

Development of mobile applications for health education in stroke

RESUMO | Objetivo: Desenvolver dois aplicativos móveis para educação em saúde acerca do acidente vascular cerebral, destinados a profissionais da saúde e cuidadores ou público em geral. Método: Trata-se de um estudo metodológico para desenvolvimento de dois aplicativos para dispositivos móveis. O delineamento do projeto e processo de construção deu-se no período de agosto de 2020 a novembro de 2021. O referencial metodológico adotado para a construção dos aplicativos foi o de Cook & Dupras, constituído por sete etapas. Resultados: O primeiro aplicativo, destinado a cuidadores e ao público em geral contém os temas: "O que é acidente vascular cerebral?"; "Grupo de risco"; "Identificando o acidente vascular cerebral"; "Tempo é cérebro"; e "Serviços de saúde". O segundo aplicativo, para profissionais de saúde, contém os temas: "Avaliação do acidente vascular cerebral"; "Conduas"; "Tratamento do acidente vascular cerebral isquêmico"; "Monitoramento do acidente vascular cerebral hemorrágico"; e "Monitoramento Geral". Conclusão: O desenvolvimento dos aplicativos propiciou o compartilhamento de informações relacionadas ao acidente vascular cerebral contribuindo para orientar e agilizar as tomadas de decisões.

Descritores: Acidente Vascular Cerebral; Aplicativos Móveis; Educação em Saúde.

ABSTRACT | Objective: To develop two mobile applications for health education about stroke, aimed at health professionals and caregivers or the general public. Method: This is a methodological study for the development of two applications for mobile devices. The design of the project and construction process was from August 2020 to November 2021. The methodological framework adopted for the construction of the applications was that of Cook & Dupras, consisting of seven steps. Results: The first application, aimed at caregivers and the general public, contains the themes: "What is a stroke?"; "Group of risk"; "Identifying stroke"; "Time is brain"; and "Health services". The second application, for health professionals, contains the themes: "Assessment of stroke"; "Actions"; "Treatment of ischemic stroke"; "Monitoring of hemorrhagic stroke"; and "General Monitoring". Conclusion: The development of applications provided the sharing of information related to stroke, helping to guide and speed up decision making.

Keywords: Stroke; Mobile Applications; Health Education.

RESUMEN | Objetivo: Desarrollar dos aplicaciones móviles de educación sanitaria sobre ictus, dirigidas a profesionales sanitarios y cuidadores o público en general. Método: Se trata de un estudio metodológico para el desarrollo de dos aplicaciones para dispositivos móviles. El diseño del proyecto y el proceso de construcción se llevó a cabo de agosto de 2020 a noviembre de 2021. El marco metodológico adoptado para la construcción de las aplicaciones fue el de Cook & Dupras, compuesto por siete etapas. Resultados: La primera aplicación, dirigida a cuidadores y público en general, contiene los temas: "¿Qué es un ictus?"; "Grupo de riesgo"; "Identificación de ictus"; "El tiempo es cerebro"; y "Servicios de salud". La segunda aplicación, para profesionales de la salud, contiene los temas: "Evaluación del ictus"; "Conductos"; "Tratamiento del ictus isquémico"; "Seguimiento del ictus hemorrágico"; y "Monitorio General". Conclusión: El desarrollo de aplicaciones permitió compartir información relacionada con el ictus, ayudando a orientar y agilizar la toma de decisiones.

Palabras claves: Accidente cerebrovascular; Aplicaciones móviles; Educación para la salud.

Angelo Antônio Paulino Martins Zanetti

Nurse. Paulista State University
ORCID: 0000-0002-9442-8977

Marcelli Cristine Vocci

PhD in Nursing. Paulista State University
ORCID: 0000-0003-0029-139X

Clara Fumes Arruda

Specialist in Health Information Technologies.
Paulista State University
ORCID: 0000-0003-4884-2410

Cassiana Mendes Bertonecello Fontes

Professor Doctor. Paulista State University
ORCID: 0000-0002-6579-8637

Ana Silvia Sartori Barraviera Seabra Ferreira

Coordinator of the Center for Distance Education and Health Information Technologies.
Paulista State University
ORCID: 0000-0002-2035-7731

