Multi-platform Mobile Application for Elderly Care Management

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Abstract. The aging of the world population has been occurring in recent decades
as a result of the decrease in birth rates and better health care that allow an increase
in life expectancy. The lack of contact with the family and unfamiliarity with habits
and tastes can reduce the quality of life of the elderly that live under the care of
professionals. Technological advances should be used to bridge the gap between
families, caregivers, doctors and the elderly. This work aimed to develop an appli-
cation for mobile devices that facilitates communication between health service
providers for elderly people living in long-stay institutions. The CuidaLife App
was developed for a software operating system with input modules for registering
the elderly, family members, doctors and caregivers. The developed application
can be accessed through any smartphone, tablet or computer, as long as it has
internet access. Its layout is responsive, it adjusts according to the screen size of
the device. The elderly registration modules were designed to allow the exchange
of information about the elderly, not only medical, but also including food prefer-
ences, habits that are important for well-being. The caregi-vers module allows the
exchange of information between caregiver shifts, with information relevant to the
care of the elderly, and the medical module allows access to health information
relevant to the monitoring of the elderly. The application worked well and may
represent an easy and safe way to improve the quality of life of individuals who
depend on third parties for their care.

Keywords: Aging · Computer Programs · Elderly Care · App · Mobile Device ·
Bioengineering

1 Introduction

The growth in life expectancy changed the world population demography. All over the
world, it is common to have the idea that all countries, states and cities are composed
of more children, young people and adults than elderly people, however, in face of this
transition, it is expected that in the year 2050 there will be more people aged over 60
than under 15, estimated to reach a global elderly population of 2.1 billion compared
to 901 million calculated in 2015 [1]. For example, the Brazilian population scenario is
undergoing changes, a country that has long been known for having a high rate of young

people, according to statistics, will, by 2025, occupy the 6th position among the oldest countries, due to the increase in number of elderly people [2]. According to Law No. 10,741 of October 1, 2003, an elderly person is one who is 60 years of age or older.

The advance of improving the quality of life in all senses (social, cultural, economic, health care, among others), resulted in a demographic transition marked by a reduction in mortality and birth rates and an increase in the rate of elderly people [3]. Despite this improvement, this data does not mean that everyone enjoyed healthy aging. According to the World Health Organization (WHO), healthy aging is a "process of developing and maintaining the functional capacity that allows well-being in old age".

In view of the above, a great challenge with the increase in longevity are chronic non-communicable diseases (NCDs), and within this category, dementias stand out, which are disorders characterized by cognitive decline, necessarily involving memory and at least one more domain, such as personality, language, social skills, abstract thinking, among others [4]. NCDs are a challenge in this population as they are causes of functional impairment and quality of life [5]. However, despite an individual being diagnosed with a chronic disease, it is possible to experience aging in the best possible way through processes that build skills and interventions to assist in this phase.

In addition to this challenge, the great transformations of society, such as the insertion of women more and more in the labor market, led to an increase in the number of elderly people within long-stay institutions, due to lack of time, fatigue, comfort, as well as the lower number of children and, consequently, of siblings to assist in this care, among other factors. Transformation that managed to demystify the vision of the old asylum that had the appearance of a "deposit for the elderly", or a place that welcomes rejected elderly people or even abandoned by the family, a sad place, taxed by loneliness for a welcoming, respected environment, having all the necessary assistance to watch over and care for the life of the elderly, whether they are in full health or weakened [6].

According to ANVISA (National Health Surveillance Agency), long-stay institutions, also called nursing homes, are governmental or non-governmental institutions of a residential nature intended for the collective home of people aged 60 or over, with or without family support, in conditions of freedom, dignity and citizenship [7].

Within the demographic profile that makes up long-stay institutions are people with dementia, who are admitted by decision of third parties, by their own choice or even caused by abandonment because they demand more care, requiring greater availability of time from the caregiver, whether this is a loved one, family member, friend or professional hired at home [8]. The support network with aging decreases and in view of this fact it is very important that institutions seek to preserve family and social ties. In this sense, remote technologies can help communication between family, doctors, institutionalized patients and the nursing team itself [9].

Therefore, it is necessary to improve the innovation of technologies suitable for the elderly, which could assist in the care of this population, to facilitate direct conversation between family and professionals that work in the institution in which the elderly person is located. This study proposes to develop an application for mobile devices or not that facilitates communication between health service providers for elderly people living in long-stay institutions.

2 Methods

Before starting the development of the application, the best way of crossing the information was studied, in order to guarantee the efficiency of the application, object of this work. In this context, it was understood that the application should be divided into three main modules, which allow changes in data entry and access: Administrator, Caregiver, Doctors.

As proposed, the administrator is responsible for providing information about the elderly person, caregivers, doctors, family members, medication, food and examinations of the elderly person to be monitored. It is important to emphasize that, in the registration of caregivers and doctors, they must also receive a username and password to access the system, which will allow their caregivers and doctors to access the information of the elderly person being accompanied by this user.

