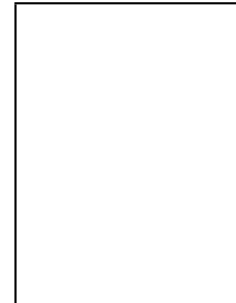


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UNLOCKING THE POTENTIAL OF DIGITAL HEALTH IN PORTUGUESE CARDIOVASCULAR DISEASE MANAGEMENT

DESBLOQUEAR O POTENCIAL DA SAÚDE DIGITAL NA GESTÃO DA DOENÇA CARDIOVASCULAR EM PORTUGAL

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Cardiovascular diseases (CVD) remain a leading cause of disability and mortality in Portugal, and require innovative approaches to enhance management and outcomes. Despite advances in medical interventions and therapies, the prevalence of CVD continues to rise, posing significant challenges to the Portuguese healthcare system (1,2). However, there is a beacon of hope. Driven by the COVID-19 pandemic, digital health technologies have emerged as promising tools in CVD management, revolutionizing traditional healthcare practices (1,3).

Now, imagine a free app managed by the Portuguese Ministry of Health that provides interoperability between the Portuguese healthcare system, and allows actively managing their health data documentation. Welcome to the SNS24 App, your ally in cardiovascular health.

Digital health involves using information and communication technologies to treat patients and promote healthy lifestyles, conduct research, educate healthcare professionals, and monitor diseases and public health. It includes e-learning, structured telephone support, wearable devices, telemedicine platforms, remote monitoring systems, and mobile health applications (2).

By empowering patients to actively participate in their care journey, digital health promotes self-management behaviors and adherence to treatment regimens, improving clinical outcomes and reducing healthcare costs. Also, it enables healthcare providers to monitor patients' progress remotely, identify high-risk individuals, and tailor interventions based on real-time data, optimizing resource allocation and improving the efficiency of healthcare delivery (4). Besides, digital health facilitates data integration and interoperability, enabling a seamless exchange of information between patients and healthcare professionals, thereby fostering collaborative decision-making and improving care coordination (5).

Despite the potential benefits of digital health in CVD management, several challenges must be addressed, such as digital literacy and interoperability (2,3,6).

Low digital health literacy is a major barrier (1,3,7). In Portugal, 53% have a problematic or inadequate level of digital health literacy and 66% have a problematic or inadequate level in navigating the health system. It is, therefore, crucial to promote digital health literacy not only among patients, but also among health professionals, by "reaching people" directly or through micro-influencers, using "people activation" practices, and creating contexts of opportunity (7).

Interoperability ensures continuous communication and data exchange among different healthcare platforms, devices, and stakeholders. It allows healthcare providers to access patient data from various sources in real-time, to more informed clinical decision-making, leading to improved patient outcomes and safety. Also empowers patients to access their health information, communicate with their providers, and actively participate in their care. This promotes patient engagement, shared decision-making, and ultimately, better health outcomes. So, interoperability solutions promote accuracy and accessibility and improve care quality (6).

To address these challenges, the National Strategic Telehealth Plan 19-22 proposed some activities (8):

- Ensuring the sourcing method for telehealth services is aligned with the institution's contracting process;
- Enhancing the networking of health professionals;
- Creating a "Living Lab" for knowledge creation;
- Simplifying the governance model of telehealth activities;
- Ensuring information security and interoperability;
- Replacing the current teleconsultation tool with video call capabilities;
- Defining indicators to monitor and evaluate SNS telehealth services;
- Creating structured training for health professionals, patient associations, and other stakeholders.

Aligned with this plan, the SNS24 App (Figure 1) is a mobile application that allows citizens to access a wide range of digital health services such as test results and vaccination records, book appointments, carry out scheduled teleconsultation, renew usual medication, access exam prescriptions, and make health records. This not only streamlines the citizen experience, but also enables better treatment coordination.

With over 9 million app downloads and more than 65 million portal visits, it is already a reference in accessibility to digital health, receiving recognition for its innovative nature (9).

SNS24 was integrated with several electronic clinical records systems used in hospitals and health centers. For example, when a citizen contacts SNS24, the healthcare professional can immediately access the patient's data, such as medical history, allergies and current medications, improving the quality and speed of care. In emergencies, patient information is transmitted directly to the corresponding emergency service, which ensures a faster and more adequate response, improving the quality and speed of care (9).

Additionally, interoperability with the electronic prescription platform (PEM) allows prescriptions to be sent directly to pharmacies and laboratories. This process simplifies obtaining medication and conducting laboratory tests, reduces errors associated with manual prescriptions, and enables physicians to access test results in real-time, speeding up diagnosis and treatment (9).

In Portugal, significant progress has been made with electronic prescriptions (PEM), electronic health records (RSE), and the MySNS app. These advancements have improved efficiency and patient care. However, more work is needed, especially in achieving data interoperability between public and private entities (10).