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INTRODUCTION

In Brazil, the use of information and communication technologies in health has increased in recent decades. The world advance is established differently due to the different levels of education, political, social development and knowledge of societies, with access to information considered fundamental to subsidize and stimulate the country's planning and development in public policies. Over time, information technologies have become the main form of communication and exchange of information between health services, government and the po-



pulation, using mobile applications, social networks and the web.^{1,2}

The development of applications for mobile devices are alternatives that can collaborate with health professionals to promote quality care, and their use by caregivers or the general public, it can speed up the identification of health-related changes that cooperate with the minimization of deleterious effects and speed up the referral to emergency services, such as people suffering from a cerebrovascular accident (CVA).^{3,4}

Stroke is characterized by sudden-onset focal neurological impairment of vascular origin, lasting for 24 hours or more. Symptoms may be numbness and/or weakness in the face, legs or arms; impairment of speech, vision, walking; dizziness and loss of balance.⁵ There are risk factors for the development of stroke, non-modifiable ones such as age, family history of stroke and previous history of transient ischemic attack. The modifiable ones are: systemic arterial hypertension, smoking, diabetes mellitus and dyslipidemia.⁵

CVA is divided into two types, the ischemic which is caused by the obstruction of a blood vessel, causing the blockage of blood flow to a specific location in the brain, and hemorrhagic, which is described as the rupture of a vessel, causing extravasation of blood in the subarachnoid and intraparenchymal region.⁵ For ischemic stroke (IS), the possibility of treatment through intravenous thrombolysis is considered, for that it is necessary to meet some criteria, where the main one is confirmation of ischemic stroke, then it is essential to start the infusion of the recombinant tissue plasminogen activator (rtPA) within ^{4,5} hours after the identification of symptoms. This moment is known as the therapeutic window, so it is essential to note the time of onset of symptoms, that is, the time at which the thrombolytic infusion can be performed, there are other inclusion criteria, such as age over 18 years and cranial computed tomography or magnetic resonance ima-

ging without evidence of hemorrhage.⁶ Thus, the effectiveness of treatment depends on how quickly health professionals, and the general population, identify the symptoms of stroke and proceed with



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referral to a referral center.⁶

In view of the above, the purpose of this study was to develop two applications for mobile devices aimed at health education about stroke, the first being for

caregivers or the general public, and the second for nurses and health professionals.

METHOD

This is a methodological study of the development of two mobile applications for stroke health education. The design of the project and construction process took place from August 2020 to November 2021. As criteria for the construction of the applications, a developer website was used, with the help of a professional specialist in Health Information Technologies, and the textual content present in the applications was taken from guidelines, manuals and articles on the subject 9, as well as specialist organizations in the field.^{10,11}

The methodological framework adopted for the construction of the applications was that of Cook & Dupras¹², consisting of seven steps described below:

1st - Analysis of needs and development of goals and objectives: identification of the problem, assessment of the needs of the environment and individuals.

2nd - Determination of need and development of goals and objectives: at this stage, the need to build mobile applications was identified according to the bibliographic survey of the theme.

3rd - Evaluation of other pre-existing apps: a search was carried out on two mobile device platforms, where two applications on CVA were evaluated.

4th - Ensuring commitments from all stakeholders and identifying potential barriers to implementation: this stage comprises the importance of all individuals participating in the research being involved and committed to achieving the objectives and goals.

5th - Content development in close coordination with website design: development of content in line with the design of the application.

The contents related to the application intended for health professionals are

based on the following themes: rating scales; ducts; ischemic stroke treatment; monitoring of hemorrhagic stroke; general monitoring. And, the contents of the application aimed at the general public and caregivers were: what is a stroke?; Groups of risk; identifying the CVA; time is brain; and health services.

6th - App usage incentive planning: to make the application accessible and user-friendly, that is, easy access to its content, applications can be accessed via a link.

7th - App Rating: test usability of the application.

RESULTS

Two applications were developed, the first called "Informal Stroke Care", designed to reach caregivers and the general public, while the second application was called "Professional Stroke Care", structured to be used by health professionals.

Application "Informal stroke care"

Figure 1 represents the application's initial screen, objective and simple, with five tabs referring to thematic contents: "What is CVA?"; "Groups of risk"; "Identifying the CVA"; "Time is brain"; and "Health services". In the "References" icon, it is possible to view the scientific materials that supported the construction of the application.

In the first available tab, "What is CVA?", you will find the definition and the two main types of CVA occurrence, hemorrhagic and ischemic. The next available tab is "Risk groups", where you can find the main groups that can be affected by stroke, namely: diabetics, hypertensives, threat of previous stroke, cardiac, alcoholics, obese, sedentary and smokers.

