



Prototype of the information application provided by the patient for urgency and emergency moments

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ABSTRACT. During an emergency and urgent care, there is great difficulty on the part of health professionals who attend the event to trust the data provided, especially when these are provided by patients who may not be mentally well, in shock, without communication or even the absence of the informant when the patient is unconscious. Therefore, this study aims to develop a prototype to validate the fundamental requirements for creating an application that contains basic patient data that are essential for their care. In addition to personal data, the patient will be able to inform data about allergies, pre-existing diseases and continuous medication use. In this way, this application will help the healthcare professional to obtain this information in a clear, easy and organized way. As a methodology, the scenario was studied, during this phase, meetings were held with professionals from the urgency and emergency service and, with that, the main requirements for the development of the prototype were elaborated. Then, the development of the prototype began.(patient and/or his/her guardian) (attendant health professional). The prototype was developed using the Lean methodology, which deals with continuous learning and a focus on team communication, and Scrum, a methodology focused on continuous development and approval and the use of features and usability. With the prototype ready, an explanatory video was made about the functioning of the prototype. Then, an interview was carried out with some health professionals, via Face book high lighted by this study and the use of the about app. The survey results showed that 96.2% of respondents said they would use the application, 93.2% would feel safer during an emergency care and 79.2% would like to be informed if the application is completed. The prototype was elaborated, evaluated and the results showed that the product is viable.

Keywords: Electronic health records; allergy and immunology; chronic disease; drugs of continuous use.

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Introduction

Many infirmities have been affecting the global population creating huge health problems for the people and for healthcare professionals. However, this study measured mainly the allergies, the use of continuous medication and Asthma, for being illnesses that affect a big part of the population. Considering these areas, the Brazilian Allergy and Immunology Association (ASBAI) predicts a 33% increase of all world allergies, studies have identified that more than 87% of elderly people take continuous medication and 30 million people in Europe suffer from asthma (Arruda & Melo, 2015).

A literature review has shown that there are studies in this area involving equipment alongside applications and the use of Internet to collect information in order to transmit them, remotely, to diagnostic centres and healthcare professionals. For example, spirometers used in paediatric patients with respiratory diseases, PEF monitoring for children and of asthma symptoms for patients in general and the use of wearable equipment for the same purpose (Kruizinga et al., 2020). Furthermore, this review also brought afloat information revealing that adult patients with chronic diseases have less access over applications being able to be harmed by this fact (Mahmood, Kedia, Wyant, Ahn, & Bhuyan, 2019). On the other hand, a study has concluded that patients who were beneficiaries of applications for healthcare will receive benefits for that (Langford, Orellana, Kalinowski, Aird, & Buderer, 2020).

Measuring the issue, the conclusion was that the studied patients, those who suffer from allergies, use of continuous medication and asthma, need facilities when it comes to benefiting themselves of an application

which can help in their health treatment. Beyond the patient, healthcare professionals can also be beneficiary from it, this way, they will have in hands an easier access towards more precise information about their patients, and resources that will help them providing a more efficient service.

Methods

This study was developed through Typeform, using the UX methodology (user experience) (Nesbitt, Beleigoli, Du, Tirimacco, & Clark, 2022) to interact better with the interviewed. In order to achieve the largest number of people, the social media Facebook was used to send the interview, composed by five multiple choice questions. To validate the marketplace viability of the application's proposal.

In the requirement gathering stage to use the Lean methodology, that deals with continuous learning and focus on team communication (Goldman et al., 2018), and Scrum, methodology focused in continuous development and approval, in the use of functionalities and usability (Hron & Obwegeser, 2022) and assistance, focused in the urgency and emergency intending to help healthcare professionals by supplying relevant information of the patient, in a clear and objectively way.

During the requirement gathering stage and approval among the healthcare professionals, points that aggregate value to the product like previous registered data approval by a healthcare professional were verified, and emergency phone contact.

