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DEVELOPMENT AND EVALUATION OF THE USABILITY OF AN APPLICATION FOR ELECTRONIC RECORD OF PRE-HOSPITAL CARE

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ABSTRACT

Objective: The study aimed to evaluate and validate the mobile application "Registro 192" for electronic registration of prehospital care. Methods: The process was done in four steps: 1) Literature review and survey of the software on IOS and Android platforms; 2) Development of the application, including the definition of the layout, organization of the screens, functionalities and content; 3) Evaluation of the application by two different groups: health professionals and computer professionals; 4) validation through a

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Revista ARACÊ
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questionnaire using the System Usability Scale (SUS) based on the Likert scale. Results: The positive items had 732 total points and a pass rate of 97.6%, while the negative items had an overall score of 165, with 22% approval. Thus, the general evaluation had 1317 points, an approval of 87.8%, corresponding to the general Cronbach coefficient of 0.827. Conclusion: The application proved to be efficient and practical, and it was possible to use it in the routine of pre-hospital care.

Keywords: Mobile applications. Pre-hospital care. Electronic health record.

Revista ARACÊ
ISSN: 2358-2472

INTRODUCTION

Pre-hospital care (PHC) refers to medical care outside the hospital environment provided to victims of health problems, whether clinical, surgical, traumatic, or psychiatric (Ministry of Health, 2018). This category of health service provision arrives early in the aggravated disease, providing a quick and effective response, which reduces the chance of sequelae and complications that can even lead to the death of patients with emergency conditions (Santos et al., 2023).

In pre-hospital care, the team is responsible for properly filling out a care form with information about the patient, their health condition, how they were found, the care provided on site and in transport, among other things. This document, which will be the patient's pre-hospital medical record, is usually a physical paper form, which is filled out manually by first responders (Prefeitura Municipal de São Paulo, 2022).

These forms are legal documents that contain the patient's clinical condition, their information, the medications administered, what was done and what was not done and the reasons for it. It is, therefore, an important document for legal issues (Barros et al., 2014). In addition, through the attendance forms, it is possible to create subsidies for research, audits, planning, statistical purposes. Thus, a well-documented, completely and legible form is essential (Ferreira et al., 2021).

In this scenario, the manual preparation of these medical records in physical media is not fruitful. Initial care outside the hospital environment needs to be agile, to take the patient to a referral unit as quickly as possible (Silva et al., 2020). Given this, the production of the form is in the background, the records are not made when the rescuers are taking care of the patient, but after the patient's stabilization, at the end of the care (Ferreira et al., 2021).

To provide agile care, and subsequent release for another service, some data in the medical record are not filled in, or are incomplete, even illegible, due to the spelling of the professional who will fill it out (Ferreira et al., 2021; Barros et al., 2014).

In addition to the service forms, PHC professionals need to fill out forms that aim to capture and record data. Some examples of these are checklists for the beginning of the shift, control forms and replacement of backpacks, materials and medications, vehicle checklist, among others (São Paulo City Hall, 2024). These are also usually filled physically, which takes time and makes it difficult to organize and package. In this sense, it is important to emphasize that, as much as they are usual activities of rescuers, the

Revista ARACÊ
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completion of these checklists and ideas to simplify and automate this process are not highlighted, and few works portray this.

Given the above, it has been observed that written forms have been replaced by electronic records. Public health in Brazil has transformed, with the use of new technologies that improve the quality of care (Almeida, 2023). Manual records have limitations, such as difficulty in storing papers and understanding the handwriting of professionals. Thus, the use of technologies in the health area enables better organization, storage, systematization, practicality, speed, and legibility of information (Reinaldo et al., 2021).

In this sense, the use of mobile applications (apps) has been highlighted in this process of computerization of health. They have assisted professionals in consultations, monitoring, automation, and data storage (Silva et al., 2021). In this way, it is possible to observe that the health area is adhering to numerous technologies that help in the collection, archiving and processing of data, which facilitates and speeds up the service, and the control of important information.

Given this, taking into account that Prehospital Care professionals have difficulties and limitations in filling out the care forms, this study aims to create and validate an application, in the form of android and IOS, to promote the transformation of physical care forms, as well as administrative checklists, to the digital form, promoting greater precision and agility in this process.

