eHealth

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Introduction

Digital transformation of healthcare systems, new healthcare technologies, healthcare data and management of data in healthcare are key when talking about strengthening the role of citizens in taking care of their own health, as well as for building a healthier society.
The Digital Agenda for Europe is becoming more important, especially as a result of the COVID-19 pandemic. Namely, during the breakout of the coronavirus pandemic across the world and in the EU, there has been a significant increase in the use of digital tools and solutions in the healthcare system, from virtual congresses, online roundtables, webinars and teleconsultations, chatbot applications, digital AI assistants for communication with citizens, a wide range of mobile applications to help with chronic conditions, applications to other digital solutions for prescribing prescriptions and renewing chronic disease therapy or delivering of medicine, IT solutions for sharing epidemiological data etc. Let us mention a Croatian example of these good practices that comes in the form of Andrija.AI - the first digital assistant in the fight against the coronavirus, as well as ONKORONA - an informative digital platform for oncological patients during COVID-19.

In June of last year during the Croatian Presidency EU2020HR, the European Commission issued their Shaping Europe's Digital Future decisions, in which they stated that the European Commission:

- RECOGNIZES the key role of digital technologies, which encompass high capacity broadband networks, blockchain, artificial intelligence and High-Performance Computing in applying measures connected with COVID-19, especially when it comes to remote work, remote learning and research;
- WELCOMES Commission guidelines for protecting data in applications which support the fight against the COVID-19 pandemic and recommendation for a joint Union package of measures for applying technologies and data to fight and overcome the crisis caused by the COVID-19 disease, especially when it comes to mobile applications and use of anonymous and unified data on mobility;
- CALLS for the Commission to present a specific proposal on managing data and to encourage development of a joint European data space for key industry sectors and areas of public interest, which includes healthcare;
- RECOGNIZES that artificial intelligence is a technology that is rapidly developing and can contribute to a more innovative, efficient, sustainable and competitive economy, as well as numerous social advantages, such as improving the security and safety of citizens, public welfare, education and training, healthcare or providing support for mitigating climate change and adapting to it;
- HIGHLIGHTS the positive role that artificial intelligence can have in the fight against the COVID-19 pandemic and in that context SUPPORTS its development and innovative use;

- RECOGNIZES that the crisis caused by the COVID-19 disease has shown the importance of the digital transformation of healthcare and its value in strengthening support for the healthcare system and the system's response to the pandemic;
- STRESSES that developing a European space for medical data, which the Commission has been working on together with healthcare bodies of member states, has the potential to ease development of effective prevention, diagnosis, treatment, and care. It could also help to ensure better cost effectiveness and optimization of the workflow in healthcare, which would lead to better patient medical results, better systems of epidemiological surveillance and more long-term sustainability of healthcare systems;
- INVITES member states to combine efforts at the EU level to increase investment in systems which ensure safe and reliable access to medical data within and outside of its borders and to introduce these systems, especially by researching the possibility of developing a European format for exchanging electronic medical records which would help in overcoming fragmentation and lack of interoperability, as well as to help support European guideline measures and to harmonize strategies for eHealth in the European eHealth network, while at the same time ensuring complete harmonization with the high level of special requirements relating to the protection of personal medical data;
- NOTES that, other than the aforementioned, significant efforts are required to improve personalized and preventative medicine to allow for the exchange of medical data for research purposes.

Based on all of the above, it is evident that the digital transformation of healthcare and disruptors in the domain of eHealth can significantly contribute to the proposed measures and strategies in the present and future of the post-COVID-19 digital future of the EU, to the benefit of citizens and the entire population.

State of play in Croatia

Croatia is one EU country that can boast a significant level of digitalization in healthcare and the healthcare system, although the level of digitalization of healthcare and the healthcare system has begun to stagnate.

The "e-Zdravstvo" service of the Croatian system was designed to simplify the use of healthcare services by citizens, as well as to improve user experience in searching and making an appointment for their desired services. Simplicity and accessibility of provided healthcare services are of great importance because of the large number of

system users and digitalization has shown itself to be a necessary step in raising the quality of service to a higher level.