After the collection of main points with healthcare professionals, the requirements were presented to a multidisciplinary technology team focused in the healthcare sector. The solutions for the elaboration of the prototype were discussed, as well as the use and the necessary security in case of a future development of the application.

AMPO is a prototype integrally developed in the programming language Javascript, HTML e CSS (Journal & Chaudhary, 2018), using framework Ionic, in its 6.0.0 version. A framework is a group of codes that many developers use, once it has generic features that allow it to be applied in many situations, it stabilises and makes the development of prototypes easier. The main idea of a framework concentrates in the fact that various developers use the codes within it, therefore it is well validated and stable, saving time and costs in the development. Framework Ionic on the other hand is Open Source, it means it is free, under the license of Massachusetts Institute of Technology MIT for programming hybrid mobile applications (ios and android). They are confectioned, normally, using HTML, CSS and Javascript, because they allow the development in many platforms, using the same HTML for different operational systems

Two groups of users were mapped as shown in the use case Figure 1. The first user is the one who provides their information and of members' or people's they are responsible for. This level of users is capable of registering allergies, preexisting diseases, continuous use medication, contact of emergency, blood type, national health card CADSUS, birth date, full name, and additional observations. By finishing the information register, the tool will solicitate 5 different angle photos so it can have the easy register of the patient who provided data. A user can have the registration of many patients, if the one is responsible for them, e.g., children, mother, father, mother-in-law, father-in-law, etc.

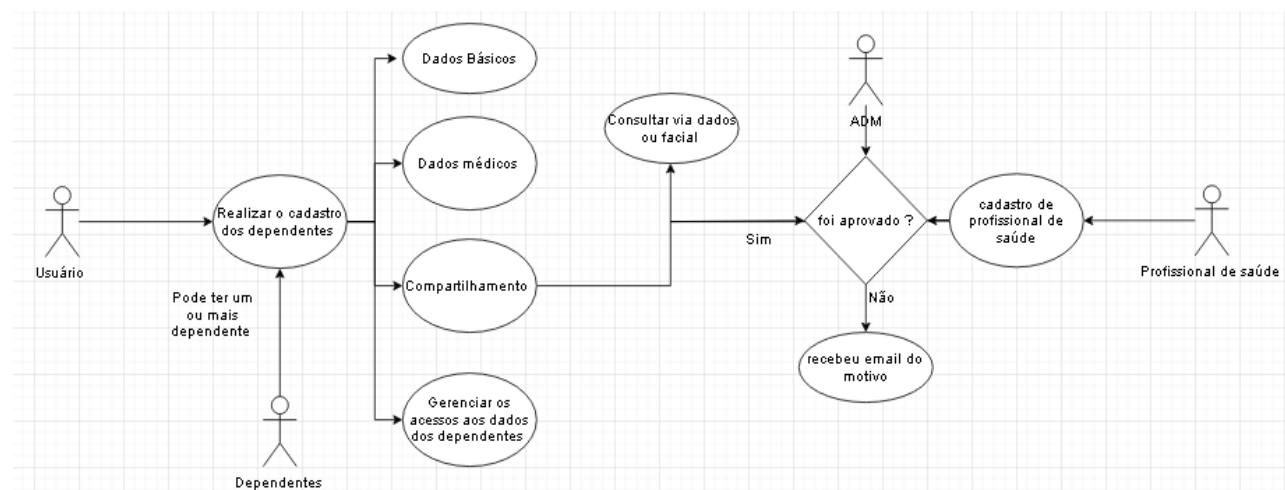


Figure 1. Use case.

The second group of users is the healthcare professional's that has a verified and validated register by secrecy motive. This profile has access to facial identification and data research, in addition to being able to validate the information of the users from the first group. Accomplishing the access to a patient's data, remain recorded the name, date and time, this way assuring who had access to the data and when, in accordance with the law LGPD (Rapôso, Lima, Oliveira Junior, Silva, & Barros, 2019).