Despite its potential, many citizens and healthcare professionals are not aware of the SNS24 App functionalities. Several strategies have been adopted to publicize it among citizens, mostly to prevent unnecessary use of the healthcare system. A recent study showed that the majority of cardiovascular health professionals in Portugal are not involved in digital health projects and are unaware of digital initiatives in their workplaces (3). But, are these professionals aware of the potential of this application for cardiovascular disease management?

To fully harness the potential of the SNS24 App in CVD management, it is essential to provide adequate training to healthcare professionals and promote citizen digital literacy. Additionally, encouraging continuous feedback on app usage is crucial to ensure it is optimized according to user needs. Therefore, it is imperative to prepare healthcare institutions with the resources needed to support teleconsultations and other digital health services, ensuring equitable access to digital health solutions for all citizens.

John's journey with SNS24 App: A case study

Meet John, a 38-year-old man from Coimbra, who was recently diagnosed with hypertension. During his appointments at the primary healthcare center (PHC), John's healthcare provider introduced him to the SNS24 App. After discussing the best treatment for hypertension, John and his healthcare provider agreed that he would try perindopril 5 mg once a day for two months. Over this period, John diligently measured his blood pressure and recorded it on the SNS24 App (Figure 2).

Since his diagnosis, John has made significant lifestyle changes, including returning to regular physical activity, maintaining a healthier diet, and faithfully taking his prescribed medication. After two months of consistent management, John requests to renew his prescription.

His general practitioner, analyzing the data entered in the SNS24 App (Fig. 3), confirms a positive evolution in John's blood pressure values. Not only has John's commitment to lifestyle changes and medication adherence yielded positive results, but he has also experienced no side effects from the medication.

Without the need for John to visit the PHC, his prescription is renewed for another six months, optimizing healthcare resources. A new appointment is scheduled for John to review his progress in two months, ensuring continuous monitoring and management of his hypertension. It was not possible to schedule a teleconsultation, as the PHC does not have the necessary resources.

This successful outcome demonstrates the transformative impact of digital health technology on cardiovascular disease management. By empowering individuals like John to participate actively in their care journey and providing healthcare professionals with accurate, real-time data through platforms like the SNS24 App, we can optimize healthcare outcomes and improve overall quality of life for patients.

John's story serves as proof of the potential for digital health solutions to revolutionize healthcare delivery, promoting preventive measures, and achieving better clinical outcomes in the management of cardiovascular diseases. Through continued support, education, and innovation, we can pave the way for a healthier future for individuals like John.

The SNS24 App offers a unique opportunity to improve cardiovascular and other disease management in Portugal.

1. Campos Fernandes A, Abreu A, Pinto F, et al. Contributions to the improvement of healthcare management for cardiovascular patients in Portugal. *Rev Port Cardiol.* setembro de 2022;41(9):791–3.
2. Frederix I, Caiani E, Dendale P, et al. ESC e-Cardiology Working Group Position Paper: Overcoming challenges in digital health implementation in cardiovascular medicine. *Eur J Prev Cardiol.* julho de 2019;26(11):1166–77.
3. Queiroz C, Guerreiro C, Oliveira-Santos M, et al. Digital health and cardiovascular healthcare professionals in Portugal: Current status, expectations and barriers to implementation. *Rev Port Cardiol.* 2024;S0870255124000738.
4. Azizi Z, Golbus J, Spaulding E, et al. Challenge of Optimizing Medical Therapy in Heart Failure: Unlocking the Potential of Digital Health and Patient Engagement. *J Am Heart Assoc.* 2024;13(2):e030952.
5. European Commission. Directorate General for Health and Food Safety., Open Evidencece., EY., Politécnica LifeStech. Study on health data, digital health and artificial intelligence in healthcare. [Internet]. LU: Publications Office; 2022 [cited 18.03.2024]. Available from: <https://data.europa.eu/doi/10.2875/702007>.
6. Torab-Miandoab A, Samad-Soltani T, Jodati A, et al. Interoperability of heterogeneous health information systems: a systematic literature review. *BMC Med Inform Decis Mak.* 2023;23(1):18.
7. Arriaga M, Santos B, Leiras G, et al. Plano Nacional de Literacia em Saúde e Ciências do Comportamento 2023-2030 — Plano Estratégico. 2023. Available from: https://www.researchgate.net/publication/371901961_Plano_Nacional_de_Literacia_em_Saude_e_Ciencias_do_Comportamento_2023-2030_-_Plano_Estrategico.
8. Martins H, Monteiro M, Loureiro P, et al. National Strategic Telehealth Plan 2019-2022 (PENTS). :2019. [cited 20.05.2024]. Available from: https://www.cnts.min-saude.pt/wp-content/uploads/2019/12/PENTS_EN.pdf.
9. SNS. SPMS [Internet]. [cited 20.05.2024]. Available from: <https://www.spms.min-saude.pt/>.
10. Movimento pela utilização digital ativa. Estudo sobre os serviços digitais no setor da saúde em Portugal [Internet]. 2021 [cited 20.05.2024]. Available from: https://www2.deloitte.com/content/dam/Deloitte/pt/Documents/life-sciences-health-care/MUDA_Deloitte_Roche%20-%20Digitaliza%C3%A7%C3%A3o%20no%20setor%20da%20sa%C3%BAde%20-%20Estudo%20Vfinal.pdf.

