Patient Portal and Central Registry of Patient Data: leading accelerators of healthcare digitalisation in Slovenia

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***Abstract*— Slovenia is one of the most digitally advanced nations in Europe when it comes to healthcare. The previous years have seen a significant progress in the development and use of the eHealth applications, particularly during the COVID-19 pandemic. The zVEM Patient Portal and the Central Registry of Patient Data have made the most notable advancements. This paper presents an in-depth analysis of the functionalities and use of the zVEM Patient Portal and the Central Registry of Patient Data, and additionally investigates how the COVID-19 epidemic has affected the development and use of these two eHealth solutions. The zVEM Patient Portal provides users with secure and reliable access to eHealth services and personal health data, which is retrieved from the Central Registry of Patient Data. The data on use of the zVEM Patient Portal and the Central Registry of Patient Data shows a big jump in 2020 and further exponential growth in 2021. Increased use continues in 2022.**

***Index Terms*-- zVEM Patient Portal, Central Registry of Patient Data, eHealth, digitalisation, healthcare informatics**

I. INTRODUCTION

eHealth is the cornerstone of the healthcare digitalisation initiatives in Slovenia. Slovenia is one of the most digitally advanced nations in Europe when it comes to healthcare [1]. The previous years have seen significant progress in the development and use of the eHealth applications, particularly during the COVID-19 pandemic. The zVEM Patient Portal (zVEM) and the Central Registry of Patient Data (CRPD) have made the most notable advancements.

The effective and comprehensive digital transformation of the Slovenian healthcare system is one of the fundamental changes that should contribute to greater success in dealing with the numerous challenges facing Slovenia's healthcare sector. The experiences of developed countries [2,3,4] indicate that successfully implemented projects of digitalising healthcare have exceptional strategic importance for the further development of the healthcare system, and they also point to broader implications centred around increased social well-being and economic growth [5].

eHealth, which has been led by the National Institute of Public Health (NIPH) since 2015, is one of the key long-term goals of the public sector in Slovenia. Despite certain challenges, great progress has been made in the field of eHealth solutions in the last years. The COVID-19 epidemic has in many ways marked the development of the entire healthcare informatics in Slovenia. The paper presents an in-depth analysis of the functionality and use of the zVEM web portal and the CRPD in the last years, especially during the COVID-19 epidemic. Today, this is without a doubt the most complex public information system in Slovenia. The use of the zVEM and the CRPD has been growing exponentially in the last two years. Although eHealth solutions have undergone unprecedented development in recent years, much effort will have to be made by all stakeholders in the future and additional human and material resources will have to be provided, if we want to maintain progress and perhaps even accelerate the development trend in healthcare informatics in Slovenia.

II. MATERIAL AND METHODS

This paper presents an in-depth analysis of the functionalities and use of the zVEM and the CRPD, and additionally investigates how the COVID-19 epidemic has affected the development and use of the zVEM and the CRPD solutions. This is an extreme example of the development process in the field of eHealth solutions in Slovenia, which was highly accelerated during the COVID-19 period, suggesting that the pandemic was a particular opportunity for rapid advancement in the digitalisation domain. The in-depth analysis presented in this paper was based on the case study research methodology [6,7], which included an in-depth study of the field and its critical analysis.

This article presents an analysis of the functionalities and use of the zVEM and the CRPD in recent years, especially during the COVID-19 pandemic. The analysis performed in this work was based on the case study research methodology and was

conducted in the first half of 2023. On one hand, the analysis included a comprehensive literature review in the field, and examination of project documentation and technical specifications for the zVEM and the CRPD. On the other hand, it was based on the observations, experience, and professional opinions of experts at the NIJZ who are managing the eHealth system (including the zVEM and the CRPD), along with the actual statistical data on the use of the zVEM and the CRPD from the administrative and business intelligence modules.
This paper focuses on the zVEM and CRPD principally because of their usability and importance both for patients and for healthcare workers, and also because of the major progress in the last years. The synthesis of findings from the literature, user functionalities from the technical documents, statistical reports and the views of the NIJZ experts, enable the formulation of credible conclusions based on verifiable data regarding the highlighted research aims.

III. RESULTS

zVEM Patient Portal

The greatest development in terms of the digitalisation of healthcare in Slovenia in the last years has been observed in the zVEM system [8,9]. The zVEM was designed as a linking service and the central hub of primary eHealth solutions for patients, for enabling secure and efficient access to their referrals, prescriptions, specialist reports and other documents, and online booking of appointments to secondary services and reviewing waiting periods [10]. From the patient's point of view, the development and establishment of the zVEM is certainly one of the major gains in recent decades. Technically, the system was set up in the conclusion of the eHealth project in November 2015, while its full use, with the possibility of registration, was ensured at the beginning of 2017 [11,9]. The zVEM provides users with secure and reliable access to their data in the eHealth databases and access to eHealth services. It also offers users current content in the area of public health [12]. The zVEM was put into successful use at the beginning of 2017, and its use experienced a major step forward in 2020 and again in 2021, with the possibility of printing out the COVID-19 test results and vaccination status, along with the European Digital COVID Certificate. The first digital vaccination certificate could be printed out on 19 March 2021, while the EU Digital COVID Certificate (EU DCC) could be printed from 24 June 2021. Since 13 July 2021 the zVEM application has also been available to mobile phone users, and users have been able to download the application for verifying the EU DCC since 5 August 2021 [9].

