SUSi: CHATBOT PROMOTING PRIMARY HEALTHCARE KNOWLEDGE

SUSi: CHATBOT NA PROMOÇÃO DO CONHECIMENTO DA ATENÇÃO PRIMÁRIA À SAÚDE

SUSi: CHATBOT EN PROMOCIÓN DE CONOCIMIENTOS DE ATENCIÓN PRIMARIA DE SALUD

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ABSTRACT
Build a chatbot for the promotion of Primary Health Care for Community Health Agents (ACS) of the Family Health Strategy (ESF) in a municipality in Ceará. Methodological study of the technological production of a chatbot. For the construction of the technology, the Planning stages were followed, with an exploratory research being carried out with 143 ACS workers of the ESF in the municipality. Afterwards, the objectives, risk assessment and technology development were defined using the Dialogflow tool with integration to the Telegram communication channel. There were 79 responses to support the content to be promoted by the chatbot. The contents provided by the chatbot were organized into subthemes, the main theme being Primary Health Care in the context of the municipality of Acaraú. The use of chatbots provide new perspectives in the form of health promotion in the use of technological and innovative resources.
Descriptors: *Primary Health Care; Natural Language Processing; Information Technology.*

RESUMO
Construir um chatbot para a promoção da Atenção Primária à Saúde (APS) para os Agente Comunitários de Saúde (ACS) da Estratégia Saúde da Família de um município do Ceará. Estudo metodológico, de produção tecnológica de um chatbot. Para a construção da tecnologia foram seguidas as etapas de Planejamento sendo realizada uma pesquisa exploratória com 143 ACS trabalhadores da ESF do município. Após, se definiu os objetivos, a avaliação de riscos e o desenvolvimento da tecnologia. O desenvolvimento foi realizado através do Dialogflow com integração ao canal de comunicação Telegram. Foram obtidas 79 respostas para subsidiar o conteúdo a ser promovido pelo o chatbot. Os conteúdos fornecidos pelo chatbot foram organizados em subtemas, sendo o tema principal a Atenção Primária à Saúde no contexto do município de Acaraú. O uso de chatbots proporcionam novas perspectivas na forma de promoção de saúde no aproveitamento de recursos tecnológicos e inovadores.
Descritores: *Atenção Primária à Saúde; Processamento de Linguagem Natural; Tecnologia da Informação. Comunicação.*

RESUMEN
Construir un Chatbot para la promoción de la Atención Primaria de Salud para los Agentes Comunitarios de Salud (ACS) de la Estrategia Salud de la Familia de un municipio de Ceará. Estudio metodológico de la producción tecnológica de un chatbot. Para la construcción de la tecnología se siguieron las etapas de Planificación, realizándose una investigación exploratoria con 143 trabajadores de ACS del ESF del municipio. Después, se definen los objetivos, se evalúan los riesgos y se desarrolla la tecnología utilizando la herramienta Dialogflow con integración en el canal de comunicación Telegram. Se obtuvieron 79 respuestas para apoyar el contenido que debía promover el chatbot. Los contenidos proporcionados por el chatbot se organizaron en subtemas, siendo el tema principal la Atención Primaria de Salud en el contexto del municipio de Acaraú. El uso de chatbots proporciona nuevas perspectivas en la forma de promoción de la salud en el uso de recursos tecnológicos e innovadores.
Descriptores: *Atención Primaria de Salud; Procesamiento del lenguaje natural; Tecnología de la información y la comunicación..*

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INTRODUCTION

Primary Health Care (PHC) is the main gateway to the Unified Health System (SUS) and the center of communication with the entire Health Care Network (RAS), that is, it works as a filter capable of organizing the flow of services in health networks, from the simplest to the most complex [1].

The role of Primary Health Care as a facilitator of access has been discussed by authors over the years, where cultural conceptions about knowledge of actions and services that are offered by PHC and the curative conception present in collectivities, in fact knowing which the role of APS [2].

The Community Health Agents (ACS) are health professionals of great importance in the context of promoting the health of the PHC of the subjects in their territory and who transit between the spaces of the community and government as interlocutors [3], in the dissemination of knowledge.

Among the various forms of dissemination and sharing of information currently used, Information and Communication Technologies (ICT) stand out [4]. Given the current "information age", information technology has become a natural part of everyday life [5] Among the technologies used, the Chatbot (conversation agent) has been gaining ground in people's daily lives, being used more commonly in commerce and companies, which allow communication with people through the application of Artificial Intelligence (AI)[6].

