Evaluation of a mobile application for individuals at risk of myocardial infarction

Avaliação de aplicação móvel para indivíduos em risco de infarto do miocárdio

DOI: 10.55905/oelv22n1-188

Recebimento dos originais: 21/12/2023
Aceitação para publicação: 23/01/2024

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ABSTRACT
Introduction: Applications are instruments of easy and fast access and low cost, but, to meet the needs of users, they must be validated to be offered. Validation is a process by which the reliability and relevance of the product are established, verifying if it has achieved the desired specific purpose. Objective: To evaluate the layout and content of an application for health education on risk factors and first aid procedures in cases of acute myocardial infarction. Methods: Methodological study of application evaluation. The application was built according to the assumptions of Design Thinking. The present study had the following stages: 1) construction of the evaluation form, 2) recruitment of the judges, 3) evaluation of the layout and 4) evaluation of the application content. The evaluation was composed of 21 judges, being 11 doctors and 10 nurses, from June to December 2019. For the evaluation of the layout and content, some strategies were used through the Delphi method, and the Content Validity Index (CVI) was calculated from the answers of the judges. Results: The application got global CVI of 0.98. Conclusions: The application presents scientifically adequate information for health education and necessary for situations of acute myocardial infarction emergencies.

Keywords: validation study, myocardial infarction, mobile applications, first aid, nursing informatics.

RESUMO
Introdução: As aplicações são instrumentos de acesso fácil e rápido e de baixo custo, mas, para satisfazer as necessidades dos usuários, têm de ser validadas para serem oferecidas. A validação é um processo pelo qual se estabelece a confiabilidade e a relevância do produto, verificando se ele atingiu o objetivo específico desejado. Objetivo: Avaliar o layout e o conteúdo de um pedido de educação em saúde sobre fatores de risco e procedimentos de primeiros socorros em casos de infarto agudo do miocárdio. Métodos: Estudo metodológico da avaliação de aplicações. A aplicação foi construída de acordo com os pressupostos do Design Thinking. O presente estudo teve as seguintes etapas: 1) construção do formulário de avaliação, 2) recrutamento dos júris, 3) avaliação do layout
e 4) avaliação do conteúdo da candidatura. A avaliação foi composta por 21 juízes, sendo 11 médicos e 10 enfermeiros, de junho a dezembro de 2019. Para a avaliação do layout e do conteúdo, algumas estratégias foram utilizadas através do método Delphi, e o Índice de Validade do Conteúdo (CVI) foi calculado a partir das respostas dos juízes. Resultados: O aplicativo obteve CVI global de 0,98. Conclusões: O aplicativo apresenta informações cientificamente adequadas para a educação em saúde e necessárias para situações de emergência de infarto agudo do miocárdio.

**Palavras-chave:** estudo de validação, infarto do miocárdio, aplicações móveis, primeiros socorros, informática de enfermagem.

1 INTRODUCTION

The most important causes of deaths worldwide and nationally are cardiovascular diseases. Among these diseases, Acute Myocardial Infarction (AMI) is an important cause of death and about 40 to 65% of these deaths occur in the first hour after the event, according to data from the Department of Informatics of the Unified Health System (DATASUS, 2019) (MEDEIROS; ANDRADE; DAVIM, 2018).

Hypertension and dietary factors are considered to have a strong influence on the occurrence of AMI, accompanied by sedentary lifestyle and other comorbidities such as diabetes, overweight and obesity (NASCIMENTO; BRANT, 2018) (MERTINS, 2016). AMI can be caused by several intrinsic and extrinsic factors related to the individual (MEDEIROS; ANDRADE; DAVIM, 2018) (RIBEIRO; SILVA; LIMA, 2016).

Studies conducted in Brazil showed that people with symptoms of AMI do not immediately seek the health service for some reasons, including the fact that they do not know the specific symptoms of AMI, the absence of specialized first aid services near their homes and due to the difficulty of transportation to the hospital (RIBEIRO; SILVA; LIMA, 2016) (TAKAGUI; MOREIRA; CARVALHO; DUARTE; SILVA; FATTAH, 2018).