With the password to access the application, the caregiver, in addition to having access to the elderly's information, such as personal data, family members, preferred food, medication and others, can record food, mediations, discomforts and other events that occur with the elderly. In this way, the application will assemble a history of the occurrences. The idea is that the system allows photos and videos to be archived along with reports of occurrences and events.

One of the main ideas of the system is that doctors have access to patient information, daily occurrences, history of medication given and exams. In this way, it is expected that these data can produce more assertive diagnoses. It is important to note that although the third module was aimed at physicians. It is possible that, in some cases, other people may be registered, for example, the person responsible for a nursing home. It is reaffirmed that the goal is for the application to serve as an electronic medical record with useful information that can help in diagnoses and guarantee the fulfillment of the caregiver's work, avoiding failures and forgetfulness.

So that the application can control an unlimited number of elderly people and their respective caregivers and doctors, a database structure was designed where a given user can control only one elderly person, thus, the database tables are interconnected through the user field, as shown in Fig. 1, in this image, it is also possible to see the fields of the idealized tables.
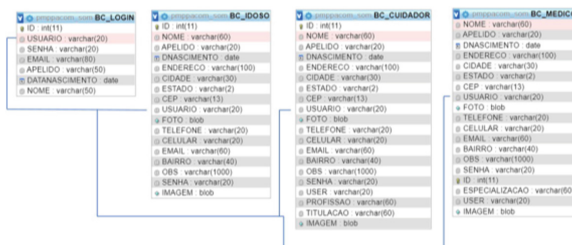

Fig. 1. Structure of the database tables designed to control the elderly, their caregivers, and doctors.

In the same way that the structure of Fig. 1 was assembled, it was also linked to the user, to the other frames: family, medicines, food, medical records and exams.

As proposed, few tables control infinite patients, followed by their caregivers, doctors and family members. The Fig. 2 presents the structure of the aforementioned tables, as well as their fields, types and sizes.

Fig. 2. Structure of the database tables designed to control family members, medication, food, exams and medical records

With this table structure, it is understood that the data can be shared between the different profiles in the system:

- User: responsible for registering the elderly and their information;
- Caregiver: responsible for feeding the actions carried out during the period of care for the elderly;
- Physician: responsible for monitoring the health of the elderly.

After planning the application, the next step was to choose the programming language, initially the idea was to develop an App for mobile phones, however, considering that at times it would be interesting to use the application on desktop or notebook, since some facilities in the use of the keyboard and the arrangement of information on a larger screen, we opted for the use of combined programming languages: PHP, HTML, Java Scripts, CSS and bootstrap, a free framework with a responsive character, which makes responsive programming, that is, it adapts according to the screen size of the equipment, wherever it is running. All the developed programming was stored on an outsourced web server and can be accessed through the link: <www.pmppa.com.br/cuidar>.

3   Results

The development of the software presented below resulted in the application for registration at the INPI number BR12021002074—0_870210078505.

3.1   App Developed

To use the App, just access the link <www.pmppa.com.br/cuidador>, the initial screen is shown in Fig. 3 (A) in the version for computers and notebooks and in Fig. 3 (B) in the version for smartphones.
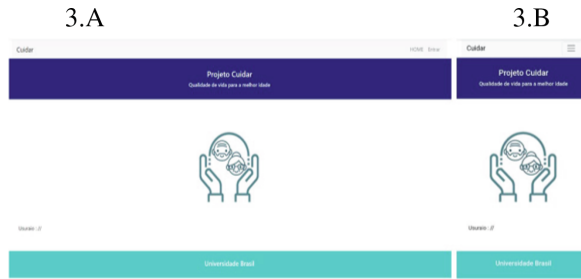
3.A   3.B

Fig. 3. In 3.A Initial screen of the developed App viewed on desktop computer and for Smartphone in 3.B.

To access the application, the user must click on Enter in the desktop version and, in the case of a smartphone, must first access the menu on the top tab on the left, represented by and dashes, where you will find the option: Enter. Two options will be displayed: login and register user. If it is the first time that the user accesses the system, he must necessarily choose the second option, register a user, however, it should be noted that the same person can register more than one user, as each user controls only one patient.

Once the user is registered, he/she must log in to access the system. Figure 4 shows the screen described in 4A and 4B, the first is the desktop version and the second is the smartphone version.

4.A   4.B

Fig. 4. In 4.A we present the login screen of the developed App viewed on a desktop computer and in 4.B viewed on a smartphone.

Once the register user option is chosen, the system will open a screen superimposed on the previous screen that will ask the user to fill in the fields: Username, Password, Name of the elderly person, Date of Birth, Surname, Email. The username and password field are responsible for giving the user access to the application. The other fields are information that the application needs to process some screens that will be presented throughout this work. Figure 5 A and B show the screen describing in the first image the desktop version and the smartphone version respectively.