METHODOLOGY

Applied research, production study and cross-sectional technological evaluation with a descriptive design, quantitative approach of the analytical type, with correlation between variables. The development and validation of the application was carried out in four stages.

Step I:

A bibliographic review was carried out using the prisma tool, in the databases, Virtual Health Library, Cochrane and Pubmed, using the descriptors: mobile applications, SAMU, electronic health record and pre-hospital care and a survey of Software on the IOS and Android platforms to compare the central idea of the software developed in this research with applications already existing on the platforms.

Step II:

Revista ARACÊ
ISSN: 2358-2472

The construction of the content of the application was carried out through the bibliographic survey carried out in the first phase, in addition to the definition of the layout, organization of the screens and their functionalities. The structuring of each screen of the application followed the objective of the project, transforming the PHC service forms and checklists from physical form (paper) to digital form, using an application that will be in android and IOS form, promoting greater precision and agility in filling. The application was divided into 03 tabs. On the home tab you will find the patient's preliminary data records and their location. In the checklist tab, there are fields for filling in the data related to the materials used by the following PHC professionals: doctor, nurse, nursing technician and first aid driver. In the service tab, there are fields for filling in the data related to the staff and procedures dispensed with the occurrence.

Step III:

It consists of the validation of the application that occurred with two different groups: health professionals and computer professionals. The computer professionals were invited according to the following criteria: preferably having at least two years of experience in the area. The choice of health professionals had the following inclusion criteria: professionals who have worked as interventionists for at least two years, (doctor, nurse, nursing technician and first aid driver) in the SAMU of Marabá Pará, totaling fifteen people invited. Professionals who were on leave or vacation were excluded. The evaluations took place between September and December 2023. Thus, at the end of the research collection period, 30 participations were obtained, 15 of which were computer professionals, and 15 health professionals who work in pre-hospital care.

The evaluators received guidance and demonstration on the functionalities and handling of the software so that they could evaluate the application according to some criteria, namely: Adequacy, operability, clarity of information, availability, interface, installation, general functionality, convenience, accessibility and practicality. The judges were granted the necessary time, according to the needs of each one of them, for the evaluation to occur without interference and complications.

Step IV:

In the fourth and final phase of the application, validation was carried out using a printed questionnaire using the System Usability Scale (SUS), based on the Likert scale in

Revista ARACÊ
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four levels of agreement (Strongly Agree, Partially Agree, Partially Disagree, Strongly Disagree). The questionnaire contained the ten items explained in the third phase, each of these items with the alternatives of agreement and an open question so that the judges could contribute with suggestions and improvements to the application.

RESULTS

This study had the participation of 30 judges, and 50% of this sample was represented by professionals in the field of computing, totaling 15 people. The other half was composed of health professionals working in pre-hospital care in the municipality of Marabá-Pará, of which eight were physicians, six nurses and one nursing technician. Regarding the length of professional experience, all of them had a time greater than or equal to 2 years, and most of the evaluators (60%) had a period of 03 to 04 years of professional practice (Table 1).

Table 1 – Training profile of the evaluators

Profile of the judges	Frequency	%
Training		
Computer Professional	15	50,0%
Medicine	8	26,7%
Nursing	6	20,0%
Nursing Technician	1	3,3%
Length of professional experience (years)		
01 to 02	1	3,3%
03 to 04	18	60,0%
05 to 06	7	23,3%
> = 07	4	13,3%

Source: Authors

For the evaluation of the application, the participants answered the statements about the program, which five were positive and five negative, totaling the ten items proposed for the analysis. In this sense, a score was assigned to each statement according to the level of agreement of the judges, by the System Usability Scale (SUS), which is based on the Likert scale, widely used in this validation profile.

Thus, about the positive assertions, the most scored, with 100% approval from the evaluators, was the one that states the following: "I think I would like to use this system frequently". Soon after, the statement regarding the ease of the system was the second in terms of approval (98%). The other favorable items had the same number of points (145),

Revista ARACÊ
ISSN: 2358-2472

representing 96.7% of validation by the judges. Table 2 shows the score and approval rate of each statement.