Healthcare providers send out specialist reports, discharge letters and data for the Patient Summary. The databases contained within the eHealth system are used to complete data on prescriptions (eRecept), referrals and appointments (eNaročanje) and vaccinations (eRCO). Insurance data is transferred from the national Health Insurance Institute (ZZZS) files. Demographic data is transferred from the Register of Patients and Spatial Units (RPPE), which is regularly updated from the Central Population Register (CRP) and the national Survey and Mapping Administration. Patients themselves can also express their consent, and can make vaccination bookings (Fig. 1).

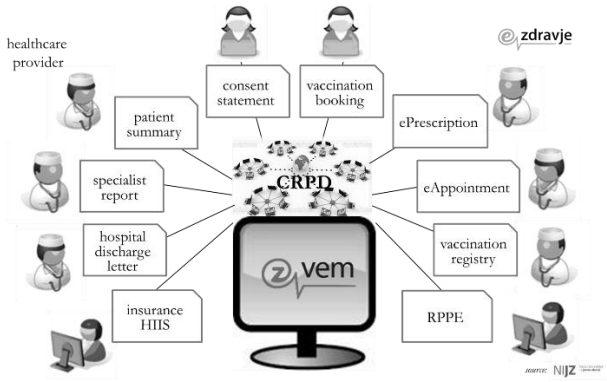

Figure 1. Display of data on the zVEM.

In 2021, the number of registered users of the zVEM increased more than ninefold, reaching 409,900 at the end of 2021. In 2022, the number of registered users is still growing, but at a much slower pace (Fig. 2).

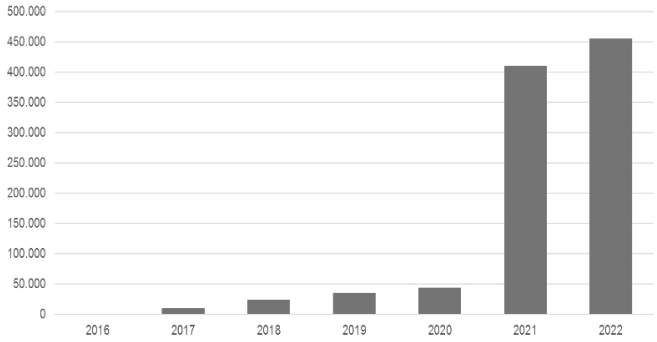

Figure 2. Growth in the number of registered users of the zVEM by year.

The number of unique visits to the zVEM portal also increased exponentially in 2021, reaching 23,975,212 at the end of the year, almost 13 times the number in 2020. The exponential growth is mainly due to the introduction of certificates of testing and certificates of vaccination against COVID-19, and in particular the possibility to print out the EU DCP in July 2021. The high number of visits in 2022 is also recorded in comparison to 2020, although it is down by a third compared to 2021 (Fig. 3).

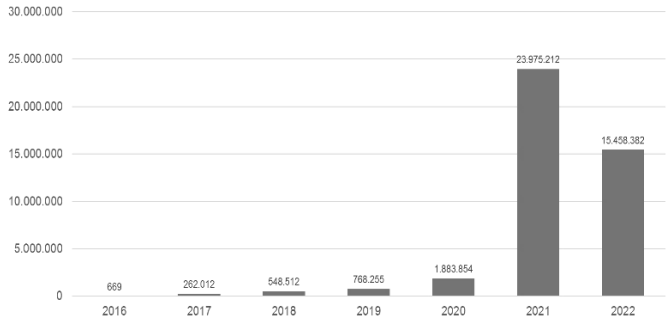

Figure 3: Growth in the number of visits to the zVEM by year

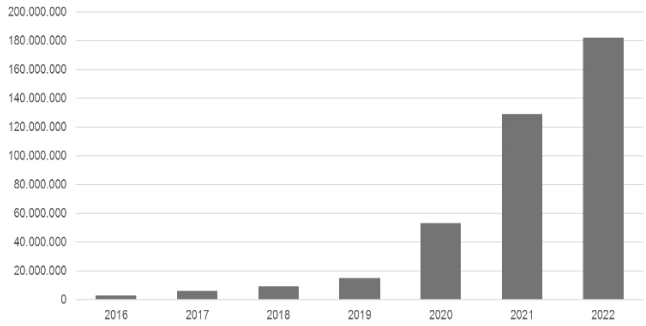

Figure 4. Growth in the number of documents in the CRPD by year.

