

Connected Health Development in R. Macedonia: Focus on Health Insurance Fund

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Abstract. The increasing adoption of Information and communication technologies (ICT) is widely recognized as a key factor for making healthcare more cost-effective. On the other hand, Connected Health involves the use of ICT to improve the quality service of healthcare and its outcomes. With the introduction of healthcare reform, many citizens of Republic of Macedonia are receiving access to a healthcare system that provides high-quality care at reduced costs, allowing the patients to save time and expense. The aim of this paper is to give a brief overview of the affection of e-services and electronic data exchange (between Fund's ICT systems and other IT systems in related healthcare institutions) at the healthcare quality for insured people, to facilitate the accessing and sharing of information and savings funds. Presented analysis can serve as a valuable input for the healthcare authorities in making decisions related to development of e-services in healthcare and connected health.

Keywords: Connected Health, e-services, Electronic Health Card, Health Insurance Fund, insured people, web portal

1 Introduction

Healthcare systems in many countries are under financial pressures from current global economic conditions. At the same time, population increase the demands for healthcare and require better and more convenient services from their healthcare providers. In this run for better health services and challenging economy, the costs for treating the diseases, costs of patients and hospitals' budget are rising. So, the need of the healthcare systems savings is inevitable. Finding new ways to improve the quality of healthcare, delivery and expand access to vital services, reducing the medication and treatments with lower costs is one of the highest priorities for the healthcare authorities. The introduction of electronic communication in the healthcare systems is one of the

possible ways to save financial resources without loss of quality and delivery of the healthcare [2].

European Connected Health Alliance (ECHAAlliance) [16] defines the term “Connected Health” as the umbrella description covering digital health, eHealth, mHealth, telecare, telehealth and telemedicine. Essentially “Connected Health” is the utilization of “connecting” technologies (i.e. communication systems – broadband, wireless, mobile phone, fixed phone lines) and medical devices for healthcare applications [5]. According to [5] and [16] Connected Health involves the use of ICT in healthcare system to improve healthcare quality and outcomes. The goal and the incentive behind connected health is to develop and deliver the healthcare solutions that can increase quality of life, reduce the risk to the health of patients while lowering the overall cost of care and increasing the quality of healthcare.

Connected health means applying of healthcare ICT to facilitate the accessing and sharing of information, and to enable the analysis of health and administrative data across healthcare systems. It goes beyond simply managing and analyzing patients’ clinical data and it encourages communication and collaboration among all the stakeholders involved in patient’s health to get improved care and better health outcomes at lower costs [17]. For example, the use of a Web Health Portal allows viewing patients’ latest medical information in real-time, at the same time, carry out physician messaging to enhance the information exchange [3].

Although healthcare data exchanges can create opportunities that improve the coordination of healthcare stakeholders, interoperability is much more than administrative necessity. Governmental policies require greater access to external and open data, and technology standards, costs and competitive barriers to be overcome.

The implementation of ICT in healthcare industries may oversimplify complex issues in healthcare system if the implementation is treated as a necessity and urgency in the direction to improve the quality of healthcare. E-service innovations in healthcare system are not static. New healthcare e-services should in continuation be investigated, developed and implemented in the healthcare area [3].

Public health institutions, in an attempt to enhance their effectiveness and reduce expenses, are making a great effort to develop online services for patients. Use of these online services and patients’ electronic loyalty is essential for the success of online health care services. In the study of Eva et al. [6], a general support for patient satisfaction as a determinant of e-loyalty intent in online health care services is revealed. They stress that healthcare providers must always work at obtaining satisfied users and to encourage them to continue using the online services.

Business processes reforming, through the implementation of a healthcare program, is an important on-going process for all governments around the world [10]. The implementation of ICT systems and providing exchange data will create conditions for simplifying administrative procedures [15]. The private sector can play an important part in the transition from paper to electronic record. Jain et al. [1] describes the cases where through the implementation of strategies and approaches, the private sector can affect the improvement of health ICT adoption.

Evaluation of the relationship between the size of hospital system and the decision to exchange electronic data is in the focus of the Miller and Tucker research [11]. Their conclusion is that larger hospital's ICT systems are less likely to exchange data across a global network and more likely to exchange data within their own network.

