Construction of a mobile application as a strategy for medication adherence in the elderly population

Construção de aplicativo móvel como estratégia para adesão medicamentosa de idosos
Construcción de una aplicación móvil como estrategia para la adherencia farmacológica en ancianos

Larissa Pereira da Silva[1]
ORCID: 0000-0003-2945-8077
Francisco Ayslan Ferreira Torres[1]
ORCID: 0000-0002-1703-0025
Antonio José Silva dos Santos[1]
ORCID: 0000-0002-4972-0303
Luciano Gualberto Soares[1]
ORCID: 0000-0003-0349-3288
Adriana de Moraes Bezerra[1]
ORCID: 0000-0003-0929-4685
Maria Naiane Rolim Nascimento[1]
ORCID: 0000-0001-9115-1485

Abstract
Objective: To describe the process of developing an application as a strategy to promote medication adherence in the elderly population. **Methods:** Methodological research of technological production. The steps of data survey, database assembly and software development were followed. A narrative review of the literature on the theme was performed. **Results:** In order to develop the technological tool, a prototype of the application was initially made. The central objective was to create an application program to remember the medication schedule through sound warnings and on-screen information, focusing on the autonomy of the health-disease process of the elderly population, using an accessible language, with large and legible fonts, with specific colors for the background screen and Ooblets suitable for the understanding of the target audience. **Conclusion:** The application contributes to medication adherence by the elderly patients, in addition to helping caregivers regarding the correct use, appropriate time, and correct dosage. The proposed technology provides the co-responsibility of the elderly citizens in their health-disease process and adherence to the prescribed therapy.

Descriptors: Technology; Health of the Elderly; Polypharmacy; Nursing Care.

[1]Universidade Regional do Cariri (URCA). Iguatu. Ceará.

Corresponding author:
Francisco Ayslan Ferreira Torres
E-mail: ayslantorresj1@gmail.com

Whats is already known on this?
Health technologies can improve the health condition of the elderly, assist in the use of medication and facilitate communication, interaction and autonomy.

What this study adds?
A technology suited to the real needs of the elderly, such as font size, colors and alarms contribute more significantly to medication adherence.

Resumo

Objetivo: *Descrever o processo de desenvolvimento de um aplicativo como estratégia para promover a adesão medicamentosa de idosos.* ***Métodos:*** *Pesquisa metodológica de produção tecnológica. Foram seguidas as etapas de levantamento de dados, montagem de banco de dados e desenvolvimento do software. Realizou-se uma revisão narrativa da literatura sobre o tema.* ***Resultados:*** *Para o desenvolvimento da ferramenta tecnológica realizou-se inicialmente um protótipo do aplicativo. O objetivo central foi criar um programa de aplicação para lembrar o horário de medicamentos através de avisos sonoros e informações na tela, com foco na autonomia do processo saúde-doença do público idoso, utilizando-se de uma linguagem acessível, com fontes grandes e legíveis, com cores específicas para a tela de fundo e os Ooblets adequados para o entendimento do público-alvo.* ***Conclusão:*** *O aplicativo contribui na adesão medicamentosa por parte dos idosos, além de auxiliar os cuidadores sobre o uso correto, horário adequado e dosagem correta. A tecnologia proposta proporciona a corresponsabilização dos longevos no seu processo saúde-doença e adesão à terapêutica prescrita.*

Descritores: *Tecnologia; Saúde do Idoso; Polimedicação; Cuidados de Enfermagem.*

Resumén

Objetivo: *Describir el proceso de desarrollo de una aplicación como estrategia para promover la adherencia farmacológica en ancianos.* ***Métodos:*** *Investigación metodológica de producción tecnológica. Se siguieron las etapas de levantamiento de datos, montaje de banco de datos y desarrollo del software. Se realizó una revisión narrativa de la literatura sobre el tema.* ***Resultados:*** *Para el desarrollo de la herramienta tecnológica se realizó inicialmente un prototipo de la aplicación. El objetivo central era crear un programa de aplicación para recordar el horario de medicación mediante avisos sonoros e información en pantalla, centrándose en la autonomía del proceso salud-enfermedad del público anciano, utilizando un lenguaje accesible, con fuentes grandes y legibles, con colores específicos para la pantalla de fondo y Ooblets adecuados para la comprensión del público objetivo.* ***Conclusión:*** *La aplicación contribuye a la administración de medicamentos por parte de los ancianos, además de ayudar a los cuidadores sobre el uso correcto, el horario adecuado y la dosis correcta. La tecnología propuesta proporciona la co-responsabilización de los ancianos en su proceso de salud-enfermedad y la adherencia a la terapia prescrita.*

