

MYeHealthAppCY: A Healthcare Mobile Application in Cyprus

Louiza AGROTI^a, Ionut - Cristian CANCIU^a, Marios CHRISTODOULOU^a, Maria PAPAIOANNOU^{a,1}, Andreas NEOCLEOUS^a, Panayiotis SAVVA^a, Constantinos YIASEMI^a, Theodoros SOLOMOU^a, Andreas PANAYIDES^b, Zinonas ANTONIOU^b, Marios NEOFYTUO^b, Ioannis CONSTANTINO^b, and Constantinos S. PATTICHIS^a

^a*Department of Computer Science, University of Cyprus, 1 Panepistimiou Avenue.*

2109 Aglantzia, Nicosia, Cyprus

^b*3ahealth, 19 Hadjigeorgaki Kornesiou. 2361 Agios Pavlos, Nicosia, Cyprus*

Abstract. This paper presents MYeHealthAppCY, an mHealth solution designed to provide patients and healthcare providers in Cyprus with access to medical data. The application includes features such as an at-a-glance view of patient summary, comprehensive prescription management, teleconsultation, and the ability to store and access European Digital COVID Certificates (EUDCC). The application is an integral part of the eHealth4U platform targeting to implement a prototype EHR platform for national use. The application developed is based on FHIR and follows a strict adherence to widely used coding standards. The application was evaluated receiving satisfactory scores; however, significant work is still needed to deploy the application in production.

Keywords. Electronic Health Record, EHR, FHIR, Interoperability, Cross border services, International Patient Summary, Patient Summary, mHealth

1. Introduction

This paper presents MYeHealthAppCY, an mHealth solution designed to provide patients and healthcare providers in Cyprus with access to medical data. The application includes features such as an at-a-glance view of patient summary, comprehensive prescription management, teleconsultation, and the ability to store and access European Digital COVID Certificates (EUDCC)². The application is an integral part of the eHealth4U platform [1], [2], [3], a platform under the led development of the University of Cyprus targeting to implement a prototype EHR platform for national use. The eHealth4U project is funded by the Research & Innovation Foundation of Cyprus via the INTEGRATED call.

The eHealth4U platform [1], [2], [3], covers the interoperable communication of the medical history, the clinical examination, the laboratory and imaging orders and results, as well as the organization of medical teams, locations, consents between patients and practitioners and medical visits. The implementation is based on the International Patient Summary (IPS) Dataset (specified in EN 17269 and ISO/DIS 27269) focusing on the

¹ Corresponding Author: Maria Papaioannou, 1 Panepistimiou Avenue. 2109 Aglantzia, Nicosia, Cyprus.

² EUDCC Portal, <https://www.eudcc.gov.cy/>

implementation of the Patient Summary not only for Europe, but on a global scale. It is mainly designed for “unplanned cross-border care” across national borders but is not limited to it. It contains essential data, including allergies, current problems, and medications. One of the most comprehensive implementations for the IPS is done via the HL7 FHIR standard. The eHealth4U platform implemented the IPS HL7 FHIR and it has recently succeeded award of HL7 FHIR certification via the HL7 FHIR Connectathon (info available at www.HL7.org) in Las Vegas, USA, in January 2023.

In the current EU landscape, a study carried out in the context of the EU project Enabling Patient Access to their Health Data (PATHED) showed that 62.5% of participating member states have some form of mobile eHealth solution [4], whereas almost all countries have a COVID -19 mobile solution [5]. There is need for further development of mobile health apps towards achieving digital health wider adoption [6].

The objective of this work is to introduce the mobile application for the support of the IPS functionality of the eHealth4U platform, named MYeHealthAppCY.

