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PATIENTS AND THEIR DATA – PART 2 – PATIENT ONLINE ACCOUNT AS A DATA SUPERVISION INSTRUMENT IN POLAND AND SELECTED EU COUNTRIES

Introduction

Currently work is underway in the Polish healthcare system on the implementation of a medical electronic records system. Its implementation and the withdrawal from paper-based documentation will be synchronized with such solutions as e-prescription, e-sick leave or e-referral. This will allow for the introduction of solutions that will soon be developed at the national level and that are obviously desired in the healthcare system. This refers to the solutions concerning a newly developed electronic delivery system¹, i.e. the establishment of legal bases for the contact data register (RDK)².

In the course of the intended change implementation process one should consider the rights of patients who should have the ability to control all the data and information about them that are created and processed in the healthcare information system. The article presents the solutions operating in EU and Poland that meet this objective as well as the blockchain solution, which may be implemented in healthcare information systems in the near future.

1. Patient Online Account (IKP)

Patient online Account (IKP) is the suggested supervision data instrument to be used commonly on the Polish market. This is an electronic application where every patient can log in and have a free access to their health history. Although the platform is free of charge, it

¹ Draft act on electronic delivery, <https://mc.bip.gov.pl/projekty-aktow-prawnych-mc/projekt-ustawy-o-elektronizacji-doreczen-oraz-o-zmianie-niektorych-innych-ustaw.html> (Accessed: 30 November, 2019).

² Draft act on the amendment of the act on computerization of activities performing public tasks and some other acts, <https://bip.kprm.gov.pl/kpr/form/r8778790702362,Projekt-ustawy-o-zmianie-ustawy-o-informatyzacji-dzialalnosci-podmiotow-realizuj.html> (Accessed: 30 November, 2019).

requires a device with internet access, such as a computer or a mobile device³. The IKP service is available at pacjent.gov.pl⁴.

When completed, the Patient Online Account will eventually make it possible for patients to:

- receive e-prescription, both from a physician (after an appointment or without the appointment in the case of a follow-up treatment) or from a nurse or midwife (after an appointment or a telemedicine consultation);
- view their e-prescriptions and collect e-referrals;
- check the prescribed dose of medication;
- receive notifications in the form of SMS or e-mails about the prescriptions issued together with a code necessary to collect the medication;
- view the history of their appointments within the National Health Fund;
- share their health information with a physician⁵;
- give a third party access to health information or other medical data;
- have access to medical data to their children up to 18 years of age;
- check the dates of their scheduled services that are reimbursed by the National Health Fund⁶.

Currently it is possible to log in to IKP through the Integrated Patient Registry (ZIP) or – in the cases where the data subject has no IKP – with the use of a trust profile (PZ) or an e-ID. The account in IKP will be set up automatically after logging in by one of the above mentioned methods⁷.

One of the breakthrough solutions in the Polish healthcare sector that operates within IKP is the possibility to make declarations. This includes:

- authorization to obtain patient health information and the received medical services with the indication of the name of the authorized person and its contact details;
- authorization to obtain medical records with the indication of the name of the authorized person;

³ *Internetowe Konto Pacjenta*, <https://obywatel.gov.pl/ochrona-zdrowia-i-ubezpieczenia-spoleczne/skorzystaj-z-internetowego-konta-pacjenta> (Accessed: 3 June, 2019).

⁴ *O IKP - Internetowe Konto Pacjenta*, <https://pacjent.gov.pl/ikp> (Accessed: 3 June, 2019).

⁵ *O IKP - Internetowe Konto Pacjenta*, <https://pacjent.gov.pl/ikp> (Accessed: 3 June, 2019).

⁶ *Internetowe Konto Pacjenta*, <https://obywatel.gov.pl/ochrona-zdrowia-i-ubezpieczenia-spoleczne/skorzystaj-z-internetowego-konta-pacjenta> (Accessed: 3 June, 2019).

⁷ *Internetowe Konto Pacjenta*, <http://www.nfz.gov.pl/dla-pacjenta/internetowe-konto-pacjenta/> (Accessed: 3 June, 2019)

- consent for examination or treatment.

Due to the fact that the use of IKP is infrequent, some interpretation doubts emerged as regards the scope and validity period of declarations that are made in various healthcare entities. The reservations were partly resolved⁸ and it was established that the declarations made by patients through IKP will be universal and a prompt and easy access of healthcare entities to the declarations may facilitate and accelerate procedural issues related to the treatment that medical staff have to deal with. Healthcare service providers are obliged to inform patients about the possibility to make declarations via IKP and the consequences (the effectiveness of declarations, possibilities to verify their scope or cancel at any moment). Only in the cases when a patient does not submit an appropriate declaration via IKP, the declaration will be entered into individual internal records (of a particular medical entity).