The awareness and orientation of society regarding the signs and symptoms of AMI are essential for the immediate search for the health service. The longer the time between the recognition of the first symptoms until arrival at the emergency service, called Delta T, the longer the time of exposure to ischemia and the delay in the initiation
of treatment, this increasing the risks for developing complications such as cardiogenic shock and death (REGGI; CARVALHO, 2016).

Evidences on the possible benefits of interventions using smartphones and social media are recent and studies are under development. However, systematic reviews and meta-analyses have demonstrated evidences that educational programs using mobile applications are viable and can increase drug adherence and improve unfavorable outcomes of the disease, as well as behaviors related to cardiovascular lifestyle (PIETTE; LIST; RANA, TOWNSEND; STRIPLIN; HEISLER, 2015) (GANDHI; CHEN; HONG; SUN; GONG, LI, et al, 2017). This makes new studies that expand the usefulness of mobile technologies in cardiovascular health opportune, considering health inequities, the socio-cultural context and the characteristics of Health Systems.

Mobile health applications are quick and easy access tools that can help in emergencies. Nevertheless, in order to truly meet the needs of users and contain the correct scientific information, they must be validated and only later made available to society (GROSSI;PISA;MARIN, 2014) (CURIONI; BRITO; BOCCOLINI, 2013).

An instrument is considered validated when it offers the real measurement of what was proposed before its construction and applicability. In addition, if there is compatibility between its content and the objectives previously elaborated effectively. For the validation proposed in this article, the Delphi technique and the Content Validation Index (CVI) were used (LEITE; ÁFIO; CARVALHO; SILVA; ALMEIDA; PAGLIUCA, 2018) (SILVA ; MONTILHA, 2021) ( BELLUCCI, 2012).

This study proposed the validation of part of an application called “SOS INFARCTION”. It was developed by a multidisciplinary team formed by nurses, systems analysts, pedagogue and graphic designer. This application aims to provide sufficient guidance to know what help to seek in case of suspected symptoms related to AMI.

2 OBJECTIVE

To evaluate the layout and content of an application for health education on risk factors and first aid procedures in cases of acute myocardial infarction.
3 METHODS

3.1 ETHICAL ASPECTS

The project honors the norms and guidelines for conducting research involving human beings according to Resolution 466/12 of the National Health Council/Ministry of Health (NHC/MH). It was submitted and approved by the Research Ethics Committee (REC) of the HUOC/PROCAPE Hospital Complex. As for the study participants, the confidentiality and anonymity of personal data were maintained, and they were clarified regarding the purpose of the investigation and the nature of the data collection. Those who agreed to participate signed the Informed Consent Form (ICF).

3.2 DESIGN, STUDY SITE AND PERIOD

Methodological study applied in the modality of technological production for evaluation of the application S.O.S infarction. The current work was developed at the University of Pernambuco, Nossa Senhora das Graças Nursing School, Recife-PE, and had as co-participant the Nova Roma College of Recife and the Telehealth Center of the Health Department of the state of Pernambuco (SES/PE). It was carried out from March to December 2019.

3.3 POPULATION AND SAMPLE

The population for this study considered professionals of Medicine and Nursing with specialization and performance in cardiology. The following inclusion criteria were established: Doctors or nurses, registered in the Carlos Chagas Lattes Platform of CNPq with a lato or stricto sensu postgraduate record in the area of cardiology operating in Brazil for at least 2 years.

Initially, a search was performed on the Lattes Platform of the CNPq portal for specialists in the field of cardiology, according to the inclusion criteria of the study, obtaining a total of 42 specialists. The sample was non-probabilistic by convenience. In case of non-response or refusal of professionals after one week, new professionals were drawn. Subsequently, they were contacted by email, message by WhatsApp or in person, explaining the project proposal and inviting them to join the panel of judges who would
validate the application. In the end, 21 experts agreed to participate and answered the evaluation form, which already contained the attached Informed Consent Form.