Chatbots are digital tools that can be voice-based or text-based, and sometimes a combination of the two. A chatbot may be able to respond through spoken language, be it a voice or text message [7]. In the midst of pandemic circumstances, chatbots have gained space in communication between people around the world, starting to be used more widely, in the field of health, especially in the area of mental health, and care for the elderly[8].

That said, emphasizing the extreme need to publicize PHC and its configurations, the present study proposes the following guiding question: How to develop a chatbot for Community Health Agents in promoting knowledge of Primary Health Care?

Faced with the extreme need to strengthen PHC in the SUS scenario and its recognition by the professionals who form it, in short, the ACS, the present study aims to build a chatbot to promote knowledge of Primary Health Care for Agents Health Programs of the Family Health Strategy (ESF).

METHODS

This is a methodological study of technological production. Methodological research seeks to investigate, organize and analyze data in order to build, evaluate and validate instruments and research techniques, with the aim of developing a new product, activity or service [9].

The present study uses as a method, the Spiral Model for the construction of the software. The model was proposed by Barry Boehm in 1988, characterized by allowing risk analysis at each phase of software construction [10]. Furthermore, the spiral model allows for prevention and tolerance for changes, in order to provide greater management and reduction of risks [10].

For the construction of the technology, steps were followed, the initial phase being called Planning, which consisted of bibliographical research in the literature on the subject and research to collect information with the target audience, in order to support the construction of the chatbot.

In the bibliographical research in the literature, the existence of chatbots in the promotion of knowledge about PHC was verified, available free of charge in virtual libraries such as ACM Digital Library, BDENF, Google Schoolar, MEDLINE, Periódicos Capes, SCieLo, Science@Direct, Springer Link.

In the search carried out in libraries, 802 articles were found using the keywords: chatbots AND health AND healthcare. When reading the titles and abstract, 91 articles were included for reading in full text. Of these, none of the articles specifically addressed the use of chatbots in PHC. Of the studies found about the construction of a chatbot, the themes found were about the promotion of self-care in the context of nutrition and mental health in the vast majority, these being international studies.

In gathering information, an exploratory survey was carried out with the 143 CHAs of the ESF in the municipality of Acaraú, CE, with the purpose of investigating the existence of doubts and gaps about the PHC. The research was carried out using the Google Forms tool, obtaining 79 free and spontaneous responses, of which they felt the desire to participate in the research and who did not have limited knowledge in using the electronic means to respond to the questionnaire.

The exploratory research listed two categories, characterization data (sociodemographic and professional experience) and self-reported knowledge about PHC. About the characterization data, 36.7% were aged between 30 and 40 years old, with up to 5 years in the profession (51.9%) and with complete elementary education (75.9%).

 In the category about self-reported knowledge about PHC, 81% said they understood PHC and 71.3% reported having confidence to carry out their study, where 88.6% participated in training in their training process. Regarding doubts about PHC, 28.6% showed doubts about guidelines regarding referrals at the municipal level, 21.7% about the objectives of PHC in the SUS and 15.7% about the identification of services that make up PHC.

Regarding the chatbot acceptability category, 97.5% would use a chat-type technology to remove doubts about the PHC. As for the content of the chatbot, the most frequent doubts were flagged about the referral guidelines that the PHC performs, followed by the objectives of the PHC in the SUS.

After completing the planning phase, the phase of defining objectives and risk assessment began. Such steps took place through the organization of the content subsidized by the planning phase. The most relevant topics about PHC were established and, based on them, the selection of content to be inserted in the chatbot through the gaps evidenced in the exploratory research in the category self-referred knowledge of PHC based on the National Primary Care Policy.

For the organization of the content, the entities, requirements, conversation flow with the specific points of the chatbot content were defined, as well as the restrictions and risks present in the construction, such as possible errors through the conversation flow, such as, for example, in the inadequate understanding of the bot upon the question asked by the user.

Once that was done, the development phase began, with the construction of the chatbot itself. Mentioning an intelligent SUS, the chatbot was titled SUSi to strengthen the Unified Health System. For the construction of SUSi, the free tool Dialogflow from Google was used. Dialogflow is a natural language processing platform that makes it easy to design and integrate a conversational UI with mobile apps, web apps, devices, bots, interactive voice response systems, and 11 others.