2. Patient portal solutions in other countries

Denmark is one of the European leaders with regard to the use of innovative eHealth solutions. A dynamic development of digital services is possible in this country as over 95% of the population have access to the Internet⁹.

Three nationwide institutions are responsible for the development of eHealth in Denmark. They are: *sundhed.dk* (a patient portal), Connected Digital Health in Denmark and MedCom¹⁰.

The national eHealth portal *sundhed.dk* is an official Danish portal of the public healthcare system that provides patients with the access to their health data. Among other things, it enables patients to:

- view their health data;
- order medications and renew prescriptions;
- register online for appointments to specialists;
- search for entities providing medical services;
- give access to their health data to physicians and pharmacists;

⁸ Draft regulation of the Minister of Health of 10 November 2019 on the types, scope and templates of medical records and methods of their processing.

<https://legislacja.rcl.gov.pl/projekt/12326010/katalog/12634203#12634203> (Accessed: 3 June, 2019).

⁹ E. Buczak-Stec, K. Lemanowicz, M. Mazurek, *E-Zdrowie - Wyzwanie dla systemu ochrony zdrowia*, <http://www.przegl Epidemiol.pzh.gov.pl/e-zdrowie-wyzwanie-dla-systemu-ochrony-zdrowia?lang=en> (Accessed: 3 June, 2019).

¹⁰ A. Chluski, *Elektroniczny Rekord Pacjenta*, http://rocznikikae.sgh.waw.pl/p/roczniki_kae_z29_34.pdf (Accessed: 3 June, 2019).

- check the results of laboratory tests¹¹.

The portal is a kind of a Patient Health Record which includes patient's full treatment history together with the medication records. Thanks to the fact that the access to the account is given both to physicians and pharmacists, the choice of medications, treatments and other services is adapted to the patient in the best possible way and, consequently, the patient obtains high quality and effective treatment¹².

The development of such technology is possible thanks to an agreement between public institutions and other healthcare system stakeholders. The agreement defined the objectives and the activities necessary to achieve them. Communication between particular stakeholders is made possible through the use of the tools of *the Danish Health Data Network* (DHDN) which provide digital transmission of images, texts or sound. The data are adequately secured and the transmission is free of errors¹³.

DHDN is accessible by every healthcare entity in Denmark. Physicians have access both to open data and the data that is secured by adequate communication safeguards¹⁴; physicians also have access to the Electronic Patient Record¹⁵.

In 1994, *MedCom Health Data Network* was developed in Denmark whose objective is to develop, test and implement computer-based services in the healthcare sector. The services within the network must meet relevant safety and quality requirements¹⁶.

The implementation of the MedCom Health Data Network resulted in several significant benefits to the data protection system:

- a return of the invested funds in the third year of the system implementation;
- a total of 80 million euros in annual savings in 2008;
- a 97% increase in effectiveness (a decrease in transaction costs due to electronic communication);

¹¹ A. Chluski, *Elektroniczny Rekord Pacjenta*, http://rocznikikae.sgh.waw.pl/p/roczniki_kae_z29_34.pdf (Accessed: 3 June, 2019).

¹² A. Chluski, *Elektroniczny Rekord Pacjenta*, http://rocznikikae.sgh.waw.pl/p/roczniki_kae_z29_34.pdf (Accessed: 3 June, 2019).

¹³ E. Buczak-Stec, K. Lemanowicz, M. Mazurek, *E-Zdrowie - Wyzwanie dla systemu ochrony zdrowia*, <http://www.przegl Epidemiol.pzh.gov.pl/e-zdrowie-wyzwanie-dla-systemu-ochrony-zdrowia?lang=en> (Accessed: 3 June, 2019).

¹⁴ A. Chluski, *Elektroniczny Rekord Pacjenta*, http://rocznikikae.sgh.waw.pl/p/roczniki_kae_z29_34.pdf (Accessed: 3 June, 2019).

¹⁵ E. Buczak-Stec, K. Lemanowicz, M. Mazurek, *E-Zdrowie - Wyzwanie dla systemu ochrony zdrowia*, <http://www.przegl Epidemiol.pzh.gov.pl/e-zdrowie-wyzwanie-dla-systemu-ochrony-zdrowia?lang=en> (Accessed: 3 June, 2019).