3.4 STUDY PROTOCOL

The construction of the application followed the following steps: pre-production and application development. The first stage comprised the process of bibliographic survey, and the second stage, the development of the application, which was supported by Design Thinking. For the development, the Ionic and Apache Cordova frameworks were used through the tools: Node JS16, Android Developer Tools, Google Chrome Browser, Visual Studio Code, Ionic Plugins and Dependencies, Firebase and Angular Js.

3.5 CONSTRUCTION OF THE EVALUATION FORM

For the evaluation of the content of the application, a semi-structured online form was developed, built on the platform Google Forms. To guide the construction of the evaluation instrument, the dimensions addressed by the application were identified: evaluation of the general functionalities of the application; evaluation of the risk score; evaluation of the content; learn more and evaluation of the domains related to objectivity, clarity, relevance and applicability. The dimensions allowed the formulation of the questions that evaluated each item of the application. To validate the layout, the form contained images of the application screens and text describing their operation. The whole form was constructed using a Likert scale with the answers, 1-Totally Inadequate; 2-Partially Inadequate; 3-Partially Adequate; 4-Totally Adequate.

3.6 EVALUATION OF THE APPLICATION LAYOUT AND CONTENT

In the validation process, the Delphi Technique was applied, which is widely used by researchers from various areas and crucial for scientific development. This methodological tool allows the validation of information through the issuance of a consensus among judges on a particular theme (SILVA ; MONTILHA, 2021) (BELLUCCI, 2012) (SANTIAGO; MOREIRA, 2019) (CASTRO; REZENDE, 2009).
3.7 STATISTICAL ANALYSIS AND OF THE RESULTS

The data collected by the instruments were stored in Microsoft Excel spreadsheets, totaling 46 items evaluated. The information was organized in tables. Subsequently, the Content Validity Index (CVI) of each item of the questionnaire responses and the global CVI were calculated.

The CVI calculation uses questions that allow judges to assign answers that vary on a scale from 1 to 4 for each item evaluated, in which 1 is considered irrelevant, 2 little relevant, 3 really relevant and 4 very relevant. In this study, the instrument used allowed answers equivalent to: 1-Totally Inadequate; 2-Partially Inadequate; 3-Partially Adequate; 4-Totally Adequate (LIMA, et al, 2020)

From the sum of the items marked as 3 or 4 and the division of this value by the total of answers, the CVI is obtained (BITENCOURT; SANTANA, 2021). After the calculation, the contents that obtain the CVI value above 0.80 are considered valid (SANTOS, et al, 2021). Even though the items were validated, the considerations of the judges were taken into account when according to the literature.

4 RESULTS

The panel of validation judges was composed of 21 judges, all with lato and stricto sensu postgraduate records in the area of cardiology, having professional experience ranging from 2 to 40 years. Of these, 10 were nurses (5 specialists/residency and 5 MSc) and 11 doctors (8 specialists/residency, 1 MSc and 2 PhD).

Table 1 exposes the judges' judgments on the screens: Registration; Clinical History of the User, which was composed of the items: gender, age, weight, height and automatic calculation of the BMI; previous infarction, hypertension, diabetes, high cholesterol, consumption of cigarettes more than 5x per day, physical activity 3x per week, consumption of fruits and vegetables, consumption of alcohol twice a week; Emergency Contact, Menu Screen, Alert Messages, Units Specialized in Cardiological Care and finally the Symptoms for Identification of the Risk of AMI.

In the Identification of Signs of Infarction screen, there were 5 checkboxes with the options: Pain, sweating, nausea, vomiting and dyspnea. If selected Retrosternal or
precordial pain (Chest pain), another 3 checkboxes would open with the options: burning type pain? In tightness? Or does pain radiate, if yes, to upper limbs or neck? For how long: More than 20 minutes or less than 20 minutes. The judges judged the items to be partially adequate and totally adequate. All of them achieved CVI = 1, that is, full agreement between the judges.

Table 1 - Application layout evaluation based on information obtained from the 21 judges. Recife, 2019.