Dialogflow makes use of machine learning for its conversational agents, a technique that allows learning from a set of data, in this case, without the power to create content, but with the ability to interpret, within a knowledge base, what is the intention of a user's sentence. By definition, the intent of a message processed by a chatbot is the subject of the conversation.

After building the chatbot, it was integrated into the "Telegram" communication channel, making it available for user access. This channel was chosen because Dialogflow provides support for integration with this means of communication and because it is free to use Telegram's Application Programming Interface (API).

All research steps were observed regarding the requirements of Resolution 466/2012 of the National Research Ethics Commission (CONEP/CNS/MS), which regulates research with human beings. The research was approved by the Ethics and Research Committee (CEP) of the Escola de Saúde Pública do Ceará-ESP/CE, approved under opinion No. 5,749,880 in November 2022.

RESULTS

CHATBOT APPEARANCE

The construction of the SUSi chatbot, using the Dialogflow application as a construction tool, initially it was necessary to create a base of intentions, that is, phrases that represent the questions of any user. This base of intentions served to feed what the chatbot should respond to, as shown in figure 1.

Figure 1: Example of intentions registered at SUSi. Acaraú-Ceará, 2022.

*(SUSi) Welcome / (listened to APS podcast) What is a podcast?/ Help / Welcome / Chinging / How does PHC promote health and prevent disease? / How can I access CAPS / How to get access to the Best at Home team?/ How is the work of the CHA with the Nurse.
Source: *Dialogflow*, 2022.

Each intention created in the tool has two main points as shown in figure 2. Highlighted in green are the training phrases for the intention. This means that if the user sends a message to the bot with any phrase similar to the training phrases, the bot will understand that that intent was triggered. Highlighted in blue are the responses that the bot will give to the user when that intent is triggered.

Figure 2 - Training phrases and responses of an intention. Acaraú-Ceará, 2022.
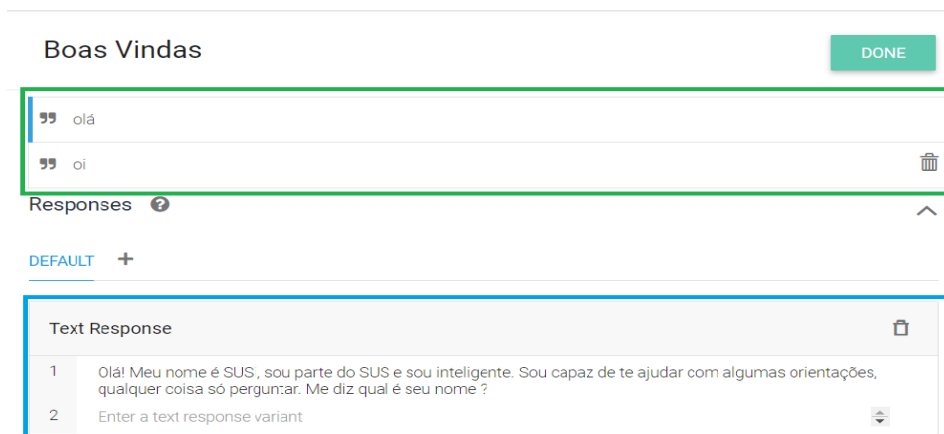
Source: Dialogflow, 2022.

After these steps, the bot was available for use by any user within the Telegram platform. It should be noted that the changes made to the intentions in Dialogflow are reflected in real time for the bot in Telegram, and it is not necessary to unlink the chatbot from Telegram for edits such as inclusion or exclusion of content.

APPEARANCE OF CHATBOT

The chatbot created has Telegram's own screen design as a background. Being its avatar, the female figure named SUSi. The caricature created has representative traits of Brazilian women, with black skin color,

curly and short hair, wearing eyeglasses and being a nurse. She wears a blue uniform for the nursing category, using the colors of the SUS slogan as a reference, and also has a "SUSi" identification badge, as shown in Figure 3.

Figure 3 - Caricature of the avatar SUSi . Acaraú- Ceará, 2022.

Source: Author, 2022.

The image of the SUSi avatar was displayed in the profile picture as a contact, as well as during the conversation flow between the chatbot and the user, allowing a better characterization of the product and providing a more sociable and friendly environment between the chatbot and the human being.