With the maturation of ICT, over the past years data delivery has been transformed in ways that can offer timeliness, effectiveness and availability, and healthcare and other organizations are collecting huge amounts of data electronically [14]. Although the data have been stored for years, each system has its own standards for coded values and use of text and data definition. Thus, Milstein et al. [12] use cross-country comparisons and learning to develop benchmark measures of health ICT that can improve the performance of healthcare systems.

Many government institutions in Macedonia are modernizing their ICT systems and create the basis for online data exchange [13]. One of the key benefits of data exchange is the ability of integrating populations' data across the borders of different institutions, especially of healthcare institutions [15]. Data governance is essential for leveraging the data to provide higher value and achieve greater availability of data of Health Insurance Fund (HIF) of Macedonia. In this context, the introduction of new e-services and information sharing, which facilitate the realization of the right of health insurance, leads to cost optimization and provides greater savings.

In this paper, we will present some e-services as part of connected health, which are implemented in HIF of Macedonia. We are going to discuss the use of the centralized IT system with web portal software solution and Electronic Health Card System (EHC System) implemented in the HIF. The Macedonian case study for connected health use the approach presented in "Connected Health: The Drive to Integrated Healthcare Delivery" [17].

In many healthcare systems, patients can use secure web portals to access their medical record and communicate with their doctors [4]. In order to support citizens to use web portals, few institutions are training residents (citizens- potential users) for using e-services. HIF's software solution is capable of bringing electronic communication between insured people, companies, health care providers (doctors and nursing) from one side on the other site. Parallel to this, HIF of Macedonia has developed a web services for secure messaging between insured people, healthcare providers, companies from one side and HIF from other side.

In next section a brief description of the architecture of the HIF's IT system is presented. Realization of connected health (case study) is given in section 3, while section 4 presents the evaluation and discussion as well as the novelty of the Macedonian approach. Section 5 concludes the paper.

2 Architecture of the IT system in the Health Insurance Fund (HIF)

One of the basic challenges of healthcare authorities is development of e-health services and e-documents workflow [8]. Clinical and healthcare workflows, healthcare models, and business processes are significantly more complex than equivalents in other sectors of the economy and other industries.

The main components of the HIF's system (web portal with background IT system and the EHC system) are depicted in Figure 1. The background IT system is based on Microsoft technologies with multi-tier architecture comprised of:

- Web servers in Network Load Balancing (NLB),

- Application servers in NLB also serving as systems for reporting, communicating with SQL DB, integration with external systems as well as for serving information to Web servers,
- Database servers that set Microsoft SQL Server 2008 clustering.

In addition to the background IT system a software solution for web portal is implemented. It consists of the following servers:

- SharePoint Portal 2013 servers in NLB configuration,
- BizTalk 2010 servers in NLB configuration.

Web Portal software solution is capable of bringing electronic communication between insured people, companies, health care providers from one side and HIF from other site. Web portal enables insured people to communicate and cooperate with their doctors and HIF in an easy and secure way. This is designed to provide better interaction between the insured people, healthcare professionals and HIF via the Internet [18]. The concept of electronic identity (eID) is crucial for various healthcare and e-health based services. Many European countries (like Austria, Belgium, Estonia, Italy and Finland) had used their electronic identity systems, other countries provide eID via authentication portals using username and passwords (UK and The Netherlands) and some countries rely on PKI software certificates and/or base their eID on banking authentication systems (Sweden) [9].

As a case of connected health, uses e-services where the EHC is used as eID. EHC provides a document-based electronic identity for Fund's insured people, and it can also be used for online activities in healthcare system [7]. To make EHC functional, cardholders must activate their electronic cards. Access to personal data in the background IT system (such as name and surname) and unique identification number of the insured people is allowed by personal identification number (PIN) used during each concrete online transaction. A secret PIN, only known to the cardholder, acts as evidence for proving the identity. By proving his knowledge of the PIN, the insured person proves to be the legitimate owner of the EHC.