<table>
<thead>
<tr>
<th>Items</th>
<th>TI* (%)</th>
<th>PI* (%)</th>
<th>PA* (%)</th>
<th>TA* (%)</th>
<th>CVI* (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>How do you evaluate the content of the initial email and password registration screens?</td>
<td>0.0</td>
<td>0.0</td>
<td>14.3</td>
<td>85.7</td>
<td>1.0</td>
</tr>
<tr>
<td>Do you agree with the data chosen to construct the user’s clinical history?</td>
<td>0.0</td>
<td>0.0</td>
<td>38.1</td>
<td>61.9</td>
<td>1.0</td>
</tr>
<tr>
<td>How do you evaluate the content of the screen: Contact for emergencies?</td>
<td>0.0</td>
<td>0.0</td>
<td>4.8</td>
<td>95.2</td>
<td>1.0</td>
</tr>
<tr>
<td>How do you evaluate the content of the Menu screens?</td>
<td>0.0</td>
<td>0.0</td>
<td>4.8</td>
<td>95.2</td>
<td>1.0</td>
</tr>
<tr>
<td>Do you agree with the Alert message based on clinical history and the Signs and symptoms of infarction?</td>
<td>0.0</td>
<td>0.0</td>
<td>14.3</td>
<td>85.7</td>
<td>1.0</td>
</tr>
<tr>
<td>How do you evaluate the content of the identification screens of specialized units for treating cardiological emergencies?</td>
<td>0.0</td>
<td>0.0</td>
<td>23.8</td>
<td>76.2</td>
<td>1.0</td>
</tr>
<tr>
<td>Do you agree with the symptoms chosen to identify AMI Risk?</td>
<td>0.0</td>
<td>0.0</td>
<td>42.9</td>
<td>57.1</td>
<td>1.0</td>
</tr>
<tr>
<td>TOTAL</td>
<td>0.0</td>
<td>0.0</td>
<td>20.43</td>
<td>79.57</td>
<td>1.0</td>
</tr>
</tbody>
</table>

* TI: Totally Inadequate; PI: Partially Inadequate; PA: Partially Adequate; TA: Totally Adequate; CVI: Content Validity Index.
Source: created by the author

Table 2 shows the composition of the risk factor score. Age, previous AMI, comorbidities and healthy lifestyle scores achieved CVI = 1 each; as for the score for assessing the risk of AMI from the clinical history, the CVI achieved was 0.95. For the final construction of the AMI risk score, the clinical history with the signs and symptoms that the user presents at the time is added. All items reached CVI equal to 0.95. Regarding the item Pain score + Duration greater than 20 minutes, 1 (4.8%) judge evaluated as totally inadequate, and the same judge suggested changing the text for pain greater than 20 minutes that did not improve with rest.
Table 2 - Evaluation of the application risk score regarding the agreement of the 21 judges. Recife, 2019.

<table>
<thead>
<tr>
<th>Items</th>
<th>TI* (%)</th>
<th>PI* (%)</th>
<th>PA* (%)</th>
<th>TA* (%)</th>
<th>CVI* (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age Score</td>
<td>0.0</td>
<td>0.0</td>
<td>19.0</td>
<td>81.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Previous AMI Score</td>
<td>0.0</td>
<td>0.0</td>
<td>4.8</td>
<td>95.2</td>
<td>1.0</td>
</tr>
<tr>
<td>Comorbidities Score</td>
<td>0.0</td>
<td>0.0</td>
<td>14.2</td>
<td>85.8</td>
<td>1.0</td>
</tr>
<tr>
<td>Healthy Life Habits Score</td>
<td>0.0</td>
<td>0.0</td>
<td>19.0</td>
<td>81.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Score for AMI risk evaluation from the clinical history</td>
<td>0.0</td>
<td>4.8</td>
<td>9.5</td>
<td>85.7</td>
<td>0.95</td>
</tr>
<tr>
<td>TOTAL</td>
<td>0.0</td>
<td>0.96</td>
<td>13.3</td>
<td>85.74</td>
<td>0.99</td>
</tr>
</tbody>
</table>

* TI: Totally Inadequate; PI: Partially Inadequate; PA: Partially Adequate; TA: Totally Adequate; CVI: Content Validity Index.

