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Health Data Collecting and Sharing: Case Studies of Czech e-Health Applications

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Abstract. The paper shows the importance of e-health applications for electronic healthcare development. It describes several e-health applications for health data collecting and sharing that are running in the Czech Republic. These are IZIP system, electronic health record MUDR and K4CARE project applications. The e_3-health concept is considered as a tool for judging e-health applications in different healthcare settings.

Keywords e-$h_h$ealth, electronic health record, home care, health documentation

Introduction

The first summary on e-health applications in the Czech Republic can be found in the study *E-Health in Central and East European countries focused on the Czech Republic, Hungary, Poland and Slovenia.* The study was supported by the European Commission, DG Information Society, eHealth Unit and published in 2004 [1]. The World Health Assembly in its resolution on e-health in 2005 [2] recognized the potential of e-health to strengthen health systems and to improve the quality, efficiency and safety of care and the added value of the information and communication technologies for health purposes [3]. The role of e-health to provide an easy transmission and communication of information in healthcare in the form of data and knowledge was stressed in [4]. The concept of e-health has been the main topic of many books, papers in journals and presentations at conferences, e.g. [5], [6], [7] and [8]. In 2011 the e_3-health concept introduced in [9] stresses not only the *electronic feature* of e-health, but also two other features the *economic* and *environmental* that are very important for the judging of any e-health application (Figure 1).

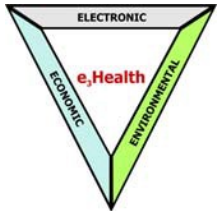

Figure 1: e_3-health concept

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The economic feature in modern healthcare offers solutions that can bring enormous savings and promotes an optimal allocation of limited resources both human and financial. We understand the *environmental feature* in health in the broad sense that addresses not only *physical, chemical and biological factors* external to a person but also factors developed in a society that belong to a *legal, social, political and cultural environment* that can potentially affect health. Therefore the concept of e_3-health is harmonizing the interrelationship among all three main features of modern healthcare, i.e. electronic, economic and environmental for all ICT tools and services in healthcare.

1. Methods

In this paper we compare the findings published in the report of the European Commission in 2004 with contemporary e-health methods and applications concerning Czech electronic health documentation, where collecting and/or sharing health data is described. The quality of data is the basic prerequisite for quality of information derived from data in healthcare. In [1] electronic health documentation was mentioned in the context of IZIP, NetC@rds and EuroMISE Center projects. The project NetC@rds is concerned with insurance cards and its present state is fully described in [10]. We consider that good electronic health documentation is the basis for the strengthening of the health systems, improving the quality of medical decision-making,, improving the safety and efficiency of health care. We discuss current state of the IZIP project, MUDR EHR developed in the EuroMISE projects (applications in cardiology and dentistry) and EHR for home care developed in the K4CARE project. We consider the possible impact of these projects on Czech healthcare taking into account also the e_3-health concept.

2. Results

IZIP project [11] originated as an Internet Health Book providing communication between patient and physician, where its existence and content was a sole decision of the patient. IZIP was not and even today is not EHR (compare e.g. with requirements [14], [15]) although it is often mistakenly or deliberately interpreted in this way. IZIP t gave no real evidence of implemented adoption of international standards such as ISO/HL7 10781:2009, ISO / EN 13606 and other standards of Health Level 7 Inc., integration profiles IHE (Integrating the Healthcare Enterprise) or any recommendations expressed by the EuroRec Institute in terms of quality guaranteed by Seal 1 and Seal 2. Therefore it is inconsistent with international efforts for interoperability and quality of EHR. Electronic health record is an inevitable part of every health care information system because it collects health information about individual patients. It is stored in a digital format that is capable of being shared across different health care setting. IZIP does not create an EHR that would fully replace the existing paper documentation and allow its effective use in healthcare. Recent media information concerning IZIP funding by VZP (General health insurance company), damages the trust of Czech citizens in the use of EHR in Czech healthcare. Other smaller health insurance companies have launched similar projects as IZIP, e.g. mVITAKARTA [12] and Kartazivota [13]. But their authors present them only as a health notebook or basic data for emergency purposes. In addition to traditional web

solution these new projects use also the form of applications for smartphones. There are dozens of systems similar to IZIP in the world, free and paid, which can be traced on the internet. This also includes systems Microsoft Health Vaud and Google Health, that closed on 1 January 2011 due to the lack of interest.