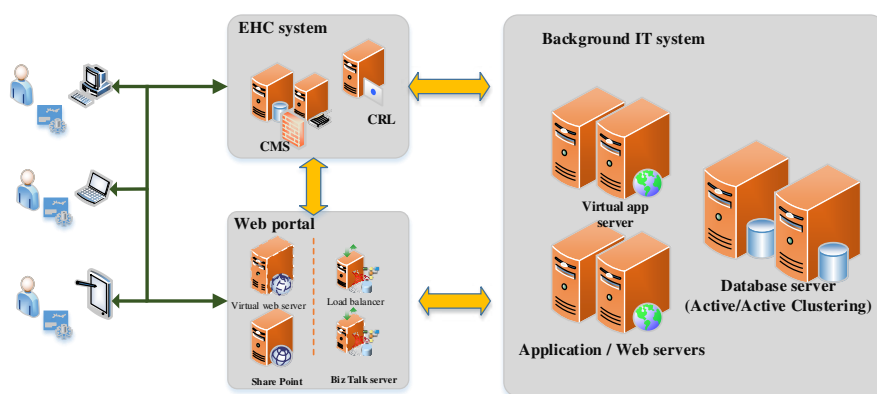


Fig. 1. Main components of the HIF's System

3 Realization of connected health (case study for R. Macedonia)

As an example of connected health, in this paper we consider three cases (services and administrative relief for the companies, services for healthcare workers and services for insured people). In our case we use three stages of the connected health journey (identified in [17], see figure 2):

- Healthcare IT adoption - the planning, construction and use of an electronic infrastructure;
- Health information exchange- the exchange of healthcare and administrative information between HIF of Macedonia, health care providers, insured people and other institutions;
- Insight driven healthcare- the use of advanced analysis of data to better inform, population health management and the creation of new care delivery models.

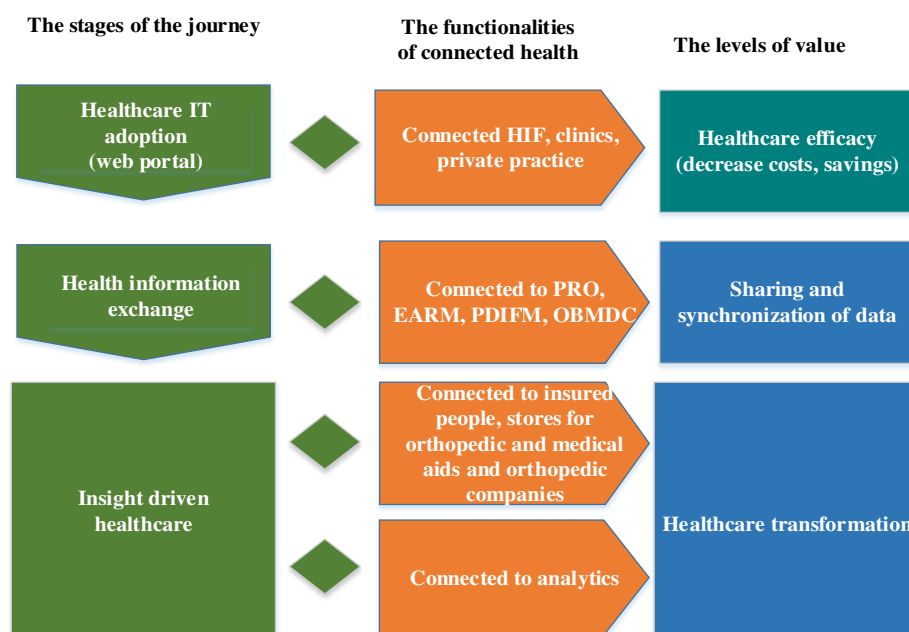


Fig.2. The journey to connected health – case study of HIF of Macedonia (adopted from [17])

Recent advances in healthcare information technologies provide the potential for development of healthcare services and integration of data in direction of connected health through the sharing information across different IT systems, and between different healthcare providers.

HIF of Macedonia leads and manages with a register of bonds of paying contributions and with the register for the calculation and payment of contributions. Bonds for the calculation and payment of contributions of health insurance are making the registration on health insurance for insured people in the branch offices of the Fund.

In the past, as proof of payment of contributions for health insurance the HIF used so called "blue coupons". But, online electronic data exchange, introduction of electronic health card and the increasing development of information infrastructure, imposes the need for electronic verification of insurance status and implementation of electronic registration and deregistration in health insurance. In order to allow all of these activities, there are background processes that handle the automatic matching of data from the HIF's database with data from other institutions (Public Revenue Office- PRO, Employment Agency of the Republic of Macedonia-EARM, Pension and Disability Insurance Fund of Macedonia-PDIFM, Office for Managing of Birth, Marriage and Death Certificates-OBMDC).The data exchange between HIF and other institutions (execution of background processes) are in real time, so the information about the status of insurance is available to external users only by digitally signed request with digital certificate of the EHC.