Source: created by the author

Table 3 demonstrates the content of the “Learn More” function. The ones that achieved the best score were the items related to “Infarction”, “Risk Factors”, “Go to Medical Consultation”, “Age Group”, “Smoking”, “Hypertension and Diabetes”, “Physical Exercise”, “Alert your Doctor About Cases of Infarction in the Family” and “Entertainment Recommendation”, all with CVI = 1. As for the items “What the person feels when having an infarction”, “Consumption of Fats”, “Excessive Consumption of Alcohol”, the CVI achieved was 0.95. Only one atherosclerosis item was considered by 2 (9.5%) judges as Partially Inadequate, with CVI of 0.90.

Concerning the layout of the application, there are screens related to registration, construction of clinical history, emergency contact option, menu screen, alert message, search for units specialized in cardiological care and symptoms to identify the Risk of AMI and “Learn More”.
Table 3 - Content evaluation of the application’s learn more according to the judges’ agreement. Recife, 2019.

<table>
<thead>
<tr>
<th>Items</th>
<th>TI* (%)</th>
<th>PI* (%)</th>
<th>PA* (%)</th>
<th>TA* (%)</th>
<th>CVI* (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is the definition of infarction adequate?</td>
<td>0.0</td>
<td>0.0</td>
<td>19.0</td>
<td>81.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Is the definition of atherosclerosis adequate?</td>
<td>0.0</td>
<td>9.5</td>
<td>23.8</td>
<td>66.7</td>
<td>0.90</td>
</tr>
<tr>
<td>Is the text: What does a person feel when having an infarction adequate?</td>
<td>0.0</td>
<td>4.8</td>
<td>23.8</td>
<td>71.4</td>
<td>0.95</td>
</tr>
<tr>
<td>Is the definition of risk factors adequate?</td>
<td>0.0</td>
<td>0.0</td>
<td>28.6</td>
<td>71.4</td>
<td>1.0</td>
</tr>
<tr>
<td>Is the definition of a balanced diet adequate?</td>
<td>0.0</td>
<td>0.0</td>
<td>14.2</td>
<td>85.8</td>
<td>1.0</td>
</tr>
<tr>
<td>Is the definition of going to a doctor's appointment adequate?</td>
<td>0.0</td>
<td>0.0</td>
<td>19.0</td>
<td>81.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Is the text about age group adequate?</td>
<td>0.0</td>
<td>0.0</td>
<td>9.6</td>
<td>90.4</td>
<td>1.0</td>
</tr>
<tr>
<td>Is the definition of smoking adequate?</td>
<td>0.0</td>
<td>0.0</td>
<td>4.8</td>
<td>95.2</td>
<td>1.0</td>
</tr>
<tr>
<td>Is the recommendation for hypertensive and diabetic patients adequate?</td>
<td>0.0</td>
<td>0.0</td>
<td>9.6</td>
<td>90.4</td>
<td>1.0</td>
</tr>
<tr>
<td>Is the recommendation on physical exercise adequate?</td>
<td>0.0</td>
<td>0.0</td>
<td>14.2</td>
<td>85.8</td>
<td>1.0</td>
</tr>
<tr>
<td>Is the definition of fat consumption adequate?</td>
<td>0.0</td>
<td>4.8</td>
<td>14.2</td>
<td>81.0</td>
<td>0.95</td>
</tr>
<tr>
<td>Is the recommendation made regarding excessive alcohol consumption adequate?</td>
<td>0.0</td>
<td>4.8</td>
<td>23.8</td>
<td>71.0</td>
<td>0.95</td>
</tr>
<tr>
<td>Is the text about alerting your doctor about cases of infarction in the family adequate?</td>
<td>0.0</td>
<td>0.0</td>
<td>14.2</td>
<td>85.8</td>
<td>1.0</td>
</tr>
<tr>
<td>Are the entertainment recommendations consistent?</td>
<td>0.0</td>
<td>0.0</td>
<td>19.0</td>
<td>81.0</td>
<td>1.0</td>
</tr>
<tr>
<td>TOTAL</td>
<td>0.0</td>
<td>1.70</td>
<td>16.98</td>
<td>81.28</td>
<td>0.98</td>
</tr>
</tbody>
</table>