The prototype screens below is a demonstration of how the developed system would be, its functionalities and usability, with validated requirements and the market study accomplished. The elaboration of the product structure was fulfilled as well (Figures 2 and 3).

Dados do Usuário

Nome Completo

Data Nascimento

Contato. Emergência

Tel. Emergência

Cartão do SUS:

Gênero Selecione ▾

Tipo Sanguíneo Selecione ▾

Doador ☒

Transfusão de Sangue ☒

Plano de Saúde ☐

Cartão do Plano

Termo de uso ☐

Detalhes usuário

Tel.: (44) 9 9921-8815
 19/02/1991 - 29 anos 10 meses
 708609089481238
 AB - Doadora
 UNIMED - Nacional
 Bruna Aparecida Polido
 Cont. Emerg: José da Silva
 Tel. Emerg: (44) 9 9922 8821

Validades

A Dipirona ☒

M Pregabalina ☒

Aguar. Validação

A Lactose ☐

QR Code

QR Code

José Maria de Silva CRM: 123452

Joselito de Souza CRM: 889452

Maria da Silva CRM: 003452

Histórico de consulta de dados

Jose da Silva
 Cardiologista
 CRM: 112231
 Data: 11/11/2021

Araldo Silvestre
 Oftalmologista
 CRM: 199231
 Data: 05/12/2021

Jose Souza
 Clinico Geral
 CRM: ee2231
 Data: 20/11/2021

João da Silva
 Ginecologista
 CRM: 882231

Figure 2. Screens below.

The figure displays four screenshots of a mobile application interface, organized into two columns.

Top Left Screenshot: Cadastro Profissional da Saúde

- Fields for registration: Nome Completo, Data Nascimento, Número Registro, Telefone, Gênero (with a dropdown menu labeled 'Selecione'), Foto Atual, and Doc. com foto.
- Below the photo fields are two camera icons.
- A red 'Informações' section contains the text: 'Tire uma foto segurando seu registro sobre uma folha com o código: OAN-58462d'.
- A 'Termo de uso' toggle switch is at the bottom.
- A large blue button labeled 'ENVIAR' is at the bottom.

Top Right Screenshot: Detalhes usuário

- Header: 'Detalhes usuário' with a blue '+' icon.
- User profile information: Tel.: (44) 9 9921-8815, 19/02/1991 - 29 anos 10 meses, 703609089431233, AB - Doadora, UNIMED - Nacional, Bruna Aparecida Polido.
- 'Validades' section:
 - A Dipirona (toggle on)
 - M Pregabalina (toggle on)
- 'Aguard. Validação' section:
 - A Lactose (toggle off)
- Bottom navigation bar: Início, Galeria, Mais.

Bottom Left Screenshot: User Profile

- Profile picture of a woman.
- User information: Tel.: (44) 9 9921-8815, 19/02/1991 - 29 anos 10 meses, 703609089431233, AB - Doadora, UNIMED - Nacional, Bruna Aparecida Polido, Cont. Emerg: José da Silva, Tel. Emerg: (44) 9 9922-8821.
- 'Validades' section:
 - A Dipirona (green thumbs up icon)
 - M Pregabalina (green thumbs up icon)
- 'Aguard. Validação' section:
 - A Lactose (red thumbs down icon)

Bottom Right Screenshot: Pesquisa

- Header: 'Pesquisar'.
- Search input fields for 'Nome' and 'Data Nascimento'.
- A large blue button labeled 'FILTRAR'.

Figure 3. Screens below.

The second group of users is the healthcare professional's that has a verified and validated register by secrecy motive. This profile has access to facial identification and data research, in addition to being able to validate the information of the users from the first group. Accomplishing the access to a patient's data, remain recorded the name, date and time, this way assuring who had access to the data and when, in accordance with the law LGPD (Raposo et al., 2019).

The prototype is a demonstration of how the developed system would be, its functionalities and usability, with validated requirements and the market study accomplished. The elaboration of the product structure was fulfilled as well.