¹⁶ A. Chluski, *Elektroniczny Rekord Pacjenta*, http://rocznikikae.sgh.waw.pl/p/roczniki_kae_z29_34.pdf (Accessed: 3 June, 2019).

- a 2% increase in distribution benefits for citizens and a 98% increase for medical entities that used the system till 2008¹⁷.

The Czech Republic is another country where digital health solutions have been implemented. The transfer of data in the Czech healthcare sector is coordinated by the Czech National Forum for eHealth which was founded in 2007. The Forum develops standards and is responsible for the cooperation with relevant EU bodies; its main tasks include the support of eHealth development, the dissemination of knowledge about it and the cooperation with healthcare entities¹⁸.

IZIP - an Internet Access to Patient Health Records platform is a significant project operating in the Czech Republic since 2002. Patients can share their medical data with medical professionals. However, only doctors can enter or modify the data. In emergency, rescue services may obtain the right of access to patient medical data without their previous consent¹⁹.

The system security is safeguarded through the implementation of appropriate standards, electronic signature and software and hardware safeguards that block unauthorized access to the system. Moreover, the transfer of data is encrypted with SSL (*Secure Socket Layer*) and system users have unique identifiers to log in. The SSL protocol ensures data privacy, authenticity and integrity and is one of the most common security protocols on the Internet²⁰. For the logging process various authorization techniques were accepted: a PIN number, additional passwords or such biometric techniques as fingerprint²¹. The IZIP account enables access to basic patient personal and medical data as well as to the information regarding services provided and the amounts of funding thereof²².

Seven years of the functioning of the system in the Czech Republic resulted in a positive net result which amounted to 60 million euro. It is estimated that:

- the implementation of the IZIP system caused a 74% decrease in the costs related to the use of medical records;

¹⁷ *ICT w służbie ochrony zdrowia. Raport Konfederacji Pracodawców Polskich*, www.orbiplus.pl/businessandlife/business/iwsozr.pdf (Accessed: 3 June, 2019).

¹⁸ A. Chluski, *Elektroniczny Rekord Pacjenta*, http://rocznikikae.sgh.waw.pl/p/roczniki_kae_z29_34.pdf (Accessed: 3 June, 2019).

¹⁹ A. Chluski, *Elektroniczny Rekord Pacjenta*, http://rocznikikae.sgh.waw.pl/p/roczniki_kae_z29_34.pdf (Accessed: 3 June, 2019).

²⁰ *Protokół SSL a TLS*, <https://certyfikatyssl.pl/news/protokol-ssl-a-tls.html> (Accessed: 14 October 2019).

²¹ A. Chluski, *Elektroniczny Rekord Pacjenta*, http://rocznikikae.sgh.waw.pl/p/roczniki_kae_z29_34.pdf (Accessed: 3 June, 2019).

²² A. Chluski, *Elektroniczny Rekord Pacjenta*, http://rocznikikae.sgh.waw.pl/p/roczniki_kae_z29_34.pdf (Accessed: 3 June, 2019).

- the avoidance of unnecessary medical services resulted in a 10% increase in effectiveness;
- the quality of healthcare and time saving improved by approx. 37%;
- the avoidance of duplicated tests, therapies and treatments resulted in a 53% increase in the savings of the main payer in the Czech Republic²³.

Table 1 presents the functionalities of three portals in Poland, Denmark and the Czech Republic.

Table 1. Comparison of patient portals in selected countries (Poland, Denmark and the Czech Republic)

<i>Category</i>	<i>Patient Online Account, IKP (Poland)</i>	<i>sundhed.dk (Denmark)</i>	<i>IZIP (Czech Republic)</i>
<i>Access to data subject's medical data</i>	+	+	+
<i>Access to child's account</i>	+	+	
<i>Checking the funding level of services and medications</i>	+	+	+
<i>Viewing e-prescriptions</i>	+	+	+
<i>Extension of the validity period of prescriptions</i>	+	+	
<i>Ordering medications</i>		+	
<i>Medication records</i>	+	+	+
<i>Innoculation records</i>		+	+
<i>Registration as organ donor</i>		+	
<i>Online registration to specialists</i>		+	
<i>e-Correspondence with physicians</i>		+	+
<i>Chat rooms – patient online discussion platforms</i>		+	
<i>Medical entity search engines</i>	+	+	
<i>Checking appointment dates</i>	+	+	
<i>Checking queues (waiting time) to specialists</i>	+	+	
<i>Checking results of laboratory tests</i>		+	+
<i>Access to results of image examinations</i>		+	+
<i>Viewing and receiving referrals</i>	+	+	
<i>Sick leave management</i>	+		
<i>Sharing data with (giving access to) third parties</i>	+	+	
<i>Sharing data with (giving access to) medical staff</i>	+	+	+
<i>Checking persons who had access to hospital data (e-journal)</i>		+	
<i>Data modification option</i>	Medical specialist only	Medical specialist or the hospital that registered the treatment	Medical specialist only