CONTENTS OF CHATBOT

The amount of text to be triggered by the chatbot was seen as something important, in order not to make the conversation tiresome and that required the user to read for a long time and possibly give up obtaining the requested information. For a better supply of information in the Dialogfllow tool, the contents were organized by subthemes, the main theme being Primary Health Care in the context of the municipality of Acaraú. For a better visualization of the contents, it is proposed to read Table I.

Table 1 – Contents of SUSi.

SUSi CONTENT THEME
Definition of what is APS
Definition of UBS
Resoluteness of the APS
Services of the APS in the municipality
Programs of APS
Family Health Strategy (ESF)
Functions of the APS
Operation of the UBS
Shares offered by APS
Access to other services (CAPS and Better at Home Program)
Community Health Agent (ACS)

Source: Author, 2022.

To access the chatbot, the user must initially download the Telegram channel from the apple store or play store. Once this is done, it is necessary to search for the virtual contact of the "SUSi" bot in Telegram. Through SUSi's identified contact, the user can initiate a conversation flow with the chatbot.

DISCUSSION

The literature shows the increase in the use of chatbots in the field of health, with 91 articles being classified as technological instruments in the promotion of self-care worldwide. However, the lack of use of technology as a means of disseminating information about specific health services and systems is perceived, in short, about PHC. Furthermore, the existence of PHC takes place in the Brazilian context, which also highlights gaps regarding the lack of chatbots in Brazil aiming to promote this level of health care.

The studies found in the bibliographical survey served as a basis to justify the choice of using the chatbot in this little-explored aspect, adding the item innovation in the informative function of the SUSi chatbot in promoting knowledge about services and levels of health care.

In Brazil, the lack of dissemination of health services to the population has an impact on the fulfillment of health as a right, on adequate access and on the resolute search for the health service according to the needs of the population, as well as on the appreciation of the SUS as a health care system. health and PHC as coordinator and orderer of the network [12,13,14]

This aspect is evidenced in the survey of information with the ACS about the "Self-reported knowledge about PHC", most professionals (81%) understand what Primary Health Care is. However, when presenting the specifics of the PHC, there are doubts in points considered crucial for the understanding of the subject, and 28.6% showed doubts about the guidelines regarding referrals at the municipal level, 21.7% about the objectives of the APS in the SUS and 15.7% on identifying the services that make up the APS, although 88.6% have gone through training processes.

Thus, it is noticed that the understanding of the levels of health care, as well as the health system itself, sometimes become unsatisfactorily known by the health workers themselves, with a superficial understanding of specific subjects of the operating health services.

This fact can be reflected in the light of Functional Health Literacy (LFS), defined by the degree that individuals have to obtain, process and understand basic information and services necessary for making appropriate decisions in health, with regard to, to health professionals and users [15].

It is noteworthy that the LFS is related to socioeconomic factors, access to education and adequate literacy 15. The CHAs, in turn, have a varied level of education, from elementary school to complete higher education, most of which are at the level average level of education (75.9%), which, in general, do not have specific training in teaching about the SUS and the levels of Health Care.

This fact highlights the fragility of these professionals regarding their knowledge of legislation, laws and the functioning of the SUS, which directly impacts assistance and the dissemination of information to the population, since they also develop the role of disseminating the health services they operate[16].

Still, the CHA's education generates reflections regarding the use of the chatbot as a resource to remove doubts, it is necessary to know how to use a tool like virtual chat, which can be remedied with the investment in Permanent Education of these professionals regarding the use of new technologies. Just as, for the conversation to flow and the doubt to be removed about PHC, it is necessary to ask a key question, which will require prior knowledge about the subject.

CONCLUSION

The use of chatbot-type tools provide new perspectives in the form of health promotion, especially in the use of technological and innovative resources common to other areas of knowledge, providing transdisciplinarity in the sharing of knowledge.

The creation of the SUSi chatbot is presented as an innovative resource in promoting knowledge about Primary Health Care and its strengthening within the SUS, especially in Brazil, where there is a vast use of PHC by the population. On the other hand, there is still a need to disclose its role and configurations at this level of Health Care, especially to professionals working in the SUS.

As future studies, it is intended to expand the intentions and information of the SUSi knowledge base, making it more robust in the sense of disseminating knowledge on broad subjects with regard to health for the population.