Descritores: *Tecnología; Salud del Anciano; Polifarmacia; Atención de Enfermería.*

INTRODUCTION

The human aging process is a natural, continuous, progressive, and irreversible process that occurs during life, characterized by organic, psychological and morphofunctional alterations and influenced by cultural, social, and economic factors that modify common aspects in healthy individuals, leading them to new perceptions of how to face life.[1] This process is still considered a worldwide phenomenon, which demands actions that provide well-being and reduce injuries and hospitalizations from preventable causes.[2]

In Brazil, the elderly population has been growing in recent years due to the increase in life expectancy. This growth occurs as a result of advances in science and technology, greater socioeconomic development, urbanization and improvement in the health care provided to the population. With the increase in longevity, an increase in the incidence and prevalence of chronic non-communicable diseases (NCDs) has been observed, leading to a worsening in people's quality of life and causing an increase in the demand for health services.[3]

NCDs, especially cardiovascular diseases and cancers, are currently the leading causes of death in the country.[4] Such diseases and their risk factors are major causes of morbidity, mortality, and disability and represent both a public health challenge and a serious threat to economic and social development. In the Region of the Americas, NCDs cause approximately 5.8 million deaths per year, representing 81% of all deaths in the region. Of the total deaths caused by these diseases, 36.4% are premature deaths, occurring in people under the age of 70.[5]

These diseases are the main causes of global morbidity and mortality. Currently, in Brazil, a predominance of such diseases has been observed, the most common in the elderly population being arterial hypertension (AH) and diabetes mellitus (DM),[6] leading to a financial impact for individuals, families, the community and for health systems, mainly due to premature deaths, disabilities and treatments.[7] Moreover, these diseases occurring together also contribute to the practice of polypharmacy, which is defined as the concomitant use of five or more medications.[8]

The use of multiple medications is common in clinical practice, especially in the elderly population, due to increased comorbidities, greater availability of drugs, simultaneous prescribing by several physicians without therapeutic reconciliation and recommendations for drug association for various clinical conditions such as AH and DM.[9]

Errors in the self-administration of medications by the elderly patients may occur due to the complexity of the therapeutic schemes prescribed, reduced cognitive functions, changes in the elderly

person's vision and the low level of education, which can compromise the reading and understanding of the drug treatment.[10]

In order to design specific and effective interventions, it is essential to identify the individual barriers that affect drug treatment adherence in the elderly population. Cognitive deficits may contribute to forgetfulness in medication use, being one of the main reasons for inadequate adherence to antihypertensive therapy[11]. Such behavior represents an important predictor of negative clinical outcomes, such as increased morbidity and mortality, hospitalizations and costs.

The association of multiple medications is responsible for about 40% of hospital admissions of the elderly citizens. Therefore, assisting in the correct use of medications reduces the risks of polypharmacy, improves adherence to treatment and increases safety, reinforcing the importance of correctly following the prescribed therapy for the preservation of autonomy and functional independence in the aging process.[12] Therefore, there are several strategies that professionals can use to help medication adherence, such as the use of health technologies.

Health technologies are important tools that can help promote the health of the elderly person, mainly by providing knowledge to prevent and reduce diseases, making people active in the process of change and encouraging autonomy in the care of his/her own health. Therefore, the use of such technologies enhances care orientation and contributes to the construction of knowledge, in the empowerment of the elderly population,[11] towards the development of individual responsibility and disease prevention.[13]

Moreover, health technologies can improve the health condition and self-esteem of the elderly person, assist in the use of medications and facilitate communication, interaction and insertion of the elderly person into society.[14] Thus, making use of these tools can facilitate care strategies and enhance the interaction between the health professional and the elderly patient.