Results

A prototype was elaborated: an Application that aims to allow the patients to fulfil a previous registration of them and their dependants with relevant information in an urgency and emergency service. By this

application, the medical team, through information, can have relevant data in a clear and objective manner, being also possible to contain the approval of the data informed by the patient with the confirmation of the professional who accompanies them. This appointment can be accomplished through name, birth date, CADSUS and facial identification. The need of two groups of users was brought up: the patient/responsible and the healthcare professional.

The patient access is made through CPF (Individual Taxpayer Registration) and a password. He has access to the initial registration, which contains the fields: full name, that will be used to help the healthcare professional in the identification when there is a serious fracture on the face; birth date to help in the filtration during written research; contact of emergency for the hospital/prompt service team inform the responsible; CADSUS to help the team during the entrance in the hospital environment; gender to be destined to the adequate hospitalization area; blood type if there is the need of a blood transfusion; if there is health insurance, because if so, it is enabled the field: health card to be informed the number of the insurance card, helping in the entrance in the hospital environment; if the application's term of use is accepted.

The second stage of a patient's registration contains information about the user's health: allergies, continuous use medication, preexisting diseases, and observations, when selected the type, the system indicates a symbol signalling the chosen type. So, it opens the field of detailing that, after filling, it is offered to the user the option of saving or cancelling, if the one chooses to save the information: type, detailing and symbol are added under it.

The patient can solicitate from the professional who does the accompanying to confirm the information through the reading of a Qrcode, that a registered professional can confirm or deny these data, this way, giving more credibility in the data informed by the user during the registration process.

The tool shows which healthcare professionals the patient has shared their data with and when the last access by these professionals to the patient's information occurred, as well as the name and registration of the professional. There is also an option for the user to delete this sharing.

The user has access to all the data, such as the name and registration of the healthcare professionals who has had access to their data, along with the date and time of the appointment, this record will be stored and won't be able to be deleted or altered for the sake of the patient who was consulted information security. The user will be notified when there is a data consultation, and it will indicate if this professional has shared access by the user or has consulted in case of emergency. There will be a symbol that displays this information alerting the user.

The group of user healthcare professional has login access through CPF and password, having access to five options of use, they are: Approval or denial of the provided information by the patient or by the user's responsible; the professional can approve or deny the secondary information, such as allergy, continuous use medication, preexisting diseases and observations informed by the patient's responsible user, the intention of this functionality is the healthcare professional being able to validate if the information are correct and if the patient is not self-medicating and self-diagnosing without their knowledge.

The second supplied feature to the user healthcare professional group is the list of patients who have shared data with this professional. It is possible to visualize the data and delete the sharing link, when visualized through this feature it is usually registered with a symbol that demonstrates that the healthcare professional knows this professional has access, and the search wasn't for an emergency and urgency occurrence. The professional is allowed to delete the patient from this list if the one is no longer his patient.

The third option is the one that informs the professional user has their initial area and registration information. In this part, there will contain their occupation, full name, registration, phone for contact and when their data got validated.

The fourth and fifth feature the healthcare professional has access presents the same result, however, in different forms of consult, it can be by name and birth date or by facial recognition, the option of name and birth date will present the feature of auto search, this one accomplishing the research during the texting process, this way making the research easier once showing the birth dates. The facial recognition works reading face traces and presents the compatibility with the registered professional. The main feature of this assignment is to show a way of helping the healthcare professional providing relevant information in a clear and objective manner, making their job easier and bringing up safety during the proceeding with documented and registered information. With the registration, it is possible to prove which were the information the patient had supplied, besides the description and safety of the patient who doesn't need to expose their health particularities all the time. Also, it is very useful for the ones incapable of providing this information, and,

with the application, the healthcare professional that will attend them can access the information in a simple, fast, and clear way.

During the study elaboration, it was applied a market research with a hundred and five interviewed through social media. The question was if the person would use the product and, to get the result, five more questions were asked in a clear, objective, and interactive manner. Before answering the research, the people would see a demonstrative video of the product (l1nq.com/cXOeK), showing the functionalities and its utilities.