* TI: Totally Inadequate; PI: Partially Inadequate; PA: Partially Adequate; TA: Totally Adequate; CVI: Content Validity Index.
Source: created by the author

Table 4 provides a general analysis of the judges regarding the illustrations, agreement, representativeness, clarity and efficiency of the application, all obtained CVI = 1, which means that the content of the application is adequate to its objective.
Table 4 - General evaluation of the application regarding the objective, relevance, clarity and efficiency of the application, Recife, 2019.

<table>
<thead>
<tr>
<th>Items</th>
<th>TI* (%)</th>
<th>PI* (%)</th>
<th>PA* (%)</th>
<th>TA* (%)</th>
<th>CVI* (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is the objective of the application aligned with an innovative proposal for assistance in AMI emergency cases?</td>
<td>0.0</td>
<td>0.0</td>
<td>4.8</td>
<td>95.2</td>
<td>1.0</td>
</tr>
<tr>
<td>Does the application provide help effectively and is it therefore extremely important to make it available to the population?</td>
<td>0.0</td>
<td>0.0</td>
<td>14.2</td>
<td>85.8</td>
<td>1.0</td>
</tr>
<tr>
<td>Is the language used clear and objective?</td>
<td>0.0</td>
<td>0.0</td>
<td>19.0</td>
<td>81.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Is the content easy to understand by the general population?</td>
<td>0.0</td>
<td>0.0</td>
<td>19.0</td>
<td>81.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Is the information adequate to guide the user in imminent cases of AMI?</td>
<td>0.0</td>
<td>0.0</td>
<td>23.9</td>
<td>76.1</td>
<td>1.0</td>
</tr>
<tr>
<td>Is the content attractive and stimulating?</td>
<td>0.0</td>
<td>0.0</td>
<td>28.6</td>
<td>71.4</td>
<td>1.0</td>
</tr>
<tr>
<td>Are the screens self-explanatory and easy to understand?</td>
<td>0.0</td>
<td>0.0</td>
<td>9.6</td>
<td>90.4</td>
<td>1.0</td>
</tr>
<tr>
<td>Are the illustrations, figures or images consistent with the application?</td>
<td>0.0</td>
<td>0.0</td>
<td>28.6</td>
<td>71.4</td>
<td>1.0</td>
</tr>
<tr>
<td>Is it easy to understand the purpose and how to use it?</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>100.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Does the app provide help clearly?</td>
<td>0.0</td>
<td>0.0</td>
<td>9.6</td>
<td>90.4</td>
<td>1.0</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>0.0</td>
<td>0.0</td>
<td>15.73</td>
<td>84.27</td>
<td>1.0</td>
</tr>
</tbody>
</table>

* TI: Totally Inadequate; PI: Partially Inadequate; PA: Partially Adequate; TA: Totally Adequate; CVI: Content Validity Index.
Source: created by the author

5 DISCUSSION

The application registration screen was the first to be evaluated by the judges, obtaining CVI equal to 1, thus being validated. Next, the items chosen for the screen “Construction of the Clinical History” of the user were judged, in addition to the data already used, and the judges suggested adding the questions: do you take any medicine? No, Yes, Name of the medicine; do have you allergy? Have you ever had any cardiovascular or other specialty surgery? and finally, if any close relative has ever had an infarction. As in other validation studies, the researchers chose to consider the modifications suggested by the experts (when according to the literature) even though the CVI was greater than 0.8, in order to improve the application items (LEITE; ÁFIÓ; CARVALHO; SILVA; ALMEIDA; PAGLIUCA, 2018).
They also stated that the measurement of alcohol consumption by the frequency 2x per week needed to be corrected since the light to moderate consumption of alcohol (no more than one dose of alcohol per day for women and up to two daily doses of alcohol for men) is considered a cardioprotective factor in the evolution of myocardial ischemia by some authors. Therefore, it was changed to: do you consume alcohol in excess? (woman: more than 1 dose per day; man: more than 2 doses per day) (FONTES, et al, 2018). Such adjustments were necessary in view of the importance of the application as a resource capable of optimizing people’s health care) (MENDEZ; SALUM; JUNKES; AMANTE; MENDEZ, 2019).

