

E-Health in Bosnia - Starting from the Ground-Up

Zekerijah Sabanovic¹, Izet Masic², Nizama Salihefendic³, Muharem Zildzic³, Lejla Zunic⁴, Samir Dedovic⁵

Medical Informatics Department, Faculty of Medicine University of Tuzla, Tuzla, BiH¹

Medical Informatics Department, Faculty of Medicine, University of Sarajevo, Sarajevo, BiH²

University Clinical Center Tuzla, Tuzla, BiH³

Faculty for Pharmacy, University of Tuzla, Tuzla BiH⁴

MEDIT, Sarajevo, BiH⁵

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SUMMARY. The development of the digital Information Communication Technology (ICT) has definitely changed healthcare system in all its areas. The development of standardized electronic medical record (EMR) make possible other forms of E-Health like transmural care, telemedicine etc. In this paper was described Health Information System (HIS) of Tuzla Canton and Br ko DC (whose citizens gravitate toward Tuzla Clinical Center). Tuzla Clinical Center is the only Clinic for tertiary healthcare in this region. To estimate level and types of the HIS, telecommunications and information management we have designed questionnaire. Based on this research we have presented current state of E-Health in Canton and the most important problems in this area. Also, based on this research and our experiences, we have identified the main directions of the HIS development, its standardization and integration as the base for E-Health in Bosnia. **Key words:** E-Health, Electronic Medical Record (EMR), ICT, Telemedicine (TM)

1. INTRODUCTION

E-Health is a relatively recent term for healthcare practice which is supported by electronic processes and communication using the Internet and WWW. The term can encompass a range of services that are at the edge of medicine/healthcare and information technology (1, 2):

- *Electronic Medical Records:* enable easy communication of patient data between different healthcare professionals (GPs, specialists, care team, pharmacy)

- *Telemedicine:* includes all types of physical and psychological measurements that do not require a patient to travel to a specialist. When this service works, patients need to travel less to a specialist or conversely the specialist has a larger catchment area.

- *Consumer Health Informatics* (or citizen-oriented information provision): both healthy individuals and patients want to be informed on medical topics.

- *Health knowledge management* (or specialist-oriented information provision): e.g. in an overview of latest medical journals, best practice guidelines or epidemiological tracking.

- *Virtual healthcare teams:* consist of healthcare professionals who collaborate and share information on patients through digital equipment (for transmural care).

- *mHealth or m-Health:* includes the use of mobile devices in collecting aggregate and patient level health data, providing healthcare information to practitioners, researchers, and patients, real-time monitoring of patient vitals, and direct provision of care (via mobile telemedicine).

- *Medical research uses eHealth Grids* that provide powerful computing and data management capabilities to handle large amounts of heterogeneous data.

- *Healthcare Information Systems:*

also often refer to software solutions for appointment scheduling, patient data management, work schedule management and other administrative tasks surrounding health. Whether these tasks are part of eHealth depends on the chosen definition, they do, however, interface with most eHealth implementations due to the complex relationship between administration and healthcare at Health Care Providers.

2. METHODS

For research purpose we have designed a questionnaire which includes the questions about:

- computer technology and networking (LAN)
- level of computerizations of Medical Records
- level of education and ICT knowledge of doctors and nurses
- databases and software they used frequently
- informational management (inside and outside certain institutions: health centers, hospitals etc.)
- connection speed and Internet usage (for telemedicine purpose & data exchanging).

Target sample was medical doctors (especially family medicine) which have average/common knowledge about ICT and information systems. In this research we have included healthcare system of Brčko