zVEM plus (zVEM for healthcare providers)

The zVEM plus portal includes various applications, connected to the Slovenian CRPD, which enable the capture of data and its processing, and the issuing of various reports for healthcare providers. It is intended for providers that do not use their own information system for this, such as retirement homes, mobile testing points etc. Some of the most widely used applications of zVEM plus include the OKZ app for the issuing of the Personal medication card and the COVID-19 test app for efficient entry of COVID-tests into the database. In the future, the system will be upgraded to a more fully-fledged appointment management and communication system, through which patients will be able to get appointments, ask for prescriptions and communicate with their health-care providers. The investment was financed by the European Union from the European Regional Development Fund as part of the EU-wide response to the COVID-19 pandemic [10].

The Central Registry of Patient Data – CRPD

The data displayed via the zVEM is drawn from the CRPD. Today, the CRPD contains a database on patients with permanent or temporary residence in the Republic of Slovenia and is the most complex public information system in the country.

Sending data to the CRPD is obligatory under the Health Care Databases Act (ZZPPZ) [13], and thus all healthcare providers are required to use this system. Data is also submitted by concession holders and private operators without a concession. Data processing in the CRPD, access to data, exchange of data for providing medical care and autopsy services, and updating health documentation is regulated by this Act as well [9].

The data on the number of documents in the CRPD shows a big jump in 2020 and further exponential growth in 2021. At the end of 2021, the number of documents in the CRPD has reached 129,010,388. The rapid growth continued in 2022, when the number of documents exceeded 182,000,000 (Fig. 4).

IV. Discussion

The zVEM surely delivers significant benefits to all stakeholders in the Slovenian healthcare system. In addition to the basic benefits of access to eHealth solutions and medical documentation already mentioned, the zVEM is a vital instrument for patient empowerment and directing public health initiatives and communication with the public, especially during the critical times (the COVID-19 crisis). From the patient's point of view, the development and establishment of the zVEM is certainly one of the major gains in recent decades. During the epidemic, the zVEM took on an important role in informing and raising public awareness.

The zVEM and the CRPD are constantly being developed and upgraded, and while this increases their wider usability, it also inevitably increases their complexity. In the time of the epidemic all the upgrades needed to be developed and implemented in the shortest possible time. For some solutions we could use already existing ideas with adjustments, while some needed to be done from the scratch. These developments would not have been possible without previous work on introducing, maintaining and developing the core services of the zVEM, the CRPD, and other eHealth solutions.

All this placed great pressure on the insufficient number of staff in the area of eHealth. This seriously impacts the eHealth budget, since upgrading and developing new services requires both initial investment costs and long-term costs for maintenance and for recruiting new staff members who will ensure the operation of these systems. The COVID-19 epidemic clearly illustrated the importance of the eHealth system for the Slovenian healthcare sector, since it can be asserted without doubt that without the eHealth system individual segments of the healthcare service in Slovenia would have collapsed, and a major portion of the system would be seriously crippled and limited in its operations. The greatest harm in such a situation would be suffered by patients.

The research results revealed that the COVID-19 epidemic had a major impact on the development and use of the zVEM and the CRPD solutions. During the epidemic, use of the eHealth system grew in leaps and bounds, and in some areas increased more than tenfold. Due to the growing requirements of users and needs of the system (patient needs, public health

needs, the needs of healthcare providers, the needs of healthcare policy), numerous existing features were upgraded, and many new functionalities were developed.

V. Conclusions

In recent years, Slovenia's eHealth system has undergone significant development, which was accelerated by the COVID-19 pandemic. The use of some eHealth applications has increased more than tenfold.

This in turn has brought up difficulties that have arisen to a large extent due to the inadequate investment in digitalisation, both in terms of HR and infrastructure, and also with regard to developing existing and new systems. There is relatively low level of awareness of the benefits of eHealth, which has been gradually improving, unfortunately, mainly due to the COVID-19 pandemic. The system was also very much exposed to the poor digital literacy of users, including the most basic use of computer and telecommunications equipment, as well as computer and information literacy and the use of software systems themselves. The digital culture in healthcare institutions needs to be raised, along with the digital competence of all employees. Digital culture is also important for the close cohesion of informatics and other areas of work in organisations, eliminating the traditional divergence. Here, the digital competence of all employees is very important.

The research also implies that the enormous progress that has been made in healthcare informatics over the past few years can only be maintained in the future with the successful promotion of eHealth and significant additional resources. Major efforts will be needed, as well as funds, to maintain and continue the truly huge progress made in healthcare informatics in recent years.

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