Business process of general practice doctor refers to the process of choice and change of doctor in accordance to the Law of health Insurance, Regulations for the content and manner of achievement the rights and obligations of the compulsory healthcare insurance. General practice doctor can be a doctor who is working in a healthcare institution that has a contract to work with the Fund. Register for the choices of the chosen doctors is in the Fund. Insured people, in a given period, can chose only one general practitioner. Choice and change of doctor, insured people have to perform on chosen doctors. Unsubscribe of the chosen doctor can be done at the new doctor practice or at the places with a computer, card reader and internet connection. Any change in the system (choice or change of the chosen doctor) is verified with the digital signature from the EHC of the insured person and/or doctor.

The processes of obtaining orthopedic and medical aids consists two sub-processes: the process of verification of orthopedic and medical aids, and registration of issued orthopedic and medical aids from orthopedic companies in accordance with the issued and verified certificates. The process of verification of orthopedic and medical aids begins after the login on the portal by the doctor/specialist who has the option to choose the entered data on a new certificate of need for orthopedic and medical aids. All entered data must pass through all defined controls (HIF's internal controls in accordance with the law) for exercising the rights for verification of the orthopedic and medical aids. The process of issuing the orthopedic and medical aids, based on the verified certificate, begins when the insured person initiate purchase in orthopedic house. Orthopedic company will be able to review only verification of codes for the orthopedic and medical aids for which it has signed an agreement with the Fund and are not issued or purchased from other orthopedic company.

4 Discussion

4.1 Benefits from the presented e-services

The main idea of Connected Health is to use the ability of the technology to expand access to health information, improve the integrity of health information and organize and present that information. Thus, every stakeholder can execute its role in the system more efficiently and effectively. Evidences of the benefits from the presented e-services

as a part from the HIF connected health system are classified (as identified in [17]) in three levels: Healthcare efficacy, Sharing and synchronization of data, Healthcare transformation (see figure 3).

4.1.1 Healthcare efficacy

Many benefits of e-services adoption for insured people, general practitioners and orthopedic companies materialize almost immediately. These benefits can include: reduced administrative activities and costs, elimination of duplicate and incorrect data, improved safety and privacy of insurers' data, shorter period for the realization of the rights of healthcare insurance.

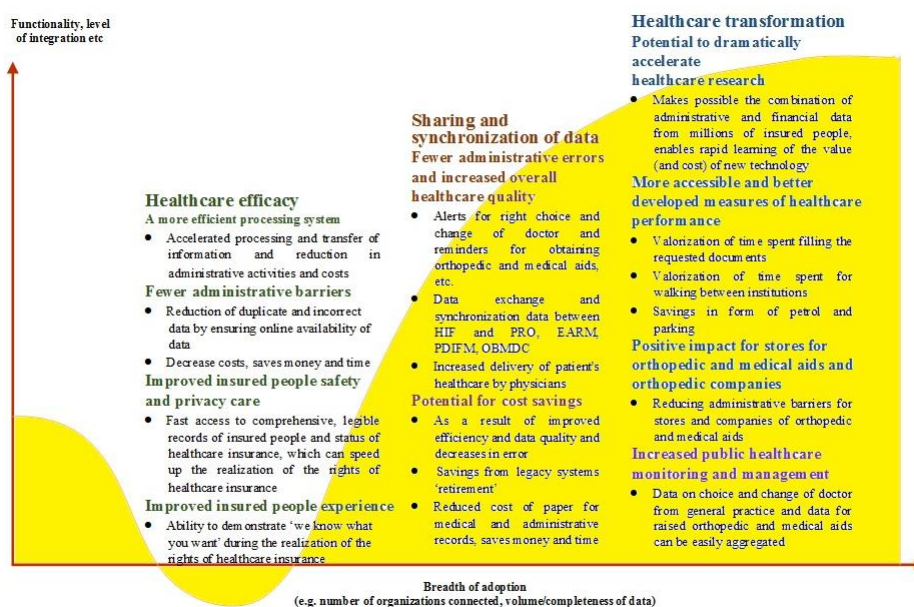


Fig.3. Three levels of value creation of HIF of Macedonia connected health system (adopted from [17])

4.1.2 Sharing and synchronization of data

Sharing and synchronization of data allows HIF to promote the exchange of healthcare information between different stakeholders in the healthcare system. HIF of Macedonia exchange data with:

- PRO - the information about all the changes of active bonds, as well as data for all newly formed bonds, data for individual payers for health insurance, data for each insured person in compulsory social insurance. The data exchange is done twice per day via SFTP server with encrypted file.