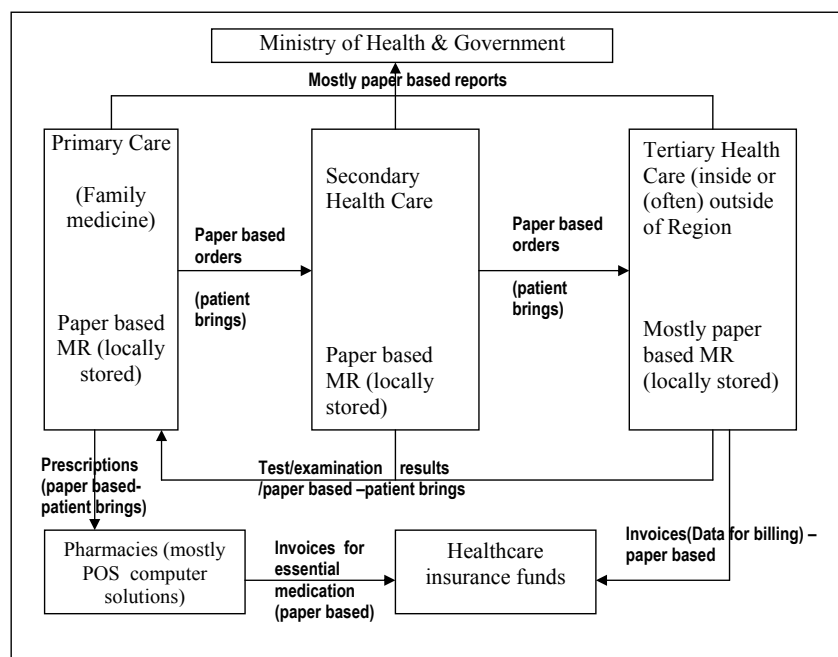


Diagram 1. Data exchanging amongst primary, secondary and tertiary healthcare (transmural care) and other levels in healthcare system

DC as a separate area whose citizens gravitate toward Tuzla Clinical Center (for tertiary healthcare)

We have excluded IT experts from sample, since they have knowledge from this area above average.

3. RESULTS

According to our research:

- 97% Tuzla Canton and 98% Brčko DC have paper based medical record. very few 2-3% institutions have combined MR (paper/electronic forms) in but it was created for inside usage (can't exchange electronic data with the others).
- In 97 % information system was developed without any European e-health standards.
- 99 % participants don't have possibilities to exchange data electronically.
- 45% have solid knowledge of Windows OS, 100% work in Word, 20% in Excel (basic tables and calculations) but very few 5% are expert in any software special designed for medicine (mostly in radiology, laboratory (partially developed RIS and LIS) and pharmacy.
- 92 % doesn't know basic things about information management in healthcare system (inside their institutions 79% and 94% out-

side) (Why and where goes information / data after they fill them on paper), system of reporting is unknown etc, which data they should receive as a return information etc.

- 100% of family medicine doesn't have parts of medical records (of their patients) from secondary or tertiary healthcare. They have only information returned in paper (results of examinations) which patient brings them from secondary and /or tertiary healthcare.
- 99% of participants share data in paper forms (amongst all participants (health centers, hospitals, insurance funds, government (ministry of healthcare), patients etc. Only 1% are reporting electronically (mostly in self designed basic Excel tables, sent through e-mail)
- 96% of health professionals don't even know what HL-7 is. Only 1% has (Brčko DC) have partially developed laboratory information system (LIS) that is HL-7 compatible.
- 97 % have LAN and other good infrastructure. Urban areas (like Brčko DC) have 1 Gigabit / 10 Gigabit fiber optic links). But healthcare participants don't exchange the data even inside the institutions: family doctor sends

to local laboratory or specialist orders in paper forms, and they return them results in paper form also (patients bring)

Health Insurance Funds in Brčko DC have electronic records (not standardized for e-health) for insured people but they don't exchange them with local health center and hospital.

About 32% have Internet connection at their work place (dial – up 21% and ADSL 11%)

According to our research and experience, we can define the main problems connecting to e-health development in our country:

- Lack of global strategy at the country level (and other levels also: entities, cantons)
- There is no separate planned financial resources for ICT development
- Paper based medical records and information systems
- Undefined information management
- There is no ICT standardization through different healthcare participants
- Lack of experts in health systems development so called “hybrids” which understand both: realities of healthcare delivery and IT (3)
- Mostly uneducated health professionals (doctors, nurses, etc.)
- Still undeveloped telecommunication infrastructure in rural areas (fast links)

Comparing to developed European countries which are in 2008. entered in project “12 European countries take first step across e-health borders” (4) of integration of all European countries in unique e-health system, e-health in B&H is really still on the ground!

4. E-HEALTH IN BOSNIA: WHERE TO START AND WHERE TO GO?

In healthcare system we can recognize three main participants with the different focus on medical record (and e-health):

- Ministry of Healthcare (Government)
- Healthcare Insurance Funds Providers

Providers are logically focused on separate part of medical records in which they are involved through

treating of the patients. It seems that provider's main interest is part of e-health—from admission to discharge.

Health insurance funds are interested for setting of health insurance premiums of the citizens, and contracting with the providers. So they should be more responsible for e-health development than providers.

Ministry of healthcare organizes complete health system from global levels (global strategy, time dimension). So we can see ministries of healthcare (government) the most responsible for e-health development.

4.1. Importance of E-health in medical practice

Healthcare reform in Bosnia has brought in focus primary healthcare through introduction of family medicine which could be capable to solve over 80% of all health problems of the citizens. Telemedicine should be directed through projects in these areas by enabling: fast diagnostics, choice of treatments, health prevention and promotion, continuous education of healthcare professionals and patients, evaluation of delivered medical services, financial control, and exchanging data with healthcare insurance funds, hospitals and ministries of healthcare.