For the screen of identification of the signs of infarction, the judges recommended to add pain in the abdomen to the symptoms, and, to the topic radiated pain, the options for jaw and back. The modifications were considered and changed in the application, considering that the clinical picture of infarction may have different presentations. An integrative review study found that abdominal, jaw and back pain was mentioned 18 times among the selected articles, which reinforces the relevance of the adjustment performed (PASSINHO, SIPOLATTI, FIORESI, PRIMO, 2018).

Another study showed that, when people experience signs and symptoms suggestive of infarction, many did not seek care at a health service because they were unaware of the signs and symptoms (PAZ; MANTOVANI; MERCES; MAZZA; SILVA, 2020).

By seeking to effectively assist the target audience, the expectation is that the application is polished to help people who are at risk of presenting AMI regarding the recognition of signs and symptoms and the search for timely care.

“Time is muscle, flow is life,” this phrase mentions the great importance of time for the victims of infarction. However, the delay of pre-hospital care to patients with chest pain is of such magnitude in clinical practice that only about 20% of these patients reach the emergency department within 2 hours after the onset of symptoms. The functionality “Locate Health Unit” aims to conduct and direct users to specialized and qualified health units in the care of cardiac emergencies through georeferencing, thus reducing the Delta T. This item was considered 23.8% partially adequate and 76.2% fully adequate and
validated with CVI of 1, which indicates full agreement between the judges (PIEGAS, et al, 2015).

Georeferencing is seen as an UHS management tool, considering information on territorialization, populations and visibility of services (CAMARGOS; OLIVER, 2019) in order to collaborate with the construction of relevant indicators and risk mapping in the analysis of the scope of public policies. Early mortality from AMI in Brazil is related to socioeconomic inequalities and access to health services, especially in poorer locations (SANTOS, et al, 2018). Therefore, the distribution of services is not homogeneous, nor based on geographic needs, such as death rates by regions and presence of risk factors. In a broader perspective, health applications can be an instrument of support in the sharing of information between institutions, in the development of new health technologies and assist in the decision-making of public policies in cardiovascular diseases (VAZ, et al, 2020).

Table 2 shows the construction of the AMI risk score, being the score calculated by the sum of the score granted by the answers on the Clinical History added to the Signs and Symptoms reported by the user. The final score categorizes low risk score between 1 and 4; intermediate risk score equal to 5; and high risk score between 6 and 8. If the risk of infarction is detected and the user promptly seeks an emergency service, the faster the diagnosis will be made, as well as the treatment, resulting in less exposure to ischemia and the risk of developing complications such as cardiogenic shock and death (REGGI; CARVALHO, 2016).

After identifying signs and symptoms and generating the risk score, an alert message is presented on the screen of the smartphone. If the assessment of the application indicates low risk, the message presented will be: “You are at low risk, do you want to call your emergency contact?”. If the calculated risk is intermediate, the message presented will be: “You are at intermediate risk, do you want to search for a health unit?”. And if the calculated risk is high, the message presented will be: “You are at high risk, do you want to call SAMU?”. The alert messages were validated with CVI = 1. This is a component of extreme importance for the application, as it will induce the user to seek immediate help. About 40 to 65% of infarction deaths occur in the first hour and
approximately 80%, in the first 24 hours after the event, thus, alerting the user’s degree of risk of infarction can prevent his/her evolution to death (FARAH; ANDRÉA; SILVA; MONTEIRO, 2019).