With the registered user, it is already possible to log in to the system, in this case, the application will open a window superimposed on the initial screen, where the user must choose in the category field, if he is a user, who manages the elderly's information, if he is a caregiver, or doctor. Once one of the options is selected, you must enter your login and password, if the data are correct, you will have access to the system according
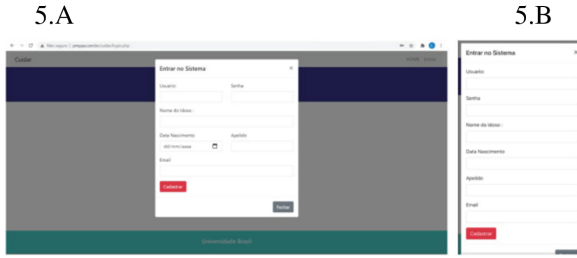
5.A   5.B

Fig. 5. In 5.A the user registration screen of the developed App viewed on a desktop computer and in 5B the screen viewed on a smartphone.

to your profile (category). Figure 6.A and B present the screen obtained for the desktop version and the smartphone version.
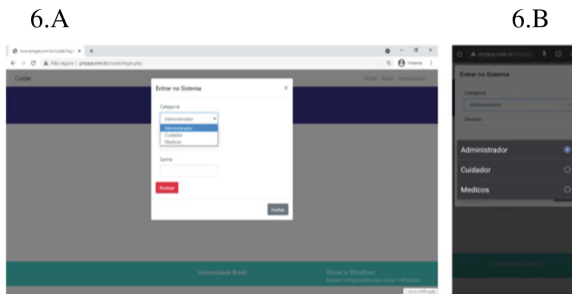
6.A   6.B

Fig. 6. In 6.A the login screen of the developed App viewed on a desktop computer and in 6.B the smartphone screen.

4   Discussion

The present study developed an App for mobile devices that facilitates communication between family and health service providers of elderly people who need third-party care for basic activities. For the development, the possibility of using a fast and practical platform that facilitates the routine of elderly people who need special care was analyzed, bringing together relevant information between doctors, caregivers and family members, promoting the safe storage of such information.

Although the increase in quality and in life expectancy have made great strides in several sectors, including health care, social and economic activities [10], according to WHO, there is a need to expand this right to everyone who reaches old age, since there is an indispensability of care and maintenance of existing methods for this to occur, as well as the development of new methods that can increasingly improve the way the professionals involved deal with the day to day in homes, institutions and also in households where the elderly may need special care [3].

According to Gaugler et al. [11] approximately two-thirds of residents in long-term care institutions in the United States have some form of dementia. Also according to the authors, the ideal treatment for patients with dementia should adopt a person-centered perspective and focus on maximizing the residents' quality of life.

Person-centered care refers to care that is individualized and adapted to changes in each person's preferences, abilities, and needs. In this context, the software developed in our study seeks to individualize the care of the elderly, from their personal food preferences to communication with family members and other health service personal to provide a personalized routine of behavior, tastes and daily manifestations made by the old man.

It has been increasingly observed the insertion of innovations and information and communication technologies (ICTs) to support health care for patients with dementia, aiming to support the care of these patients at home and improve the quality of life of caregivers [12]. Our software addresses some of the areas of interest pointed out by the researchers. In the case of patients with autonomy of manifestation, there may be the introduction of favorite foods, habits of interest and contact with family members through the program.

For those who have lost their autonomy, the program's caregivers area allows the exchange of information and experiences that can support the service provider in decision-making in the face of demands presented by the elderly, and in the aspect of assisted living, interaction with family members can help the elderly in maintaining contact with habits and customs of their daily life.

The inclusion of the elderly in their preferences is essential to maintain some degree of autonomy and control over daily activities and our software allows information to be exchanged between caregivers regarding the person's own preferences. Receiving care [13].

On Google Play, it was possible to find applications such as The Backup Memory where family members send photos and activities developed with the elderly so that they can try to maintain or establish a connection with family and friends. In the same category, Samsung launched the Memory recaller app. However, no applications were found that had similar characteristics to CuidaLife.

It is necessary that the software developed in this study to be tested by caregivers, family members and the elderly so that its performance can be analyzed, and necessary adjustments can be developed. Technological advances and access to real-time information in a safe and fast way should be explored for the care of elderly people [14] who will increasingly have access to technology because they have lived with it for a good part of their lives, thus, integration from simple software like the one proposed in this study to the development of connected products that can facilitate the care and quality of life of the elderly should be encouraged, including as a public policy in the health field.

5 Conclusions

The present study developed an application for mobile devices as well as for computers that facilitates communication between health service providers for elderly people living in long-stay institutions. The cross-platform mobile application will be able to broadly contribute to communication between professionals, family members and the elderly.

Conflict of Interest. The authors declare that there are no conflicts of interest in carrying out this study.

Declaration of Human Rights. The study was not performed directly or indirectly in humans, not requiring submission to Ethical Committee on Human Experimentation.

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