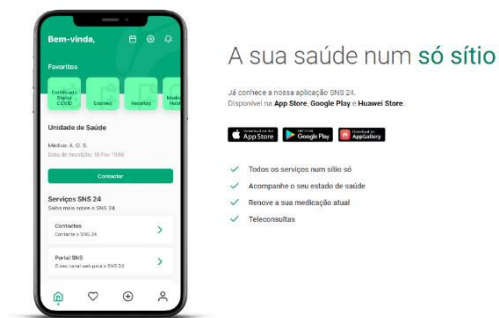


Figure 1 – SNS24 App (9)

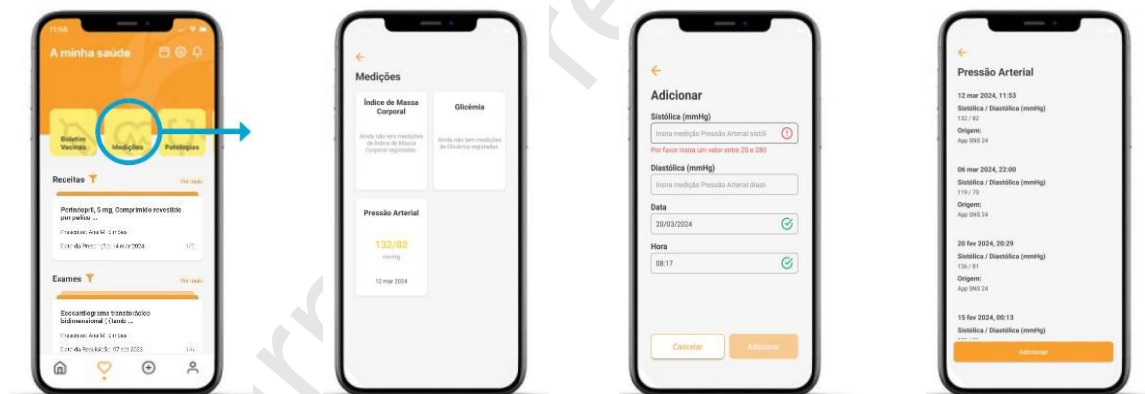


Figure 2 – How to enter health records on the SNS24 app.

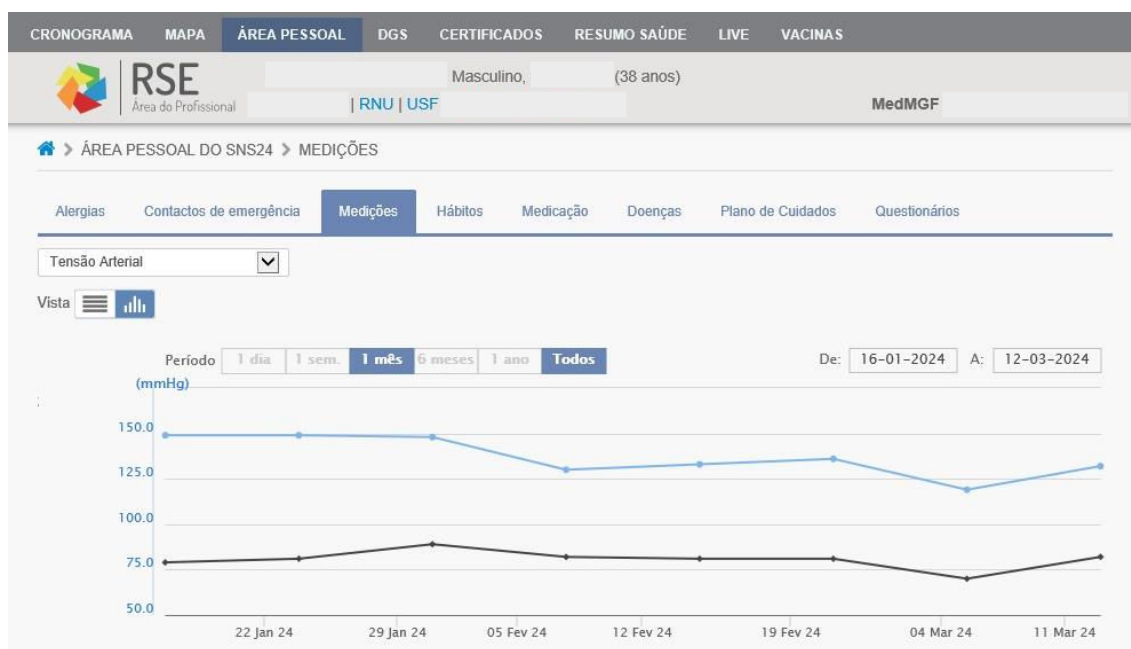


Figure 3 – How to access health records entered on the SNS24 app.