In the next tab, "Identifying CVA", it is possible to check the main signs and symptoms of stroke, such as: speech alteration; change in coordination; change in vision; weakness or tingling in the arm, especially on one side of the body; and sudden headache. The SAMU mnemonic,

an acronym created to facilitate the identification of a stroke, is also available: letter S for Smile; the letter A for Embracing (Abraçar); the letter M asks the individual to sing a Song (in the original, Música). If the person presents any changes during this assessment, they should call the Mobile Emergency Care Service (SAMU-192) immediately, this includes the letter U, which means urgency.

The fourth tab is called "Time is brain", where you can learn about the importance of writing down the date and time when the first signs and symptoms started. This information is intended to investigate the possibility of administering the thrombolytic or another form of treatment.

In the "Health services" tab, there are the places in the health care network that provide care to patients with or suspected of having a stroke, such as: Emergency Care Unit (UPA); Emergency Room (PS); SAMU; Hospital and Basic Health Unit (UBS). In addition, this tab has the SAMU number, by clicking on the indicated location, it is possible to make a direct call to this service.

The sixth and last tab refers to the "References", constituted by the bibliographic list used to support the construction of the application.

The "Informal care at CVA" application is available through the link: https://app.vc/cuidado_informal_no_avc.

Application "Professional care in the CVA"

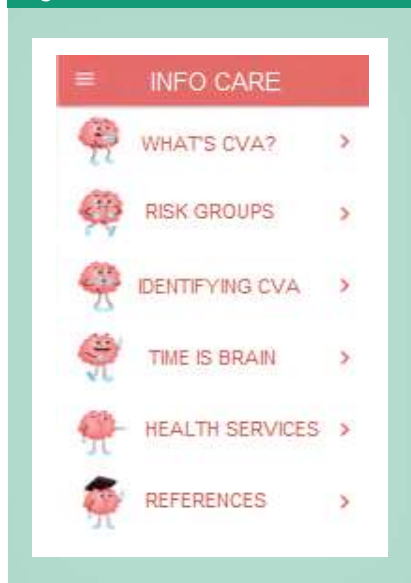
Figure 2 shows the initial screen of the application intended for health professionals, five thematic contents are arranged in the tabs:

"Evaluation scales"; "Conduits"; "Treatment of Ischemic CVA"; Monitoring of Hemorrhagic CVA; "General monitoring"; and "References".

The first tab is called "Assessment Scales", and has the three main scales (CINCINNATI; GLASGOW and NIH) used during the assessment of patients with suspected CVA. These scales can be

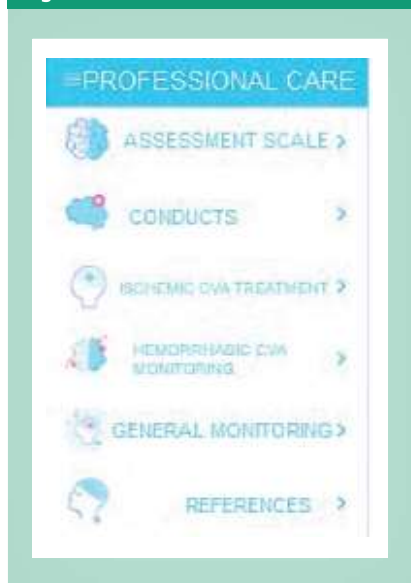
accessed and used in full by clicking on the respective link inserted in the application. In this same tab, a document produced by the Ministry of Health, called "Manual of routines for attention to the CVA" is available 8, with relevant infor-

Figure 1. Home screen overview.



Source: prepared by the authors, 2021.

Figure 2. Home screen overview.



Source: prepared by the authors, 2021.

mation about stroke.

The tab called "Conducts", has the description of the procedures that must be performed from the beginning of the signs and symptoms reported by the patient to the health team. In the next tab called "Ischemic CVA Treatment", it describes the importance of the time of 4 hours and 30 minutes in relation to the onset of signs and symptoms and future therapeutic measures such as intervention by thrombolytic treatments and mechanical thrombectomy, as well as the objective of these therapies. Time is a limiting factor that can lead to worse neurological sequelae, if not strictly considered.