2. Methodology

2.1. eHealth4U Architecture

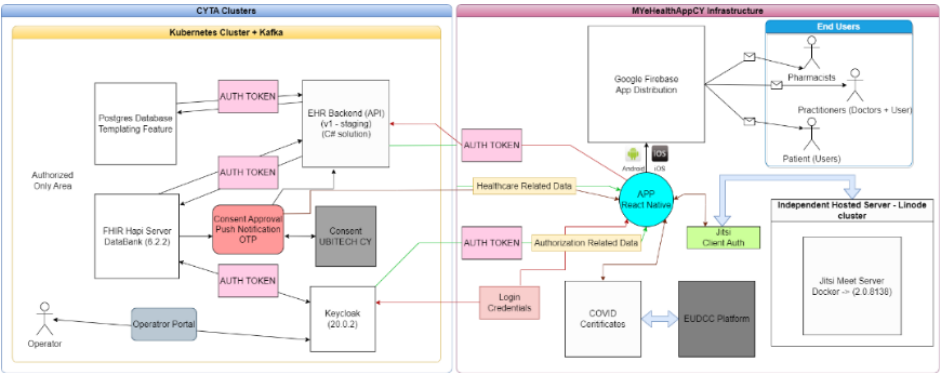


Figure 1. Overall architecture of the eHealth4U platform (left half) and the MYeHealthAppCY infrastructure (right half)

Figure 1 presents, the architecture of the eHealth4U platform [1], [2], [3], incorporating the MYeHealthAppCY infrastructure. MYeHealthAppCY infrastructure is composed of the following four paths: (i) Authentication Related Data; (ii) Healthcare Related Data; (iii) Covid Certificate issuing that is connected to the EUDCC platform; (iv) Jitsi Meet Teleconsultation Module (see [7]). In addition, MYeHealthAppCY is distributed to the three user groups (patients, doctors, and pharmacists) via the Google Firebase App Distribution for Android and iOS versions (.apk and .ipa files respectively). Essentially, when the user interacts with the application, s/he is required to give his/her consent. Specific roles and permissions are applied so that personal data, administrative or clinical are accessible only to authorized users. To increase the security level, every short period of time, an authentication token is generated.

The eHealth4U platform uses the FHIR protocol, providing a standardized method for data exchange, reducing errors, and improving care. Moreover, the SNOMED, LOINC, ICD-11, and ATC/EDQM [8] coding standards that enable semantic

interoperability were implemented. These standards were primarily used in the backend API of the proposed platform, allowing FHIR resources to be mapped and translated into standardized codes. Consistent representation across systems and applications improves data quality and reliability. By utilizing international medical concepts and standards, healthcare professionals can ensure compliance, increasing efficiency and confidence.

2.2. Selected Screen Shots

Selected screen shots of the MYeHealthAppCY are given in Fig. 2.

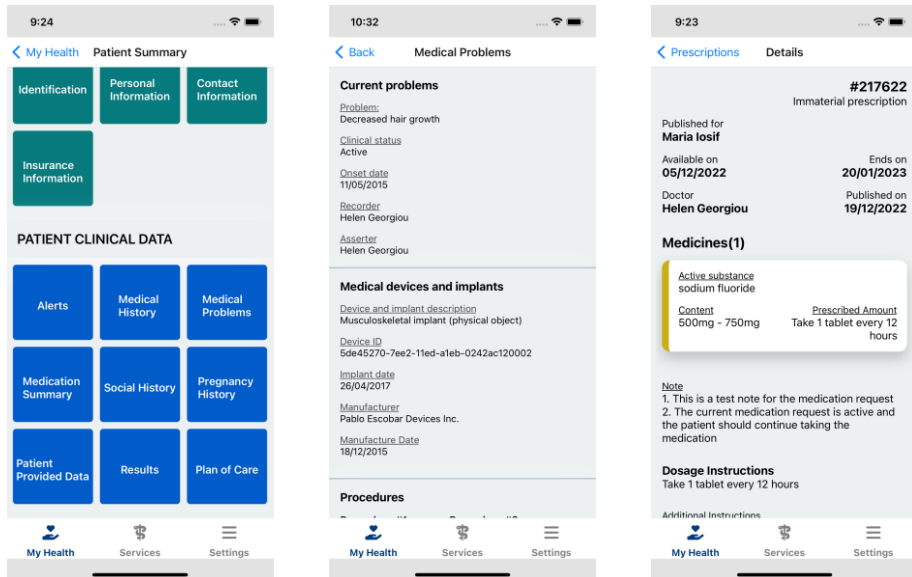


Figure 2. Selected screen shots of the MYeHealthAppCY. Left: IPS overview. Middle: IPS – Medical Problems. Right: Sample ePrescription.