The first effective question had the intention of knowing if only the people with allergies, preexisting diseases or those who take continuous medication, were interested in the topic, because after the video they had to make themselves available to answer a non-obligated research (Table 1).

Table 1. First question.

01-Do you or some family member of yours have allergy, preexisting diseases or take continuous medication?	
Family members and I	38,5%(40 people)
Me	32,7%(34 people)
No	28,8%(30 people)

The second question had the purpose of comprehend if the people trust the application to provide this information and if themselves would use (Table 2).

Table 2. Second question.

02- Would you use a previously informed application that could help the medical team in an urgency case?	
Yes	96,2%(101 people)
No	3,8%(4 people)

The third question was to validate the hypothesis of people feeling insecure in hospitals related to the questions (allergies, continuous use medicine and preexisting diseases) (Table 3).

Table 3. Third question.

03- Would feel safer	
Yes	93,2%(96 people)
No	6,8%(7 people)

The fourth question was to know if the product would need a way of indicating a family member and if a user would have many dependants, if this would be a feature that could aggregate value to the product, this way, creating value of use to the final user (Table 4).

Table 4. Fourth question.

04- Would you make a register for your family?	
Yes, and would suggest to distant relatives.	41,3%(43 people)
Yes, and for myself as well	41,3%(43 people)
No, only for myself	13,5%(14 people)
No, for anyone	3,8%(4 people)

The last question had the intention of rating the interesting of use and have a group control for future research.

With the research accomplished, the alterations of requirements were made in the prototype, because the product must be thought about and elaborated thinking of the user profile utilization (Table 5).

Table 5. Last question.

01- Would you like to be informed if the application got released?	
Yes	79,2%(80 people)
No	20,8%(21 people)

Discussion

A study made in 2017 sought to compare the sensitivity in 2004 to discover if there was a growth in the allergic sensitivity in fifteen factors of different sectors, and, concluded that there was an increase in six factors (Arruda & Melo, 2015). The number of people with allergy and its complexity only increase with time passing, generally a person does not have allergy of only a factor, but of many, people with severe allergies get to tattoo the allergies on the intern part of the arm or forearm, so, in a case of urgency they know what to do. There still is an older group more affected by many skin contact severe allergies, which even the care glove can cause a serious allergy attack.

The present study focus, therefore, in a solution to solve the communication issue between patients and healthcare professionals, allowing it to happen in a clear, objective, and safe way for both sides, seeking the fact that the elder population is considerably expanding throughout the years and that the aging of the population enhance the number of chronic diseases, (Ladeira et al., 2021) which in turn makes a bigger use of continuous use medication (De & Garcia, 2018). The proposal of the prototype was based in these three matters, including other information that help the healthcare professional during the treatment.

A mHealth mobile communication application, used to support the service related to the health, with information, data flow, patient self-management, disease follow-up since the diagnosis until the end of treatment. During the year of 2018, the European Academy of Clinical Allergy performed an operation to rate the allergy sector, seeking that the allergy could interfere in treatments (Kagen & Garland, 2019).

The prototype proposal, which corroborates with these studies, used three health problems that affect the population in general (allergies, continuous use medication and preexisting diseases) as a basis, including other information that help the healthcare professional during the treatment.

During the requirement gathering of the prototype, there were gathered and altered many subjects such as the inclusion of the blood type, private and public network card, private network indication and even the phone contact in case of urgency, sectors that front-line professionals need and weren't being contemplated. We accomplished all the work of elaborating and validating the product, for only then, accomplish the validation with the general population.

Conclusion

The patient information in a moment of urgency and emergency does not have price, because it can facilitate and help the healthcare professional on having a fast and effective answer. The biggest difficulty is the reliability of these data, once the data in Brazil are not unified and many times are provided by the patient who may not be under their mental faculties. Therefore, the prototype was elaborated to structure an application that can help these matters, providing information in a clear, objective and safe way, also, being able to be searched and visualised in a discreet way, giving reliability to the information.