The results of laboratory tests are often synonymous with efficient service as the results are available to doctors in real time, which can then prescribe adequate treatment based on the received results or issue a referral for further treatment by a specialist. This kind of positive example of digitalized healthcare services shows a multitude of benefits - it makes the job easier for doctors and allows for the treatment of a greater number of patients during work hours, as well as shortening wait times for patients, which frees them from administrative actions which are now completely automated. Communication of all parties in the healthcare chain clearly shows that, other than contributing to timely and efficient healthcare services, it also cuts spent time and resources.

From 2016 to 2020, the improvement was made in one of the most important steps in the work of the eHealth system, the CEZIH project. The result of the project is the electronic medical record, in other words, communication through a portal for patients under the name "Portal zdravlja" (Health Portal). The purpose and aim of this project is the strengthening of the role of the patient in the system, as well as making their record available to specialists who are not part of primary healthcare. In the long term, this model allows for access to medical and administrative patient data in unplanned and emergency situations thus decreasing the administrative load of medical personnel, which makes more room for treatment. However, one question that arises is the digital literacy of the population, as well as the doctors and whether developed systems such as "Portal zdravlja" are sufficiently used. It would be useful to conduct a survey of digital readiness of, for example, general practitioners in the use of such system and to compare the number of active system users to the actual number of general practitioners in Croatia and to offer them adequate additional education as a result.

It is also important to stress that independent management of user data by service users in "Portal zdravlja" is possible and allows users to authorize access to other participants in the healthcare system (primary care, pharmacists, dentists, emergency services, specialists etc.). In addition, the system allows for and authorizes cross border data sharing with other member states of the European Union, in accordance with the European Directive on Cross Border Healthcare (2011/24/EU).

It is also important to stress the role of the Croatian Institute of Emergency Medicine, which is in charge of developing a central IT system for the 21 county Centers for Emergency Medicine with a central call center and an advanced system for exchanging information with ambulances. This same Institute is also in charge of developing and building telemedical centers with a highly accessible information network for communication between all centers. All integrated communication systems so far have been shown to be highly successful and have operated at a very

high level even during the global coronavirus pandemic but have also shown a need to unite all existing registries into a single network which would be integrated with hospital IT systems. However, the question of the legal framework for implementing telemedicine in Croatia still remains. The system would need to be reorganized and, if needed, the Institute for Telemedicine would need to be reactivated. Currently, there are numerous limitations when it comes to introducing telemedicine into Croatian healthcare, which includes the question of human resources for this segment. For example, introducing a teleradiology center would greatly speed up diagnostics, especially in smaller hospitals, as well as decrease healthcare system costs.

Currently, a large number of hospitals are developing or have already developed their own IT systems which cover business processes, but they are not integrated with other parties involved in the system. On the other hand, the Croatian Institute of Public Health manages more than 20 integrated registries, such as the Registry of Healthcare Professionals, the Cancer Registry, Diabetes Registry and others. The importance of this project has been recognized by the World Bank which has financed it with the aim of creating a functional and integrated single registry, which would be managed by the CIPH.

Along with the aforementioned registries, preventative lists are also in active use, as well as lists for proactively managing patients with diagnoses that demand keeping records of all specific parameters of each individual illness. Lists are a very useful tool due to their specificity, which doctors use when making a diagnosis and when deciding on future treatment options. This type of work is recognized by the World Health Organization, which has characterized the list system as an innovative and good practice of the Croatian healthcare system.

From all the previously mentioned examples we can conclude that the IT system is very functional and at an adequate level of development, but when it comes to interoperability between individual parties of the system it is important to stress that it is a fairly complicated process and there is significant room for improvement. First of all, this relates to hospitals which have independently developed their own internal systems, which consequently does not allow for the exchange of information with other institutions and also reduces the possibility of quality communication. It is of great importance to unify all systems in the future, as well as the users of healthcare system services.

Other than this, the inability to settle the debt of Croatian hospitals towards pharmacies for many years, among others, shows the need to improve managing finances and planning. The new trend in managing healthcare institutions requires advanced planning and budget management, which encompasses the use of predictions (along with machine learning), consolidation of financial results and real time reporting on all business results with the aim of increasing efficiency and reducing risk.