It is hoped that the present study can contribute to a more well-known and publicized SUS, in order to contribute to a more resolute and organized Primary Health Care, given its real role understood by society.

REFERENCES

1. Ministério da Saúde (BR). Conselho Nacional de Saúde. 8ª Conferência Nacional de Saúde: Quando o SUS ganhou forma. Ministério da Saúde [Internet].Brasília:2020.Disponívelem:https://conselho.saude.gov.br/ultimas-noticias-cns/592-8-conferencia-nacional-de-saude-quando-o-sus-ganhou-forma

2. Azevedo ALM, Costa AM.[The narrow entrance door of Brazil's National Health System (SUS): an evaluation of accessibility in the Family Health Strategy]. Interface - Comunic., Saúde, Educ. 2010.14(35). DOI: https://doi.org/10.1590/S1414-32832010005000029

3. Ministério da Saúde (BR). Secretaria de Atenção Primária à Saúde. Agente Comunitário de Saúde. Brasilia:2021.Disponível em: https://aps.saude.gov.br/ape/esf/esf/composicao

4. Ministério da Saúde (BR). Secretaria Executiva. Departamento de Monitoramento e Avaliação do SUS. Política Nacional de Informação e Informática em Saúde . Ministério da Saúde. Brasília : 2016. Disponível em: https://bvsms.saude.gov.br/bvs/publicacoes/politica_nacional_infor_informatica_saude_2016.pdf

5. Rezende DA, Abreu AF. Tecnologia da Informação Aplicada a Sistemas de Informação Empresariais. São Paulo: Atlas, 2000.

6. Bansal H Khan R. [A review paper on human computer interaction]. International Journal of Advanced Research in Computer Science and Software Engineering. 2018. 8(53). DOI: http://dx.doi.org/10.23956/ijarcsse.v8i4.630.

7. Fadhil S. Gabrielli FB. [Addressing Challenges in Promoting Healthy Lifestyles: The AI-Chatbot Approach]. Pervasive Health [online] 2017, março. 261-265. Disponível em : https://www.researchgate.net/publication/316141692

8. Palanica A, Fossat Y. [COVID-19 has inspired global healthcare innovation]. Can J Public Health.2020. 111:645–648. DOI: https://doi.org/10.17269/s41997-020-00406-2 /

9. Polit DF , Beck CT. Fundamentos de pesquisa em Enfermagem: avaliação de evidências para a prática da Enfermagem. 9. ed. Porto Alegre, Artmed, 2019.

10.Sommerville I. Software Engineering. 9ª ed. Pearson Education , 2011.

11.Google Cloud. Dialogflow. 2022. Disponível em: https://cloud.google.com/dialogflow/docs?hl=pt-br

12.Kulicz TK, Uscocovich, KJSO. Perfil de atendimento em unidades de pronto atendimento em um município do oeste paranaense. Revista de Saúde Pública do Paraná [online]. 29 nov.2021 [citado 8dez.2022];4(3):96-04. Disponível em: http://revista.escoladesaude.pr.gov.br/index.php/rspp/article/view/526

13.Souza, GCA. Costa, IC. O SUS nos seus 20 anos: reflexões num contexto de mudanças. Saúde Soc. São Paulo. 2010. 19 (3), 509-517 p. DOI: https://doi.org/10.1590/S0104-12902010000300004

14.Silva AM, Cordeiro CG. Costa GC, Caetano DAM, Alves MS, Sanches VS, Chistofoletti, G. O conhecimento da população sobre o Sistema Único de Saúde e seu funcionamento. In: Supl. - Anais do XXIV Fórum Nacional de Ensino em Fisioterapia e I Congresso Brasileiro de Educação em Fisioterapia, 2014. 1(1).

15.Passamai, MPB et al. Letramento funcional em saúde: reflexões e conceitos sobre seu impacto na interação entre usuários, profissionais e sistema de saúde. Interface (Botucatu). 16 (41) Jun 2012. DOI: https://doi.org/10.1590/S1414-32832012005000027

16.Oliveira HM, Garcia JS. Conhecimento dos Agentes Comunitários de Saúde da Fronteira Franco-Brasileira sobre a Atenção Básica. Revista Pesquisa Qualitativa [online]. São Paulo (SP), v.7, n.15, p.473-489,dez.2019. Disponível em :https://editora.sepq.org.br/rpq/article/view/242/17