The idea of this research is justified by the Agenda of Research Priorities of the Brazilian Ministry of Health[15] in its thematic axis – Development of Technologies and Innovation in Health. This research is also justified by studies[16-8-10] that show the need for better adherence to treatment of diseases by the elderly citizens, emphasizing those who are followed in programs for hypertension and diabetes, because they often use several medications, which has a direct impact on the lack of adherence. Accordingly, it is imperative to affirm the need for the development of strategies that provide improvements in the process of (self)care for the elderly patients who use medications, with respect to the alarm, nomenclature, dosage, schedule and time of use of the drugs.

In light of the foregoing, this study aimed to describe the process of developing an application as a strategy to promote medication adherence in the elderly population.

METHODS

This is a methodological research of technology production, developed in the year 2019. Methodological research is based on a systematic investigation that uses orderly methods to answer questions and solve problems. It consists of constructing and developing software and other technological strategies that can be implemented in both educational and care settings.[16]

The steps that made up this research were: bibliographic survey, database assembly and software development,[17] being based on the third principle of Parse Theory, which highlights the autonomy of the elderly client in his health-disease process.

In the first step, the bibliographical survey, a search was conducted in articles, dissertations, theses and books to assess the real need or demand for strategies that address the theme, through the question that guided the study: *What is being published in the national and international literature on the use of educational technologies by the elderly citizens with chronic diseases?*

In order to respond to this concern, the *Descritores em Ciências da Saúde* (DeCS) appropriate for the search were identified and selected: "Elderly", "Educational Technology" and "Chronic Disease", which were crossed with the Boolean operator *AND* and the Medical Subject Headings (MeSH) "Aged", "Educational Technology" and "Chronic Diseases". It should be noted that the search for studies was held in pairs to provide better quality to the review carried out.

The research was carried out in the Scientific Electronic Library Online (SciELO), Latin American and Caribbean Health Sciences Literature (LILACS) and Medical Literature Analysis and Retrieval System Online (MEDLINE) databases, through the *Biblioteca Virtual em Saúde* (BVS). Regarding the search for articles, the inclusion criteria were: studies available in full, in English, Portuguese and Spanish, published

in the last five years. The time frame of the last five years was used to filter the most updated studies on the theme. The exclusion criteria were repeated articles, and those that did not answer the guiding question.

A validated instrument[18] was used to construct the synthesis of the selected articles. This approach, besides allowing the succinct organization of data, facilitates the comparison of studies on specific topics such as problems, variables and sample characteristics.[19] Concomitant to this, a search was carried out to find out which medications are most used by this clientele within the Brazilian Unified Health System (SUS, as per its Portuguese acronym) for insertion into the developed application.

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) instrument was used to report the process of identification, screening, eligibility and inclusion of the studies as illustrated in Figure 1, totaling 11 references, which were analyzed in their entirety.