Results of most relevant diagnostic procedures (ECG, EEG, CT, MRI, etc) are already in digital format. Fast exchanging of these data is very important for the teams of family medicine. At Tuzla Clinical Center has introduced contemporary radiology information system (RIS) with great capabilities to store and exchange data. To use this system in telemedicine we need to develop appropriate ICT infrastructure in our Canton (and whole country). By connecting in networks, family doctor offices could become a part of international telemedicine with all of its advancements.

Emergency medical care (EMC) is very important area in which fast information and on-line communications can save patients lives. Although activity of EMC is defined through standards and norms, this area is pretty in the margin of the expert and social interest. Research

and analysis of EMC in Tuzla Canton has presented that current organization and capacities can't satisfy needs of the citizens. To advance this area it is important:

- To establish new system of EMC in Canton
- To prepare and educate health professionals
- To equip properly departments of EMC (vehicles, equipment for reanimation, polytraumas, etc.).

To establish (and follow) appropriate information management (reports of urgent conditions by citizens and from departments to centers of EMC, continuous patient and condition observation—during transport, medical treating and after that)

By connecting (through ICT) of the units of EMC, healthcare centers and hospitals could be great organizational test which can be spread through whole country. First step we should undertake in organization and establishment of infrastructure for unit of EMC at Tuzla Clinical Center. Newly created information system should be capable to be replicated in other hospitals and units of EMC through whole country. The main mission of this project should be transmission of urgent patient data in digital form as one of important condition for effective treatment.

To develop contemporary e-health system in Bosnia we should consider the next things:

- Definition of the general strategy at the country level. All healthcare participants should be involved but especially: ministry of healthcare, healthcare insurance funds, providers,
- The key players (5) for E-Health development should be determined (and involved): ministries of healthcare; health insurance funds; Society of Medical Informatics; professional organizations (healthcare specialists); providers (health centers, hospitals, clinics etc.); producers & distributors of medications, medical materials and devices; pharmacies, universities, patients and ICT companies,

Define information management through complete healthcare system

and legitimate it (as obligation). For transmural care, to establish full access in medical records, for others, for ex. hospitals (for comparison) define minimal sets of data that has to be exchanged. Make some data more transparent.

Find, define and plan financial resources (separate and continuous budget for e-health development).

Electronic medical records (EMR) development, and definition of centers for storing it (5). Start thinking about using of the smart cards for the patients for storing parts of medical record (MR) –important and actual data (ID data, insurance data, actual medical data etc.)

Standardization is essential (ISO, CEN, ANSI, NEMA, ASTM, IEEE, etc.) (6)

In the meanwhile through telemedicine projects start to exchange what is currently possible:

- data from insurance funds (which are mostly in electronic databases)
- parts of MR like: radiology images, laboratory tests etc.

Establish fast links in some important areas like rural emergency centers with emergency center at hospitals and clinics. We can see urban links through fiber optics, and rural through DSL or wireless.

On-line pharmacies and prescriptions (7)

5. DISCUSSION AND CONCLUSIONS

Electronic medical record (EMR) has many advantages comparing to paper based medical record but the main is: it can be shared very fast among all (local or remote) participants of healthcare systems. The main prerequisites for that are:

- It has to be standardized
- It required fast connections if we want to exchange it rapidly (ISDN, DSL, Fiber Optic, etc.)

According to our research and experience from this area we can say: ICT definitely affected our lives, but unfortunately not our minds! Local managers (from healthcare insurance funds, providers, etc.) still think locally, not globally. They are still developing “internal” information systems without possibility to share data with the surroundings. The main question during develop-

ment of computer based information system really is “what I need in electronic forms” but also “what I can exchange with the others” (acceptance of ICT standards in healthcare)

Large clinical centers (Tuzla, Sarajevo, Banja Luka, and Mostar) should be involved and very interested for development of other providers especially in rural areas. They should be some kind of Expert Centers for certain regions and they shouldn't hesitate to offer help (experts, technical support, fast links) to smaller ones in accordance to be a real Expert Center using telemedicine. They are now like lonely islands: they have advanced systems but the others can't follow and share data with them.

Also, the developed countries especially European countries should be very interested to help e-health in Bosnia. Good example is telemedicine project which has connected India and Ethiopia (8).

Good start could be through projects in emergency medical care area by connecting rural centers with emergency medical centers located at the clinical centers (9,10,11,12).

The fact is that, even now but especially in the future, it is not question “Who is bigger and geographically closer?” but “Who is better?”. Better means: good quality of medical practice, faster response, cheaper medical service etc.

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Corresponding author: Prof Zekerijah Sabanovic, PhD, Medical Informatics Department. Faculty of Medicine University of Tuzla, BiH. E-mail: zekerijah.sabanovic@untz.ba