²³ ICT w służbie ochrony zdrowia. Raport Konfederacji Pracodawców Polskich, www.orbiplus.pl/businessandlife/business/iwsozr.pdf (Accessed: 3 June, 2019).

<i>Viewing contact details and information about general practitioner</i>		+	
<i>Viewing all treatment methods in hospitals</i>		+	
<i>Testament of treatment (physicians follow wishes concerning therapy when patients are unable to provide their own information)</i>		+	
<i>Security tools</i>	SMS /e-mail code for prescriptions, trusted profile, login, password	Encrypted messaging, a system of logins and data registers, electronic signature	Electronic certificates, electronic signature, encrypting data, user's identifier, PIN number, password or fingerprint
<i>Standards</i>	HL7 CDA	MedCom Health Data Network, Danish Health Data Network	DASTA
<i>Benefits confirmed</i>	-	+	+

Source: Author's research based on: *IZIP, Czech Republic – web based electronic health record*, http://ehealth-impact.eu/fileadmin/ehealth_impact/documents/ehealth-impact-7-5.pdf (Accessed: 3 June, 2019); *Patient access to the electronic health record; Report of the eHealth stakeholder group – 2017*, https://www.uems.eu/_data/assets/pdf_file/0010/1531/Patient_access_to_EHR_-_FINAL_2_.pdf (Accessed: 3 June, 2019); *eHealth in Action Good Practice in European Countries – 2009*, <https://www.ehealthnews.eu/download/publications/1488-ehealth-in-action-good-practice-in-european-countries> (Accessed: 3 June, 2019); S. Santana, B. Lausen, M. Bujnowska-Fedak, C. Chronaki, P. Kummervold, J. Rasmussen et al., *Online Communication Between Doctors and Patients in Europe: Status and Perspectives*, https://www.researchgate.net/publication/44676030_Online_Communication_Between_Doctors_and_Patients_in_Europe_Status_and_Perspectives (Accessed: 3 June, 2019); *Sundhedsjournal, Denmark – web based electronic health record*, <https://www.sundhed.dk/borger/min-side/min-sundhedsjournal/> (Accessed: 3 June, 2019).

Patients with accounts on the Danish platform have the widest functionality in comparison to the Polish and Czech patients. The common elements of the three platforms are: access to medical data, checking the funding level of services and medications, viewing prescriptions, medication records, sharing data with (giving access to) medical workers, some security tools and the possession of separate standards for medical data.

3. Blockchain as a data management method on patient platforms

Patient digital platforms transfer some of the health management responsibility from medical entities to patients. Blockchain technology is one of IT solutions which includes the possibility to transfer the responsibility for data – medical data including – from central institutions to individual entities.

In the healthcare sector the technology in question refers to a system that- in simple terms - is based on a data base network that enables all parties involved (medical entities, patients) to save, transfer and archive information in an equal, effective and secure way. A detailed

presentation of the blockchain architecture and its functional structure in healthcare IT system is given in a separate article of the same team of authors²⁴.

It seems that blockchain technique is a solution that is particularly looked forward to in the times when the traditional endpoint protection in information management systems does not make sense anymore. However, although the concept itself and the methodology that describes information processing model in a block chain has a well know characteristics, the introduction of the technique into information management processes in healthcare is still at an early stage. Considering the reasons for such state of affairs which are mainly related to the arrangement of system solutions and permanent issues with the digitalization of healthcare (with a particular consideration of the key functionality of electronic medical records documentation), one should keep in mind that blockchain technology brings a completely new perspective to the functioning of IT in healthcare.

The main advantage of the new technology which has a fundamental significance to healthcare sector services is the trust infrastructure that is built into the blockchain system. The trust is based on the assurance of a reliable, clear and open information processing in a dispersed yet always integrated data base. The trust coexists with a completely different way of data protection that ensures a high level of cyber security. The method consists in encrypting the dispersed data instead of securing the access to data processing centers, which significantly minimizes the risks of leakage or theft of data about the transactions that are registered in the healthcare system. Another advantage of the blockchain system is a substantial simplification of the information processing architecture, which - among other things - has a direct impact on the effectiveness of safeguards against the access of unauthorized persons to the information resources of the healthcare system.