Figure 1. Selection process of the review studies according to PRISMA flowchart. Iguatu, Ceará, Brazil, 2019.
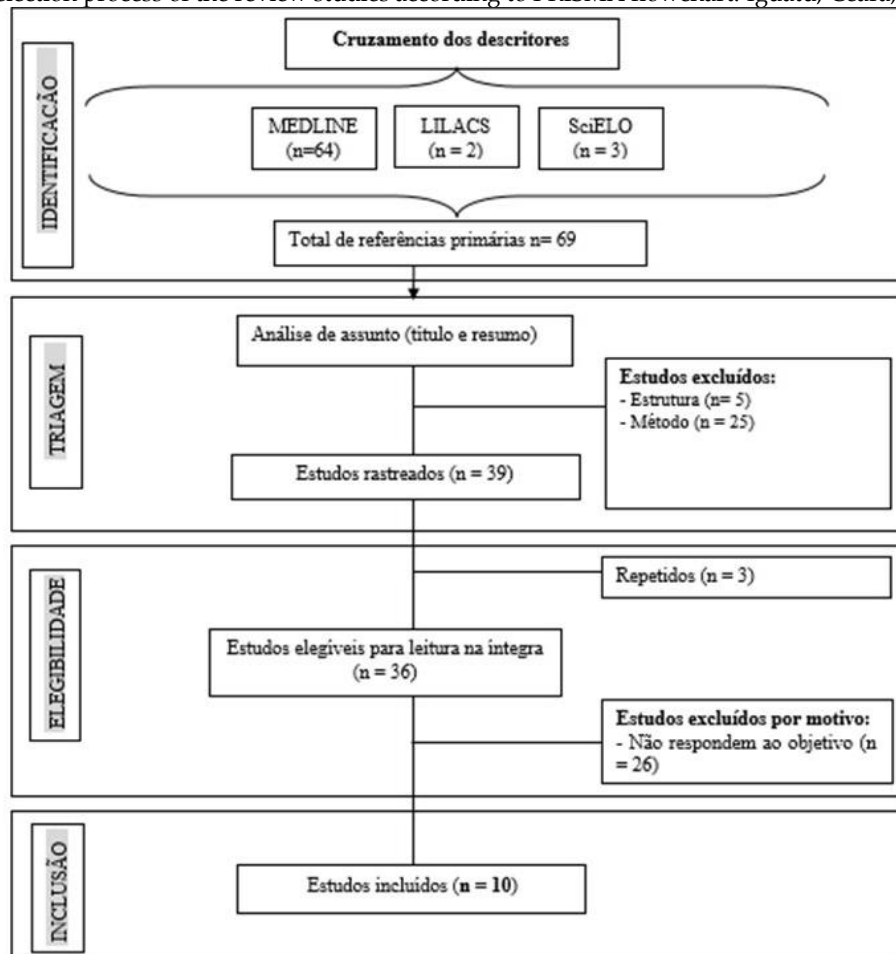
Source: Prepared by the authors (2019).

Subsequently, in order to conduct the assessment process of the selected studies, the evidence criteria were taken into consideration based on the items of the Critical Appraisal Skills Programme (CASP)[20] instrument, which classifies the articles in categories A, with good methodological quality and reduced bias, and B, studies with satisfactory methodological quality, but with increased risk of bias.

In the second step, referring to the assembly of the databases, the minimum possible number of Ooblets were developed to facilitate the use of the application by the elderly. Thus, three Ooblets were developed and each one had several modules to help the elderly person, namely: "Registration", "Create Alarm", and "Exit".

After registering, the user will create an alarm through the "Create Alarm" button, later, he will be able to consult it through the "Alarm List" button and then exit the application through the "Exit" button. The medications will be registered in the application containing the type and name of the medication, dosage and number of times a day.

It is noteworthy that the alarm sound was planned to be played at the same time as information about the medication is displayed on the screen in text and image form. The information and interface components are presented to the elderly patients in a way that they can perceive and understand them as easily as possible.

Finally, the third step consisted in the development of the software, which was named *Hora Certa* (Right Time), being necessary to follow the software development phases proposed in the scientific literature[19], namely: Communication: whose purpose was to understand the objectives and needs of the application, and the requirements to be offered by the software; Planning: a "map" was created that guided the team throughout the project and guided the work of creating the technology, describing the technical tasks to be conducted, the necessary resources, the resulting products to be produced and an activity schedule; Modeling: a draft was created so that it was possible to have an idea of the whole and how the integral parts fit together, and Construction phase: phase in which it was possible to verify the problems in the execution and functioning of the application.

In order to carry out the application development, the Android system was chosen, as it is a widely disseminated system as a result of being compatible with most cell phones and tablets, thus making it an accessible application. In this way, for the user to have access to this application, he will only need to download it; and, after being saved in the memory of the cell phone or tablet, the application will be available for offline use.

Since this is a survey that uses public domain data without human participation, the waiver of ethical approval is justified[21].