EuroMISE Center was the partner in the European project TripleC, where results of the European project I4C (Integration and communication for the continuity of cardiac care) [16] were implemented and validated in two Czech hospitals. The knowledge acquired from the project TripleC was further enhanced at the EuroMISE Centre multidisciplinary research. The priority was to propose and develop appropriate techniques of structured data entry, representation and processing aimed at minimizing the effort of users (physicians, nurses) of the system and maximizing the clinical outcome of the collected data. The suggested solution was implemented in a pilot application named 'Multimedia distributed electronic health record' (MUDR) [17], [18], [19], [20]. The prevalent application area for the research was the domain of cardiology and dentistry. A voice-controlled DentCross component for EHR in dental medicine was developed and semantic interoperability in the cardiology domain was studied. Dental EHR with the interactive voice-controlled DentCross component is running in dental care at the University Hospital in Prague-Motol [21].

European cooperation with Czech participation in research on EHR was also running in K4CARE (Knowledge-Based HomeCare eServices for an Ageing Europe) project [22]. The K4CARE platform is accessible using different ICTs. It is a web-based platform, and the services provided, are accessible by web browsers and wireless devices, such as mobile telephones or PDAs. With this integrated platform, the flow of information about the updated state of the patient among the different professionals can become time-space independent. Nowadays, when the patient in home care moves to a different places, the health professionals have found serious difficulties to obtain the patients´clinical history. Since most of the services have been performed either by nurses or social workers who usually do not have laptops for their work the application for PDAs was developed. It provides caregivers with all necessary data and knowledge they need at the point of care (patient´s home) and allows them to enter new data about the patient´s health state. The electronic health record for home care [23] integrates data from multiple sources, captures data at the point of care, and supports caregiver decision-making. . At present we are continuing in the area of technology supported home care, in particular focused on development of smart home applications and telemonitoring of health state of chronic patients, especially cardiac and diabetic [24], [25] patients.

The presented solutions MUDR with the DentCross componenet and and EHR used in K4CARE project proved to be significant contributions to electronic healthcare. We are not evaluating these e-health applications by GEP-HI guidelines [26] but we are judging them according to the e_3-health concept. The electronic feature and its complexity is judged according to J.H. van Bemmel scheme [27], We classify these two EHR applications on level 2 of the scheme. The economic feature can be judged only for applications running in healthcare practice. In MUDR EHR with DentCross component it was found that the synergy of the voice-control and the graphical representation of data made hand-busy activities in dental practice easier, quicker and more comfortable [28],[29]. In this application and even in the pilot application (K4CARE) it has been shown that they can save time, reduce the number of errors (including mistyping) in the data, make work more efficient, have all necessary information at the point of care, include multimedia data (image, sound). The

environmental factors influencing health are not usually part of patient documentation although it has already been shown that they play an important role. The e-health solutions may easily integrate this type of information, e.g. air pollution, noise pollution in the area where the person lives. Thus the doctor has a complex view of all factors that may influence the patient´s health state. Moreover, we have to consider environmental factors in the broader sense, especially social, cultural, political and legal factors that heavily influence types of health systems and can support or reject some e-health applications.

3. Discussion

E-health applications suitable for healthcare must be based on the technological platform of the future development of appropriate hardware and software. During their development and implementation it is essential that primary data and other information are stored mainly in a structured form and not in the form of free text. Transferring information between health care providers must always be based on a responsible approach of both parties in the relevant legal and human relation to the data subject, i.e. a patient. The patient should receive the best possible care regardless of where the physician and the patient are located and in what language the health documentation is stored The use of international classifications and standards, the use of ontologies and systems designed to allow integration with clinical practice guidelines or other systems supporting medical decision-making must be of good quality and be economically efficient. It is not only in the interest of the patient, but also of health organizations communicating with each other. Data storage and data transfer must be properly secured and at the same time should allow the highest possible degree of interoperability. Interoperability may significantly influence the effectivity both design and development of an integrated system and its routine operation. It will become more and more important with the development of telemedicine, home care and possibility of remote monitoring of patient state.. Only e-health applications meeting the state of the art in the field of medical informatics and judged from the point of view of the e_3-health concept allow physicians to obtain patient data and medical knowledge needed for determining optimal care.

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