The provision of health care through mobile applications has the potential to offer preventive actions in the face of cardiovascular events even for patients undergoing cardiac rehabilitation (HAMILTON; MILLS; BIRCH; THOMPSON, 2018). It can be a tip among health services of high complexity with the most remote environments and that present difficulty of access or transportation, such as rural areas. In the case of the elderly who have higher cardiovascular risk, the benefits in the use of applications are also demonstrated, since this population has been sensibly adhering to the use of digital technologies and social media (BOSTROM; SWEENEY; WHITESON; DODSON, 2020). Randomized trials conducted in the United States and Austria, in patients with a mean age of 65 years, had, for example, reductions in hospitalizations and in emergency rooms (SCHERR; KASTNER; KOLLMANN, et al, 2009) (WIDMER; ALLISON; LENNON; LOPEZ-JIMENEZ; LERMAN; LERMAN, 2017).

The V Guideline of the Brazilian Society of Cardiology on AMI treatment reinforces the need to offer more information to people focused on signs and symptoms suggestive of AMI and on the immediate search for care in a health service. Given this, the “Learn More” tab, presented in table 3, brings an approach in health education for users, which explains about infarction, atherosclerosis, risk factors, symptoms; raises awareness about the need for a balanced diet, consumption of healthy fats, physical exercise, going to the doctor, avoiding smoking and excessive use of alcoholic beverages, and the importance of fun (PIEGAS, et al, 2015).

The creation of this information space aims to increase the ability of self-care by the user in the management of his/her cardiovascular health, through clear, safe information and easy practical execution. Health education as a motivational strategy, executed through problematization, can be allied in primary prevention in patients at high risk of cardiovascular disease, strengthening the promotion of healthier behaviors and habits (FEIGIN; NORTVING; MENSAH, 2017) (CORDEIRO; OLIVEIRA; ABREU; SOUSA; BESSA; PEREIRA, 2017).
The judges analyzed each text and made some considerations about grammar for better terms employed. All were validated by index 1 in the CVI, except the texts: atherosclerosis, what the person feels when having an infarction, excessive alcohol consumption and consumption of healthy fats that obtained 0.9 in the CVI due to the need to correct some terms.

Some application screens were modified after the recommendations proposed by the judges. They also highlighted the need for illustrative images for the “Learn More” tab, which would help in compressing the text. These will be created and submitted for validation in the future. The function of the illustrations is to attract the reader, awaken and maintain his/her interest in reading, complement and reinforce the information provided) (CORDEIRO; OLIVEIRA; ABREU; SOUSA; BESSA; PEREIRA, 2017).

Finally, a general evaluation was made, presented in table 4, in which the judges judged the application S.O.S infarction as an innovative proposal of assistance to cases of risk of AMI, which provides help effectively, this being of great importance its availability to the population. They also consider having clear, objective, self-explanatory and easy to understand language for the population. The validation of the application obtained a global CVI of 0.98. According to these results, the content of the instrument is considered validated (SANTOS, et al, 2018).

5.1 STUDY LIMITATIONS

Contact with health professionals by email and WhatsApp for them to participate and answer the questionnaire was not as efficient as the face-to-face approach.

5.2 CONTRIBUTIONS FOR THE NURSING AREA

The application S.O.S infarction has the potential to increase the resolution of the work of nurses in Primary Health Care concerning the prevention of risk factors of cardiovascular events and the stimulation of self-care, as well as improve their performance in high complexity, from risk classification, in emergency care, to care provided to victims at risk of infarction, who, through the correct use of the application, can discover the risk early and quickly seek a health service.
6 CONCLUSIONS

The SOS Infarction Application was validated with global CVI 0.98, containing the correct scientific information necessary for its use in emergency situations of AMI. The application, according to the judges' evaluation, is functional, reliable, adequate and efficient. Its use may lead to rapid responses by nurses in the identification of risk situations and aid in clinical management. Another strong point of the application is to increase user participation in the control of his/her cardiovascular health, alerting to the early signs and symptoms of AMI, through the survey of risk scores, which will serve as support for patients and families and will direct victims to specialized health units qualified for the diagnosis of AMI. The expectation is that the application serves as a bridge, even at a distance, between scientific knowledge and the population, resulting in the reduction of Delta T, complications and mortality rates by AMI.
REFERENCES