RESULTS

According to the results obtained by searching the databases, and after reading the selected studies, it was possible to notice that the studies focus on the adherence and acceptability of apps by the elderly citizens and their families, thus offering a better quality of life and autonomy to this clientele. Chart 1 presents a summary of the main characteristics of the studies included in the literature survey.

Chart 2. Main characteristics of the studies included in the review. Iguatu, Ceará, Brazil, 2019.

Authorship	Titles	Objectives	Type of Technology	Main Features
Adu MD, Malabu UH, Malau-Aduli AEO, Malau-Aduli BS. (2018)[22]	Users' preferences and design recommendations to promote engagements with mobile apps for diabetes self-management: Multi-national perspectives.	To examine app use and resource preferences among people with Diabetes Mellitus and explore their recommendations for future inclusions to promote engagement with diabetes apps.	Mobile Application	The study highlighted patients' perspectives on essential components for inclusion in diabetes apps to promote engagement, including information on healthy eating, blood glucose and physical activity monitoring.
Ormel HL, van der Schoot GGF, Westerink NL, Sluiter WJ, Gietema JA, Walenkamp AME. (2018)[23]	Self-monitoring physical activity with a smartphone application in cancer patients: a randomized feasibility study (SMART-trial)	To examine the use of the RunKeeper for blood pressure (BP) elevation in cancer patients and to evaluate patients' opinions about the use of the RunKeeper in a 12-week program.	Mobile Application	Self-monitoring of BP with RunKeeper is safe and feasible in cancer patients. More research is needed to investigate whether the use of the RunKeeper app improves and sustains BP in cancer patients and survivors.
Hoffman V, Söderström L, Samuelsson E. (2017)[24]	Self-management of stress urinary incontinence via a mobile app: two-year follow-up of a randomized controlled trial	To investigate the long-term effects of using a mobile app to treat stress urinary incontinence, with a	Mobile Application	Long-term effects of using a mobile app to treat stress urinary incontinence, with a focus on pelvic floor muscle training.

		focus on pelvic floor muscle training.		
Sun L, Wang Y, Greene B, Xiao Q, Jiao C, Ji M, Wu Y. (2017)[25]	Facilitators and barriers to using physical activity smartphone apps among Chinese patients with chronic diseases	Examine the willingness of Chinese patients with chronic diseases to use a physical activity app.	Mobile Application	The results indicate considerable smartphone ownership among Chinese patients with chronic diseases; in addition, more than half of the participants reported that they would use a physical activity app designed for them.
Höchsmann C, Walz SP, Schäfer J, Holopainen J, Hanssen H, Schmidt-Trucksäss A. (2017)[26]	Mobile Exergaming for Health—Effects of a serious game application for smartphones on physical activity and exercise adherence in type 2 diabetes mellitus—study protocol for a randomized controlled trial	Evaluate whether a state-of-the-art exergames application, developed by sports scientists and professional game developers in close collaboration over 24 months is superior to traditional patient guidance at home.	Mobile Application	Mobile phone-based game application is an option to sufficiently address the problem of program adherence in health promotion interventions and provide information relevant to the general transferability of this application for use in other chronic diseases.
Waki K, Fujita H, Uchimura Y, Omae K, Aramaki E, Kato S, Lee H, Kobayashi H, Kadowaki T, Ohe K. (2014)[27]	DialBetics: Smartphone-Based Self-Management for Type 2 Diabetes Patients on Insulin Injections	Evaluate the safety and usability of DialBetics for patients using insulin.	Mobile Application	Information communication technology – including smartphone apps – is recognized as a promising means of enabling timely intervention to support self-management of patients with diabetes.
Kim JY, Wineinger NE, Steinhubl SR[28]	The Influence of Wireless Self-Monitoring Program on the Relationship Between Patient Activation and Health Behaviors, Medication Adherence, and Blood Pressure Levels in Hypertensive Patients: A Substudy of a Randomized Controlled Trial	To study the influence of the wireless self-monitoring program and patient activation measures on health behaviors, medication adherence and blood pressure levels, as well as blood pressure control in hypertensive patients.	Wireless Self-Monitoring Program	A blood pressure monitoring device connected to a cell phone, reminders for self-monitoring, a Web-based disease management program and a mobile application for monitoring and health education.
Ong SW, Jassal SV, Miller JA, Porter EC, Cafazzo JA, Seto E, Thorpe KE, Logan AG. (2016)[29]	Integrating a Smartphone–Based Self–Management System into Usual Care of Advanced CKD	To evaluate the acceptability of a smartphone app in managing patients with advanced Chronic Kidney Disease (CKD) and examine changes in various clinical parameters.	Mobile Application	Smartphone-based system to increase self-care for CKD patients and integrate its use into usual care.
Sedlar, U., Volk, M., Bešter, J. (2016)[30]	Usability Pitfalls of Diabetes mHealth Apps for the Elderly	To evaluate the use of mobile apps by elderly people for	Mobile Application	It has been shown that, with a limited number of modifications, an existing application can be