Table 2 – Score and approval rate of positive statements

App Review: Positive Affirmatives	Punctuation	Approval
I think I would like to use this system often.	150	100,0%
I found the system easy to use.	147	98,0%
I think the various functions of the system are very well integrated.	145	96,7%
I imagine people will learn how to use this system quickly.	145	96,7%
I felt confident using the system.	145	96,7%
Overall Assessment of Positive Factors	**732**	**97,6%**

Source: Authors

As for the negative items of the evaluation, the one that scored the most was the one regarding the need to have a person to help use the system, with 35 points. The statement that says "I think the system has a lot of inconsistency", was the one that obtained the lowest approval rate, with 20.7%. Table 3 presents these relationships and the data of the other negative statements.

Table 3 – Score and approval rate of negative statements

Product rating: Negative Statements	Punctuation	Approval
I think I would need help from a person with technical knowledge to use the system.	35	23,3%
I had to learn a lot of new things before I could use the system.	34	22,7%
I find the system unnecessarily complex.	33	22,0%
I found the system complicated to use.	32	21,3%
I think the system has a lot of inconsistency.	31	20,7%
Overall Assessment of Negative Factors	**165**	**22,0%**

Source: Authors

To develop a statistical opinion on the reliability of the results, the total score of positive and negative factors was used, using Cronbach's alpha index. The positive items had 732 total points and an approval rate of 97.6%, while the negative items had an overall score of 165, with 22% approval. Thus, the general evaluation had 1317 points, an approval of 87.8%, corresponding to the general Cronbach's coefficient of 0.827, as shown

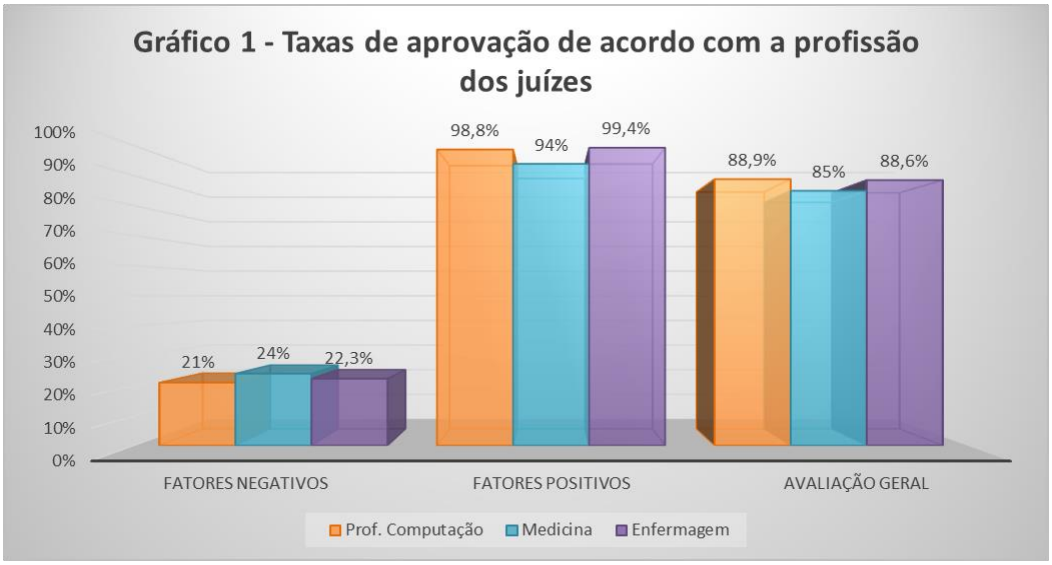
Revista ARACÊ
ISSN: 2358-2472

in table 4. Graph 1 shows the overall evaluation rate and the negative and positive components, according to the judges' profession.