The situation is made more difficult by the fact that healthcare professionals are overloaded due to high demand, as well as their lack on the labor market in Croatia, along with the emotional intensity of their work environment. This is why it is key to attract and keep highly talented workers and ensure their mental and physical wellbeing – it is important to professionally manage this by:

- Analyzing all available data on employees in the Croatian healthcare system and
- prediction of behavioral trends.

The lack of healthcare professionals can partly be supplanted by using the Internet of Health Things (IoHT) – for the purpose of automatically tracking the parameters of chronic patients by using smart devices/sensors, as well by automating logistics activities. Achieving harmonization of the entire system will be one of the greatest challenges in future "e-Zdravstvo" improvement steps. With the goal of improving the "e-Zdravstvo" service, a strategy needs to be defined for the development of an efficient system, or rather to form expert working parties with clear roles and responsibilities needed to plan strategies, prescribe standards, manage investments and management and implementation into the "e-Zdravstvo" system.

Without the aforementioned, there is a possibility of a lack of adequate strategic planning which would consequently lead to inoperability of the system as a whole. What is encouraging is the realization and understanding of competent bodies that there is a need to form a stable management structure and to find resources for future updates of the aforementioned system.

For these reasons it is necessary to continually raise awareness on the importance of updating and improving the Croatian "e-Zdravstvo" healthcare system to bridge the gap between it and those European Union healthcare systems to which we naturally strive towards.

Examples of Good Practice

As the most significant example of good practice, we would like to mention the Czech Republic, or rather the example they set in using a digital cancer registry with the aim of improving the outcome of treating malignant diseases.

Czech Republic

The Czech Republic possesses a unique instrument in this field which can be held as an example to other member states of the EU. The Czech Republic has been managing its National Cancer Registry (NOR) for a long time (since 1977) and is one of the most comprehensive and best databases in Europe. Namely, it is a

representative and complete database that contains data on all patients for the entire considered timeframe. Managing this database is prescribed by law and is thus a mandatory and at the same time important element in planning the need for oncological care and evaluation of its results.

This nearly 40-year-old time series allows for long-term evaluation of epidemiological trends for particular types of carcinoma, the assessment of treatment outcomes and the rate of survivability of patients, as well as for predicting the number of people with carcinoma which will be treated in the years to come. Data from the National Cancer Institute is absolutely essential for planning the need for oncological care and the evaluation of its impact.

While working with registries they stick to two basic principles - predictive (evaluation of the number of treated patients in the years to come) and retrospective (monitoring of procedures and results of expensive treatment). The retrospective data evaluates aspects of treatment such as the correct indications of the observed therapy, therapy procedures and how safe it is, causes of premature conclusion and its frequency, immediate and long-term treatment results. A collective of authors from the OCD and IBA organizations has created an analysis of all drug registries in which it is stated that costly treatments are distributed in a controlled manner between oncological patients and only to patients with a completely determined diagnosis. Biological treatments are offered only to patients whose general state allows them to profit from the offered care.

Finland and Estonia

Another successful good practice example is related to the Cross-border digital prescription and patient data exchange between EU countries.

The project first started with the exchange of data between two countries - Finland and Estonia and today that number has increased to include 5 countries. The project has allowed for the exchange of e-prescriptions and the exchange of data from e-charts between countries included in the project, which has simplified healthcare and the mobility of citizens.

Great Britain

The Western Sussex Hospitals National Health Service (NHS) Foundation Trust has around 450,000 users and manages three hospitals. They have created an innovative product called Family Assist, which allows for and improves the care of its members from conception (-9 months) to 19 years of age. By creating this service, the Western Sussex NHS Foundation Trust can approach care in a new way and act more efficiently. In addition, digitalization has solved the problems faced by healthcare professionals when communicating with patients during the ban on physical visits prescribed by epidemiologists and they have revolutionized the way in which they can communicate with patients in a short time by introducing a chat service.