		diabetes self-management.		significantly improved to better serve elderly users.
Karhula T, Vuorinen AL, Rääpysjärvi K, Pakanen M, Itkonen P, Tepponen M, Junno UM, Jokinen T, van Gils M, Lähteenmäki J, Kohtamäki K, Saranummi N. (2015)[31]	Telemonitoring and Mobile Phone-Based Health Coaching Among Finnish Diabetic and Heart Disease Patients: Randomized Controlled Trial	To evaluate the benefits of a structured mobile phone-based health training program supported by a remote monitoring system among patients with chronic diseases.	Mobile Application	Home telemonitoring of chronic diseases appears to be a promising disease management approach with the potential to increase patients' adherence to self-care, while bringing health services closer to patients and therefore resulting in improved quality of life.

Source: Prepared by the authors (2019).

Through the literature findings, three thematic categories were established that were essential for the construction of the application. The first category addresses the recently published technologies, in which the articles highlight the mobile application as the most used technology,[22-31] serving as an important mediator in health management and patient follow-up. Apps are very important resources in supporting learning and developing technical skills in older people.[32]

In this sense, a study developed with Chinese patients with some kind of chronic diseases evidenced easy access and usability of smartphones among the participants and, above all, interest and willingness to use applications.[25] It is emphasized that mHealth applications developed by health care organizations present themselves as efficient strategies in the (self-) management of people with chronic diseases.[22,26,27]

The second category alludes to the potentialities and barriers to the use of applications in the elderly population. It was identified that even with the insertion and approach of the elderly person to the use of applications, devices and social networks, it is discussed how the elderly citizens make contact with these types of software.

Through the evaluation of home telemonitoring of chronic diseases, it was not possible to find great statistical significance in relation to the increase in patients' adherence to self-care; however, it is possible to see the approximation and monitoring of individuals in health services, resulting, therefore, in improved quality of life.[31]

Nevertheless, the participation of people in the use of a urinary incontinence monitoring application,[24] in a wireless blood pressure self-monitoring program,[28] as well as a smartphone-based self-management system in the usual care of patients with chronic kidney disease[29] demonstrated motivation of those involved in their health-disease process and in terms of improving their health management, showing positive acceptability and usability in the use of these tools.

At this juncture, it can be inferred that these tools must have specific needs regarding their functionality compared to general users, which suggests that subsequent research should target the content and design to specific users, taking into consideration their age, education and medical condition.[22,23,25] Thus, it is necessary to identify the main difficulties in the use of mobile devices and smartphones by users and their real needs.[30]

In the third category, usability and accessibility of applications for the elderly population, it was found that usability is an attribute of acceptability that a user can have about a system's interface, and should be associated with four main factors: being easy to learn, easy to use, error tolerant and pleasant to use.[32] Accessibility must seek to meet the needs of the public in a broad and generic way so that everyone feels assisted. Considering the theoretical contribution found in the scientific literature regarding the main demands for the construction of a technology, the present research proceeded with the development step.