Next, in the tab called "Monitoring of the Hemorrhagic CVA", the care to be provided to the patient who was affected by Hemorrhagic CVA is listed, such as: immediate transfer to the prepared unit; absolute bed rest; continuous cardiac monitoring along with blood pressure monitoring (systolic blood pressure should be maintained at 140-160mmHg); perform intubation if Glasgow less than 8; treat intracranial hypertension and, if necessary, surgical treatment. Despite these specific care, in the "General monitoring" tab there are care that must be provided to all patients, such as: Non-invasive cardiac monitoring; patient positioning; respiratory and oxygen saturation monitoring; body temperature control; food; hydration; and pressure control.

Regardless of where the nurse or user works, it is essential to identify signs and symptoms of stroke. For safe care, with agility and promptness, time is precious in the early or momentary identification of alterations presented by the affected person or at risk of a cerebral ischemic event. Thus, with the use of this application, the effects and damages can certainly be minimized and the therapy to be implemented will become efficient, in addition to accelerating referral to a referral center.

The "Professional care in CVA" application is available through the link https://app.vc/cuidado_profissional_no_avc.

DISCUSSION

Technological advances can bring numerous benefits to the health of the population, favoring the work of the professional or even privileging self-care and quality of life. With the increasing use of smartphones and the emergence of apps, a new term has gained space, mobile health (mHealth), medical and public health practices that rely on the help of mobile devices, such as cell phones and tablets. This growing expansion can be seen through the more than 3 billion health app downloads worldwide in 2015.^{13,14}

The use of technological tools in the field of health is on the rise, one of its many advantages being easy access and use, in addition to the possibility of reaching different segments of the population. Applications built for the health area can be directed to the general public, as well as to health professionals, such as doctors, nurses and physiotherapists with more specific knowledge and covering the individualities of each profession.¹⁶⁻¹⁷ This transformation into a new reality of care and service provided the use of smartphones for online consultation of protocols, guidelines and also to monitor the evolution of patients undergoing health care.¹⁵⁻¹⁷

Thus, the construction of applications such as assistance and care technologies can collaborate with agility in real-time care, in any place where the health professional is inserted, whether in primary, secondary or tertiary care, in an environment with internet access and using a cell phone, tablet or similar equipment. This can be demonstrated by the 8,005 applications in the medicine category found in Apple's App Store in its American version, a number close to that found in the Android system's virtual store.¹⁸

In this way, the construction of the application aimed at health professionals emerges as an excellent tool for use at work amid the rise of applications in the

respective area of activity. For healthcare professionals, these applications contribute to their work, as they allow them to move within the organization, allowing them to quickly and accurately consult scientifically reliable content, as well as remote monitoring, diagnostic support and decision-making support.¹⁹

Due to the advancement of applications in the health area, it is already possible to find studies that bring the construction of applications, such as the development of an app for the treatment of wounds with laser therapy, for elaboration, the Contextualized Instructional Design (DIC - Design Instrucional Contextualizado) methodology was used.¹⁸ A literature review study identified different methods for building applications, however, the most widespread is the Systematic Design of Instruction (SDI), developed by Walter Dick and Lou M. Carey.²⁰

Unlike those mentioned above, the present study used a methodological framework for structuring the applications, as well as using the results of qualitative research specifically with nurses who work with stroke and formal and informal caregivers of post-CVA patients at home. The evidence from these qualitative primary studies corroborated the elaboration of the tabs and their contents.

The applications were made available through links, and to access them it is necessary to click on them, wait for the application and its respective contents to load.

The dimension and influence of applications in modern life is notorious and reaches several areas that inspire changes in the format of work processes.²¹ There are numerous methodologies for building applications, but it is still a field that needs to be explored and that will in fact contribute significantly to science, health and technology.

Thus, the development of health applications is important due to the need to provide specific knowledge for the nursing care area in digital format and that can be quickly accessed, in addition

to the importance of knowledge by the general population about the signs and symptoms of CVA and how they can act in a situation of family confrontation, or in a public place.

CONCLUSION

It is concluded that the construction of applications favors the dissemination of content about the topic addressed,

taking into account the individualities of each target audience. The processes, creative and creation, were executed according to the schedule, and the content inserted brings the main information about the CVA in an objective way so that it is easy to understand.

The use of health education applications by formal and informal caregivers speeds up the identification of changes, cooperating with the minimization of de-

leterious effects of the affected people. And, for the nursing interface, it collaborates to promote quality care, as it allows the use of scientifically reliable content, supporting the diagnosis, and support for decision making.

Thus, it is considered that the construction of applications will contribute in bringing information quickly, free and easily accessible. 🐦

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