Family Assist allows for greater interaction between service users and healthcare professionals so that members can be sent targeted communication.
Another part of the NHS organization, the NHS Business Services Authority (NHSBSA) conducts case studies by using AI in healthcare by using Big Data Analytics. NHSBSA has been able to connect and analyze billions of pieces of data on prescribed prescriptions, drugs, medical exemptions, doctor-patient relationships and call center services and have used this data to reveal potential savings and efficient treatments to provide better results. The same project has resulted in prevention of revealed scams in the amount of 581 million British pounds and in a 7% decrease in prescribed antibiotics.

Recommendations

Considering that other European countries have faced similar challenges in digitalizing healthcare and that the reasons why "e-Zdravstvo" has stagnated are neither technological nor financial in nature, it is necessary to, other than create an analysis of the stagnation itself, bring back focus to the process of digitalization and the importance of digitalizing healthcare itself.

Technological solutions for **"e-Naručivanje" and "e-Karton"** (electronic appointment booking and electronic health records) have already been installed and successfully implemented into the Croatian healthcare system. It is necessary to continue implementing these two solutions and to remove the remaining obstacles to apply them 100%. This way both systems would be able to come into full effect which would allow for a quick win needed for a public awareness campaign for use of these solutions by both healthcare professionals and patients. In parallel with establishing and popularizing these two projects, the following phases of medical digitalization would also need to be defined.

To ensure continuity when implementing the mentioned solutions, as well as new projects, one possibility is **to establish even greater cooperation with the Republic of Slovenia.** Namely, due to the great number of healthcare system patients of one country that need to use the healthcare system services of another country (Croatia and Slovenia), for cross-border employment or for tourism, as well as deep connections in border areas, cooperation on further development of the "e-Karton", for example, would be of significant use to patients. Considering that one of the goals of healthcare digitalization is to put patients at the forefront of the healthcare system, this type of cooperation would be made easier by synchronizing legislation in the area of healthcare data exchange which is expected at the EU level.

By 2027, "e-Zdravstvo" in Croatia should:

- Allow for the integral and multidisciplinary care of patients, or rather, tracking them through the entire treatment process, whether it be in the ambulance, hospital or during rehabilitation. Considering that existing IT systems are not currently connected, it is necessary to **digitally connect the hospital system, IT system for primary healthcare and IT system for care and rehabilitation** to provide a better outcome of treatment.
- Ensure processing of information, analysis and data which support and supplement the work of healthcare professionals and to improve safety and quality of care. Based on the received data from "e-Zdravstvo" charts, it should **develop analyses and system surveillance** which will lead to improved outcome treatment and cost rationalization.
- Provide support to the population when managing their own health and well-being by leading better and healthier lives at home or their neighborhoods. **Encourage healthier lifestyles and preventative care of the population by tracking available data.**
- Contribute to the partnership between the government, municipal authorities, research sector and industry so that Croatia has a chance to be a long term leader in digitally enabled care – for example, through projects funded by EU funds, such as the Healthy Cities Project; **encourage the development of digital and software solutions aimed at encouraging health and illness prevention** (for example the Accunea Transplant Monitor application).
- It will be managed by a single expert body in cooperation with the Ministry of Health which will be in charge of project management and sustainable development based on the Danish and Finnish model (for example, the Danish eHealth Office).

To achieve this, we additionally suggest the following:

- To enable the introduction of unified telemedical solutions and centers of excellence.
- To enable even distribution of digital infrastructure and to make it available to everyone.
- To enable education of all healthcare system participants with the aim of achieving digital literacy.
- To measure utilization of existing IT solutions before developing new ones (cost aspect) and to find ways for even greater utilization.
- To create functional and integrated patient registries as one of its top priorities for implementation of evidence-based patient treatment.
- To consider the importance of introducing tools, such as Digital patient monitoring tools and Digital decision-making tools which serve as support for the digital tracking of patients and taking note of their diagnostic and treatment outcomes. Such real-world data is used further, again in digital fashion, to make new treatment decisions. In such a way, the entire process of diagnosing and treatment is sped up, real-world data is used for better treatment outcomes, which leads not only to increased benefits for patients, but increased benefits for healthcare systems as well.

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