In order to carry out the software development, a prototype of the application was initially made. Thus, prototyping in the Software Engineering universe is a process that qualifies the developer to build a model of the final product that will be developed later.[33]

The prototype can be partial (usually used to emphasize an idea), or with a complete flow (used for user testing), and does not necessarily need to have a visual refinement. How much a prototype will look like the final version of an application is what is called fidelity. As far as fidelity is concerned, the prototypes can be of low, medium and high fidelity, the latter being the most similar to the final product,

that is, the software performs part or all of the desired functions, but some aspects have been improved in the final product.[34]

It was decided that the central intervention used in the app would be an app program to remind people to take their medication by means of audible warnings and on-screen information, with a focus on the autonomy of the health-disease process of the elderly public. In order to contribute to the autonomy of the elderly and motivate them in medication adherence, it was decided to present the application with accessible language, with large and readable fonts, with specific colors for the background screen and the Ooblets, which were, respectively, the colors black and yellow.

Authors justify that, when the background of the electronic media is black, the best contrasts are obtained with yellow, green, cyan or magenta figures with high saturation. The main focus is to make it easier for users to separate foreground and background information. For visual presentations, it is about making sure that the information being presented contrasts sufficiently with the background. [32]

In the development of the navigation project, the menus that made up the application were elaborated, with the respective Ooblets, registration, create alarm and exit. After this phase, the files were sent to the graphic designer for the elaboration of the images. At first, the user creates an alarm using the "Create Alarm" button, then can consult it using the "Alarm List" button and then exit the application using the "Exit" button.

On the first screen of the prototype, the user will do a simple registration for better information about the client (Figure 2).

Figure 2. User registration. Iguatu, Ceará, Brazil, 2019.

Source: Prepared by the authors (2019).

All user data entries will be handled so that only valid values can be added to each field. As an example, the indication of the medication dosage, in which the application only allows numbers to be entered. On the page for creating a new alarm, every user input control has an indication of what that particular field represents. Some medications are already registered in the application, those prescribed and dispensed more frequently within SUS. The other medications will be added by the user himself according to their use (Figure 3).

Figure 3. Insert new medication. Iguatu, Ceará, Brazil, 2019.
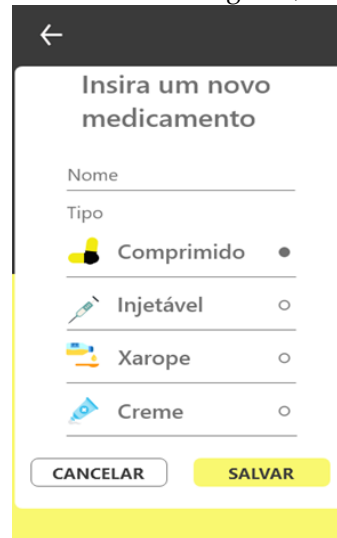
Source: Prepared by the authors (2019).

After inserting the medication, the user must select the days of the week in which the alarm should sound, the time and whether he wants the alarm to wake up 10 or 15 minutes earlier. Subsequently, the alarm will be saved using the "Save" button. The alarm will sound for a period of 60 seconds, until the user presses "Take Medication" on the screen (Figure 4). In the profile tab, the user will be able to delete or edit the entered data.

Figure 4. Alarm to take medication. Iguatu, Ceará, Brazil, 2019.

Source: Prepared by the authors (2019).

After the completion of the previous steps and their detailed review, the last step began, in which the application was implemented on the Android platform (Figure 5).

Figure 4. Implementation of the application on the Android platform. Iguatu, Ceará, Brazil, 2019.

Source: Prepared by the authors (2019).

DISCUSSION

With an increase in life expectancy, an increase in the elderly population has been observed over time. This phenomenon has become a reason for study and concern by researchers and government authorities, because the aging process, although physiological, may be associated with comorbidities and chronic diseases that require treatment. From this perspective, technology can be an ally in the treatment of these conditions. As an audiovisual strategy with sounds, images, colors, and text, it allows a better understanding by the elderly when compared to written or spoken language.[34]

Therefore, the use of educational technologies in health through applications becomes a viable strategy for health education with the elderly, facilitating autonomy, self-care and independence of longevous people.[35]

The literature shows that most elderly people do not use their medications correctly, which makes the use of the application relevant, since it helps the client, the family member and the caregiver regarding the correct use of the medications, contributes to an improvement in medication adherence, improves quality of life, reduces the risks associated with polypharmacy and increases the security and self-esteem of the elderly, providing an improvement in the quality of care and the participation of the user throughout his/her treatment.