As it was mentioned before, blockchain system puts special emphasis on the assurance of full information processing security. Thanks to the integrity, invariability and transparency of the data that is stored in nota bene electronic register, there is also a possibility to conduct detailed auditing of the registered transactions. Moreover, the integration of blockchain solutions with data repositories, e.g. in a medical entity, may result in the decrease of data auditing costs in organizations. A feature of blockchain solutions which is particularly important for the security of healthcare information system is the indisputable way of recording

²⁴ S. Jakubowski, A. Romaszewski, W. Trąbka, M. Kielar, *Blockchain-Based Applications in Various Areas of Healthcare Functioning*, „Journal of Public Health, Nursing and Medical Rescue” 2019, nr 3, <http://pzpr.eu/index.php/jphnmr/article/view/33> (Accessed: 30 September, 2019).

which enables a relatively simple verification of unauthorized or incorrect operations as well as the confirmation of the origin of data and its reliability. The above functionalities of blockchain technology seem to support the idea of its prompt implementation in the selected areas of the healthcare system (e.g. patient platforms) especially as a secure data registry that prevents from any data interference and provides a complete auditability in medical entities.

Conclusions

The trends in changes that are recommended in the Polish healthcare system seem to be acceptable. However, it is worrying that the recommendations do not suggest any help of the state in the implementation of the solutions. Moreover, they do not take into consideration the assistance in the selection of signatures, electronic seals or time stamps that are used in keeping the records. The Medical Specialist Card (KSM) or the Administrative Specialist Card (KSA) do not appear in the regulations as the tools to be used. There are no proposals regarding the use of other tools that are provided by eIDAS (Regulation (EU) No 910/2014 of the European Parliament and of the Council of 23 July 2014 on electronic identification and trust services for electronic transactions in the internal market and repealing Directive 1999/93/EC)²⁵ - particularly such as electronic seals, the services of data and electronic seal preservation or the application of the electronic registered delivery to share and transfer electronic medical records.

Due to the fact that the program of healthcare computerization that is based on electronic medical records is extremely important for the functioning of both the healthcare system and numerous other areas crucial for the state, one should expect authorized institutions to be involved in a financial, organizational and educational help to implement trust services that are dedicated to healthcare entities (e.g. the development and preservation of electronic signatures, seals or certificates that are related to such services)²⁶.

One of the possible methods of data complementary management on patient platforms is the Blockchain technology which offers secure processing of information in a database that is

²⁵ Regulation (EU) No 910/2014 of the European Parliament and of the Council of 23 July 2014 on electronic identification and trust services for electronic transactions in the internal market and repealing Directive 1999/93/EC, <https://eur-lex.europa.eu/legal-content/PL/TXT/?uri=CELEX%3A32014R0910> (Accessed: 3 June, 2019).

²⁶ Regulation (EU) No 910/2014 of the European Parliament and of the Council of 23 July 2014 on electronic identification and trust services for electronic transactions in the internal market and repealing Directive 1999/93/EC, <https://eur-lex.europa.eu/legal-content/PL/TXT/?uri=CELEX%3A32014R0910> (Accessed: 3 June, 2019); Proclamation of the Marshal of Polish Parliament of 7 December 2018 on the announcement of a consolidated text of the act on trust services and electronic identification, <http://isap.sejm.gov.pl/isap.nsf/DocDetails.xsp?id=WDU20190000162> (Accessed: 3 June, 2019).

dispersed but always integrated, and is based on a built-in blockchain's trust infrastructure. However, one should remember that this solution, despite numerous practical benefits and expected functionalities, has also certain limitations which make this technology inapplicable in some data processing processes.

Apart from some relatively tangible benefits for the Polish IKP-based healthcare system, such as e-prescription, e-referral or the access of patients and their physicians to medical records, there are some major obstacles. Undoubtedly, measures should be taken to gain the supporters of the new solutions in every age. It is a well-known fact that new solutions are not accepted by people of retirement age who are still within the system. Thus, in the present circumstances a transition period for the suggested solutions should be reconsidered.

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Abstract

Patient Online Account (IKP) is a multifunctional electronic application that aims at the improvement of data storing and processing in the IT system of healthcare. The article discusses national and international perspectives of data supervision platforms that are similar to IKP and use modern IT solutions and electronic applications.