2.3. Evaluation

MYeHealthAppCY functionality was evaluated by 12 patients (10 Android users and 2 iOS users). Seventy-five percent of the users were satisfied with the overall experience whereas 60% of the users found the application very easy to navigate. Users made recommendations mostly about the overall design and user experience like: (i) enhance overall design; (ii) display information in a more coherent way; (iii) selection of better colours; (iv) add accessibility functionality. Moreover, a few problems were reported, such as EUDCC certificate saving was unsuccessful for one user.

3. Concluding Remarks

This paper presents MYeHealthAppCY, an mHealth solution designed to provide patients and healthcare providers in Cyprus with access to medical data. The application includes features such as an at-a-glance view of patient summary, comprehensive

prescription management, teleconsultation, and the ability to store and access European Digital COVID Certificates (EUDCC). The application is an integral part of the eHealth4U platform targeting to implement a prototype EHR platform for national use. The application developed is based on FHIR and follows a strict adherence to widely used coding standards. The application was evaluated receiving satisfactory scores; however, significant work is still needed to deploy the application in the production phase regarding the Data Protection Impact Assessment and connectivity with the Government Data Warehouse for access to the civil registry. Moreover, it should be highlighted that MYeHealthAppCY is aligned with the European Union's target towards the creation of a European Health Data Space [9], so that EU citizens have access and control over their medical data, towards establishing a high-quality European Health System.

4. Acknowledgements

This work was co-funded by the European Regional Development Fund and the Republic of Cyprus through the Research and Innovation Foundation (Project: INTEGRATED/0916/0030).

References

- [1] Neocleous A, Papaioannou M, Savva P, Miguel F, Panayides A, Antoniou Z, Neofytou M, Schiza EC, Neokleous K, Constantinou I, et al. The International Patient Summary: Proposal for a National Implementation for Cyprus. 2022 E-Health and Bioengineering Conference (EHB) [Internet]. 2022; doi: 10.1109/ehb55594.2022.9991445.
- [2] Papaioannou M, Neocleous A, Savva P, Miguel F, Panayides A, Antoniou Z, Neofytou M, Schiza EC, Neokleous K, Constantinou I, et al. A Prototype of the National EHR system for Cyprus. 2021 43rd Annual International Conference of the IEEE Engineering in Medicine & Biology Society (EMBC) [Internet]. 2021; doi: 10.1109/embc46164.2021.9630760.
- [3] Neocleous A. eHealth4U: A DEMO of a National Electronic Health Record for Cyprus. In Proc. of 21st Int. Conf. on Inf., Management, and Technology in Healthcare (ICIMTH) 2023, Jul 1-2, Athens, Greece.
- [4] Lantos Z. Implementing EHDS InteropEHRate, PATHeD and Beyond. Presentation of EU project EU4H-2021-DGA-MS-IBA-02: Enabling Patient Access to their Health Data (PATHED). Accessed Apr. 2023. Available from: [PowerPoint Presentation \(interopehrate.eu\)](https://www.interopehrate.eu/).
- [5] Ming LC, Untong N, Aliudin NA, Osili N, Kifli N, Tan CS, Goh KW, Ng PW, Al-Worafi YM, Lee KS, Goh HP. Mobile health apps on COVID-19 launched in the early days of the pandemic: content analysis and review. JMIR mHealth and uHealth. 2020; doi: 10.2196/19796.
- [6] Mathews SC, McShea MJ, Hanley CL, Ravitz A, Labrique AB, Cohen AB. Digital health: a path to validation. NPJ digital medicine. 2019; doi: 10.1038/s41746-019-0111-3.
- [7] Canciu I-C. Enhancing Healthcare Accessibility: A Teleconsultation Mobile Application for Patient-Centric Care in Cyprus. In Compsystech 2023, Jun 16-17, Russe, Bulgaria, submitted.
- [8] Master Value Catalogue - PSB Data Catalogue [Internet]. Master Value Catalogue - Dataset - PSB Data Catalogue. Available from: <https://datacatalogue.gov.ie/dataset/master-value-catalogue>.
- [9] European Health Data Space [Internet]. Public Health. 2023. Available from: https://health.ec.europa.eu/ehealth-digital-health-and-care/european-health-data-space_en.