Table 4 – Evaluation of negative and positive factors with the Cronbach index

App Evaluation	Punctuation	Approval	Cronbach
Negative Factors	165	22,0%	0,852
Positive factors	732	97,6%	0,802
Overall Rating	**1317**	**87,8%**	**0,827**

Source: Authors



Source: Authors

DISCUSSION

This work presented a mobile application for electronic registration of pre-hospital care and sought to demonstrate the validation of the software by judges in the computational area and PHC, based on the content acquired, through a literature review on applications aimed at improving and agility in PHC (Almeida, 2023; Reinaldo et al., 2021).

The choice of judges took into account the area of expertise, including professionals in the area of computing and health workers working in PHC services. In addition, the time in the profession of the evaluators was also considered, aiming to obtain the evaluation of people with considerable clinical experience. Thus, like the project by Augusto et al., 2021, this study sought to evaluate professionals who know software and those who work in PHC, aiming at a critical analysis of the functionality, usability, and practicality of the program.

In addition, the questionnaire involved questions that were able to assess the ease of learning and memorization when manipulating the application, its efficiency, the

Revista ARACÊ
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presence of possible errors, and the judges' satisfaction with the software (Forçan, et al., 2021). This shows that the evaluation took into account a multidimensional view so that the mobile application was rigorously analyzed and then validated.

It is important to mention that the assertion that had the highest approval rate (100%) concerns the satisfaction of users when using the application, which shows that all judges were satisfied with the program. The criterion that had the lowest number of points represented whether there were errors in the software, indicating that the developed program advocates minimization of errors.

In addition, to generate greater reliability and relevance, Cronbach's Alpha Test was also performed, which evaluates the questionnaire used in the research and infers whether the instrument was able to evaluate and validate the application (Matthiensen, 2010). This test ranges from 0 to 1, the coefficient of this research was 0.827, revealing a high reliability index, which proves that the questionnaire applied proved to be useful for the validation of the software.

In this sense, the evaluation of the application showed that the professionals who used the program consider it adequate, efficient, easy to use and satisfactory, which contributes to the idea of replacing the physical completion of the pre-hospital care form with the mobile application.

Thus, the application is a technological innovation in health, with a view to the functionality of recording the pre-hospital care form, promoting an automated filling of data, to speed up this process and reduce the number of fields filled incompletely or erroneously (Ferreira et al., 2021).

Other studies such as Augusto et al. 2021 and Bernadi et al. 2016 have also created applications with similar functionality, however this is the first developed in the southeast region of Pará, which will help to contribute to improving pre-hospital care in this center. In addition, this software also has the computerization of the inventory control of the inputs of the PHC service and the checklists of the professionals, which represents a novelty, given the scarcity of applications with this utility.

It should also be noted that the creation of this program contributes to the process of computerization in the health area. The insertion of technologies in the organization and description of care has been observed, which generates improvements in the efficiency of the registration of occurrences (Almeida, 2023). In this context, it is understood that the addition of information technology is essential for the operationalization of advanced

Revista ARACÊ
ISSN: 2358-2472

support units, since resorting to software services facilitates and promotes optimization of care (Fernandes, 2017). In this sense, there are different information systems in municipalities and states, but there is still a need for technologies that can contribute with more specificity and detail, especially in regions far from large centers, as is the case of the state of Pará.

Finally, digital medical records and telemedicine care services are growing components of pre-hospital care, currently considered essential for several health professionals (Colla et al., 2020). This is evidenced by the rise of new technologies, the development of artificial intelligence software, and innovations in automation and data storage. These innovations, such as the development of this electronic application for automating pre-hospital care records, contribute to a wide spectrum of possibilities that can lead health professionals to transform their knowledge into practical purposes with greater efficiency and agility (Fernandes, 2017; Colla et al., 2020).

CONCLUSION

The developed application proved to be an efficient and easy-to-use tool to automate pre-hospital care forms. This was evidenced by the evaluation of the expert judges, who were satisfied with the program. This software is a novelty in the health area, because in addition to presenting the service form, it brings with it the computerization of the checklists that PHC professionals need to fill out at each shift. It is believed that with this work it will be possible to promote greater agility and efficiency in the care provided by PHC teams, in addition to being an instrument that contributes to the computerization of the health area, which has been increasingly assertive in capturing and interpreting SUS indicators.

Revista ARACÊ
ISSN: 2358-2472

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