Referências

- Arruda, L. K. & Melo, J. M. L. (2015). The allergy epidemics: why are allergies increasing in Brazil and worldwide?, *Brazilian Journal of Allergy and Immunology*, 3(1), 1-6.
- De, A. L. & Garcia, F. (2018). *Avaliação do uso de medicamentos entre os participantes da Universidade do Envelhecer (Uniser)*. Brasília, DF. Retrieved from <https://repositorio.unb.br/handle/10482/39266>
- Goldman, M. P., Wong, A. H., Bhatnagar, A., Emerson, B. L., Brown, L. L., & Auerbach, M. A. (2018) Providers' Perceptions of Caring for Pediatric Patients in Community Hospital Emergency Departments: A Mixed-methods Analysis. *Academic Emergency Medicine: Official Journal of the Society for Academic Emergency Medicine*, 25(12), 1385–1395. DOI: <https://doi.org/10.1111/acem.13509>
- Hron, M., & Obwegeser, N. (2022). Why and how is Scrum being adapted in practice: A systematic review. *Journal of Systems and Software*, 183. DOI: <https://doi.org/10.1016/j.jss.2021.111110>
- Journal, I., & Chaudhary, P. (2018). *IRJET-Ionic Framework IONIC FRAMEWORK*, *International Research Journal of Engineering and Technology*. Retrieved from <https://www.irjet.net/> (Accessed: 19 January 2022).
- Kagen, S., & Garland, A. (2019). Asthma and Allergy Mobile Apps in 2018. *Current Allergy and Asthma Reports*, 19(1), 1–13. DOI: <https://doi.org/10.1007/s11882-019-0840-z>

- Kruizinga, M. D., Essers, E., Stuurman, F. E., Zhuparris, A., Van Eik, N., Janssens, H. M., ... Gertjan J. A. (2020). Technical validity and usability of a novel smartphone-connected spirometry device for pediatric patients with asthma and cystic fibrosis. *Pediatric pulmonology*, 55(9), 2463–2470. DOI: <https://doi.org/10.1002/ppul.24932>
- Ladeira, G. D. A. et al. (2021). *Polifarmácia no Idoso e a importância da Atenção Farmacêutica*. Ladeira, ÚNICA Cadernos Acadêmicos. Retrieved from <http://co.unicaen.com.br:89/periodicos/index.php/UNICA/article/view/188> (Accessed: 24 January 2022).
- Langford, A., Orellana, K., Kalinowski, J., Aird, C., & Buderer, N. (2020). Use of Tablets and Smartphones to Support Medical Decision Making in US Adults: Cross-Sectional Study. *JMIR Mhealth Uhealth*, 8(8). DOI: <https://doi.org/10.2196/19531>
- Mahmood, A., Kedia, S., Wyant, D. K., Ahn, S., & Bhuyan, S. S. (2019). Use of mobile health applications for health-promoting behavior among individuals with chronic medical conditions. *Digital health*, 5. DOI: <https://doi.org/10.1177/2055207619882181>
- Nesbitt, K., Beleigoli, A., Du, H., Tirimacco, R., & Clark, R. A. (2022). User Experience (UX) Design as a co-design methodology: lessons learned during the development of a web-based portal for cardiac rehabilitation. *European Journal of Cardiovascular Nursing*, 21(2), 178-183. DOI: <https://doi.org/10.1093/eurjcn/zvab127>
- Rapôso, C. F. L., Lima, H. M., Oliveira Junior, W. F., Silva, P. A. F., & Barros, E. S. (2019). LGPD - Lei geral de proteção de dados pessoais em tecnologia da informação: Revisão Sistemática. *RACE - Revista de Administração do Cesmac*, 4, 58–67. DOI: <https://doi.org/10.3131/race.v4i0.1035>