtain the most reliable consensus of opinion from a group of experts (judges) for two or more rounds of evaluation guided questionnaires, interspersed with controlled feedback (Keeney et al., 2011).

2.2. Study Location and Participants

The study was carried out at Federal University of Santa Catarina, South Brazil. The content was validated by 12 judges who accepted the invitation sent by email. Inclusion criteria of judges were: nurses who worked at undergraduate nursing program at different Brazilian Universities with adherence of safety patient or surgical nursing are and/or nurses who worked at surgical center or safety patient area; both with minimum two years of experience; and with specialists, master or PhD certification.

We searched for judges in a website named Lattes Curriculum of National Council for Scientific and Technological Development. This curriculum is part of a Brazilian database in which researchers can include information about their education and scientific output.

2.3. Development of the Technology

Content development and animations were designed considering the surgical safety checklist and a safety surgery protocol (Brazil, 2013; World Health Organization, 2009). The content produced present the general context of surgical safety, and the learning objective is proposed by application and applied of a surgical safety checklist in three steps (before induction of anesthesia, before surgical incision, before departure from the operating room), in a simulated case with cartoon design (Fig. 1).

Animations were designed by authors using GoAnimate® platform, and an image from each screen was saved as Portable Document Format® (.pdf) file. These images were reunited in 4 files to be sent to judges by e-mail; a total of 84 screenshots were sent.

2.4. Instrument and Data Collection

This study was conducted online. First, the judges were invited by email and after were invited by email and then received the electronic form for assessment.

The Google Form® platform was used to create the data collection instrument, which included sociodemographic data of participants and the assessment questionnaire (20 closed-ended questions), related content, language, illustrations, layout and motivation, which were evaluated using a Likert scale (1 to 5), and space was provided for registering of opinion and suggestion (Fig. 2). The judges were able to register improvement suggestions and comments in a specific field at the end of the electronic form.

2.5. Data Analysis

To validate content, we used the Content Validity Index (CVI) and modified kappa (Polit et al., 2007). The CVI can be defined as the proportion of items that receive a score of 4 or 5 by judges, calculated by dividing the number of answers with a score of 4 or 5 by the total number of answers obtained. Results can range from 0 to 1; when ≥ 0.80, they can be considered excellent standard in terms of content validity among judges (Polit et al., 2007).

The scores “4 - Agree” and “5 - Totally agree” were considered similar (i.e., they were considered positive), as done results in other studies (Oliveira et al., 2008; Reberte et al., 2012; Souza and Turrini, 2012).

The modified kappa completes the CVI calculation and the first calculation to probability of defined casual occurrence. The concordance measure has a maximal value of 1 and its interpretation, according to concordance, can be classified from 0.40 to 0.59 (Weak),