In view of the compilation of studies found through the review carried out, it was found that the strategy of using apps is valid to sensitize the target audience in their actions and co-responsibility in the treatment, highlighting the lack of the type of technology proposed in this study.

Nevertheless, the evidence explains the need to facilitate usability for the elderly public. Thus, this research evidences the use of the application with some specifications found in the literature studied: larger font to facilitate the literacy of the longevous people, the Ooblets and background colors suitable for this population and images of medications.

The application developed in this research helps the elderly citizens in terms of controlling their routines with medications, which can be easily forgotten if they do not have external help, and which can easily be transported to any environment, providing the user with the opportunity to feel more autonomous in his/her health-disease process.

Therefore, one of the main advantages of health interventions through apps is that they are easily accessible and usable, besides reaching different segments of the population, such as the elderly patients. For this audience, the apps can work as facilitating strategies for self-care, maintenance of autonomy and independence.[36]

In this sense, the apps used with the elderly citizens corroborate good medication adherence in this population. In addition, these tools help preserve the autonomy of the elderly patients, making them protagonists of their care, keeping their aging active, either by interacting with other people through the apps or with games that exercise their concentration, memory, among other features.[37]

Moreover, studies show the importance of using apps that can help the elderly patients, their caregivers and family members for better medication adherence and disease control. Other relevant implications of the use of apps are: memory activation capacity, facilitating the use of medications at the right times, facilitating patient health education, improving the professional-patient bond and influencing behavioral changes and the adoption of healthy habits.[38]

Accordingly, applications that help manage medications can greatly contribute to the correct adherence to drug treatment, since they allow not only the elderly to be informed of the time of use and reminded of the correct prescription, but also that a caregiver can program the application correctly and that health professionals can access this information during consultations.[37]

Besides the care aspect, the applications related to the use of the telephone or other communication devices provide accessibility to the elderly in the digital environment, enhancing the expansion and maintenance of social interaction.

This limitation of this study is the fact that it was developed only for the Android platform, even though it is the most used platform in Brazil and in the world, it is necessary that other operating systems have access to this technology, thus spreading knowledge about this application about the routine use of medications by the elderly user.

Despite this limitation, this study brings relevant contributions in the field of teaching, research, and in the strengthening of qualified and innovative care, in the autonomy and valorization of the elderly, collaborating to the technological inclusion of the elderly public, providing them with greater autonomy, better therapeutic adherence, resulting in a reduction in the risks associated with the elderly submitted to polypharmacy, generating a lower number of hospital admissions and lower costs for the health systems.

CONCLUSION

The use of several medications tends to increase with aging due to the comorbidities presented by most elderly people. Studies that address polypharmacy and medication adherence linked to the use of technologies are necessary in order to reduce the inadvertent and iatrogenic use of continuous use medications. Seeking an alternative to make the elderly co-responsible for their health-disease process, this research evidences that the use of technology found in smartphones contributes to prescribed medication adherence.

It is noteworthy that the technology developed can be used as an interventional strategy in nursing consultations, in groups of social institutions for the elderly, by caregivers of the elderly and, above all, by the target audience. Furthermore, it is intended to carry out future research to evaluate this software with the target audience, with health professionals, and with computer professionals, so that this application can be improved.

CONTRIBUITIONS

Contributed to the conception or design of the study/research: Silva LP, Bezerra AM. Contributed to data collection, analysis and/or interpretation: Silva LP, Bezerra AM. Contributed to article writing or critical review: Silva LP, Torres FAF, Santos AJS, Soares LG, Bezerra AM, Nascimento MNR. Final approval of the version to be published: Silva LP, Torres FAF, Santos AJS, Soares LG, Bezerra AM, Nascimento MNR.

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