- EARM- the data for insured people for each M1-registration, M2-deregistration and Mx-change. The data exchange is performed using the so-called "push" methodology on 15 minutes interval.
- PDIFM- the information for new pensioners and data for pensioners with "pause status". The data exchange is realized by "request" from web service on HIF's side to the web service on the side of PDIFM.
- OBMDC- the information about newborns. The data exchange is realized by "request" from web service on HIF's side to the web service on the side of OBMDC. Several times per day the data is import into the HIF's database by matching the data on paid contributions and comparing the data obtained from other institutions with the data in the HIF's database. All these operations are performed in order to provide accurate data for Fund and the external institutions that need this data.

4.1.3 Healthcare transformation

The greatest level of value for connected health users is created by analyzing administrative and financial data sets which can be used to improve healthcare. The introduction of connected health, case of HIF's e-services, has a positive impact on healthcare transformation. In the evaluation of implemented e-services for the insured people, healthcare providers and companies (healthcare IT adoption), the following parameters are taken into account:

- Valorization of time spent filling the requested documents in HIF for achieving the rights of healthcare insurance and services;
- Valorization of time spent for walking between institutions; and
- Savings in form of petrol and parking fees for acquiring the requested documents.

All of these parameters have a positive impact of healthcare transformation and management that can improve the quality of healthcare and improvements and development of rights of healthcare insurance.

4.2 Benefits for different stakeholders

Although all stakeholders have benefits, in this sub-section we will stress the specific advantages from the different perspectives of the doctors, the healthcare organizations, the insured people and HIF. However, the greatest value of connected health lies in the long term changes to clinical and HIE.

4.2.1 Benefits for doctors

Doctors need the opportunity to use their time with a patient more efficiently, by exploring the treatment options and help with patient education. Another significant area of benefit to providers is the ability to query and analyze the complete population of insured people for whom they and their colleagues are responsible.

4.2.2 Benefits for healthcare organizations

Connected health systems generate valuable performance information that can improve workflow, safety and efficiency within healthcare systems. Our case study of connected health system of HIF, has shown several examples of improvement efforts, access to synchronized and unique data. One of the main advantages of healthcare IT for general practitioners is document management systems, meaning that all administrative data are available online, rather than taking a few days to go through all of the paperwork.

4.2.3 Benefits for insured people

Connected health offers many benefits to insured people. Insured people realize their rights more efficiently in terms of having a connected health e-services. From costs' point of view, insured people are avoiding unneeded strolling up counters between institutions and do not need additional paper documents.

4.2.4 Benefits for HIF

Connected health system makes savings in time and transportation. The institutions, that HIF share data with, are making savings in form of paper, printing expenses and labor. Savings are made as a result of the elimination of requested paper documents, which have been exchanged between HIF and the other institutions, in the new electronic procedure or e-services. Despite the obvious savings for HIF because of the reduced paperwork, the assumption is that the new workflows processes will release significant administrative capacities of HIF, which in the future can be redistributed to other work tasks. An additional aspect is to transpose these savings into environment savings, as a result of reduced demand for paper. Finally, the time spent for the achievement of rights of health insurance, services for insured people, healthcare providers and companies is invaluable and for it cannot be made a calculation.

5 Conclusion

We can summarize few potential benefits and losses from presented HIFs connected health system. HIF and other institutions will have reduced issuing of documents for insured people and healthcare providers. The increased efficiency of the employees means that the employees can devote more time to other work tasks. Insured people save time and reduce costs for transportation by going to fewer places to obtain healthcare services. Providing simplified and more efficient e-health services and electronic data exchange enables faster data access and more accurate data in terms of timely updates. HIF's connected health system shows an improved image of the HIF towards better healthcare quality. On the other hand, the reduction of printed paper defines the positive impact towards a greener society.

As a leader in healthcare in Macedonia, HIF will continue the transition towards connected health. But attaining and maintaining the trust of insured people and the other stakeholders is crucial for the success.

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