

ПРОБЛЕМНІ СТАТТІ

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Opportunities and Challenges of eHealth – Interconnectivity for Healthcare Services

E.T.Kldiashvili

Georgian Telemedicine Union (Association), Tbilisi, Georgia

РЕЗЮМЕ, ABSTRACT

The setting up of eHealth applications will enhance rapidly the decentralization and the enrichment of the country territory driving it towards a homogenous environment for healthcare. For all areas of eHealth the concept of connectivity for and among individuals, healthcare services, and health systems is central. But interconnectivity for healthcare services has many aspects (technical organization, psychological, social and socio-cultural, financial, legal, political, security-associated) which play a substantial intertwined role (Ukr. z. telemed. med. telemat.-2006.-Vol.4,№1.-P.4-8).

Key words: Information and Communication Technology, eHealth

Е.Т.Клдиашвили

ВОЗМОЖНОСТИ И ЗАДАЧИ ЭЛЕКТРОННОГО ЗДРАВООХРАНЕНИЯ – ВЗАИМОСВЯЗЬ СФЕР ЗДРАВООХРАНЕНИЯ

Союз (Ассоциация) телемедицины Грузии, Тбилиси, Грузия

Внедрение возможностей электронного здравоохранения ускорит тенденцию децентрализации, а также обусловит развитие страны в соответствии с вектором создания гомогенной среды для здравоохранения. Для всех направлений электронного здравоохранения концепция взаимосвязи для и между индивидуалами, сферами и системой здравоохранения в целом краеугольна. Хотя упомянутую взаимосвязь характеризуют многие аспекты (техническая организация, психологические, социальные, финансовые, легальные, политические, а также аспекты безопасности) осуществляющие последовательную и взаимозависимую роль (Укр.ж.телемед.мед.телемат.-2006.-Т.4,№1.-С.4-8).

Ключевые слова: информационные и коммуникационные технологии, электронное здравоохранение

Є.Т.Клдіашвілі

МОЖЛИВОСТІ І ЗАДАЧІ ЕЛЕКТРОННОЇ ОХОРОНИ ЗДОРОВ'Я - ВЗАЄМОЗВ'ЯЗОК СФЕР ОХОРОНИ ЗДОРОВ'Я

Союз (Асоціація) телемедицини Грузії, Тбілісі, Грузія

Упровадження можливостей електронної охорони здоров'я прискорить тенденцію децентралізації, а також обумовить розвиток країни відповідно до вектора створення гомогенного середовища для охорони здоров'я. Для всіх напрямків електронної охорони здоров'я концепція взаємозв'язку для і між індивідуалами, сферами і системою охорони здоров'я в цілому є наріжною. Хоча згаданий взаємозв'язок характеризують багато аспектів (технічна організація, психологічні, соціальні, фінансові, легальні, політичні а також аспекти безпеки), що здійснюють послідовну і взаємозалежну роль (Укр.ж.телемед.мед.телемат.-2006.-Т.4,№1.-С.4-8).

Ключові слова: інформаційні та комунікаційні технології, електронна охорона здоров'я

http://www.telemed.org.ua/UJTMNT/N1_06/article1.html

The introduction of Information and Communication Technology (ICT) in the healthcare scenario is instrumental for the development of sustainable services of di-

rect benefit for the citizen. The setting up of eHealth applications will enhance rapidly the decentralization and the enrichment of the country territory driving it towards a ho-

mogenous environment for healthcare. Specific benefits obtained from the developments of eHealth will essentially be:

- To support the take up of broadband services in rural areas;
- To enable public authorities to contain service costs and improve prevention strategies;
- Through the provision of healthcare services on moving platforms eHealth will ubiquitously enhance the safety for citizens;
- The only way to provide healthcare emergency services in disaster situations;
- To enhance the provision of ubiquitous medical education services of direct benefit for the patient and the overall medical community;
- Due to its intrinsic capability of aggregating the demand, eHealth services will encourage the generation of Global standards, legal and regulatory frameworks.

For all areas of eHealth the concept of connectivity for and among individuals, healthcare services, and health systems is central. On the background of the added value chains for an integrated healthcare approach, healthcare services delivered by different providers must be interoperable on four levels of connectivity:

1. Political interoperability (policy, ethical and legal aspects);
2. Social interoperability (professional and citizen mobility, citizen centred approach);
3. Organizational interoperability (health system and service integration and coordination of levels and individual and community; smooth collaboration according to patient-individual care plans is required, on basis of appropriate regulations, agreements and contracts);
4. Technical interoperability (communication networks, content standards, platform standards). A secure, reliable and accessible communication infrastructure for health and social care is required as a prerequisite for broad deployment of eHealth.

Interconnectivity comprises a lot more than merely devising and installing the technological infrastructure so as to be able to communicate and spread medical data through defined secured channels from one

point on the earth to another. Interconnectivity is responsible for several aspects of eHealth service delivery when installing and running it:

- Technical aspects
- Organizational aspects
- Psychological aspects
- Social and socio-cultural aspects
- Financial aspects
- Legal aspects
- Political aspects
- Security aspects

Technical aspects. With the availability of electronic patient record systems [1] which try to integrate not merely both the stationary and the ambulatory medical workflow of diagnostics and therapy, but deliver real-time medical patient data in a ubiquitous fashion to hold these data available at any time and any location, the basis for a global data exchange in the field of medicine is given. The main stakes today comprise HL7 (HL7 2004) and information servers, CDA (CDA 2004), SCIPHOX (SCIPHOX 2004) and many other existing and to become documentation standards. More and more, the availability and performance of terrestrial communication lines becomes continually better: back from analogue telephone line to digital ISDN and nowadays xDSL lines [2]. Whereas these communication line types are financially affordable usually for private and small business applications and services, such lines of even better quality (e.g. optical fibre) are today too expensive to compete adequately for a substantial market share in medicine.

The most important aspects which enable these “new” technologies to be widely accepted are [3]:

- User-friendless
- Reliability
- Error tolerance
- Security and privacy
- Service availability
- Quality of service
- Quality of workflow realization

Existing middleware must be integrated into more modern software concepts. Concerning the availability of communication services, ad-hoc networks must be installa-

ble within short periods of time. Adequate Quality of service shall be provided. Different technological gadgets and equipments must be interoperable so as to work together and be compatible to each other on a large scale. Mobile units must be set up within few minutes to hours (quasi real-time deployment capability) after an incident (trauma, emergency, disaster, terror attack etc.) has taken place.

Organizational aspects. The necessary forms of organization within hospitals and the medical practices are only partially compatible to each other. As of yet, there are no general recommendations as how to organize services which have to deal with a more through electronification of medicine [4]. This, however, is independent of the underlying communication technology used.

Access to medical data must be authorized by the informed patient. The physician is not the proprietor of these data, whereby he may edit and manipulate them according to their "load of truth". Medical data must be ubiquitous for mobility's and flexibility's sake.

Psychological aspects. Many staff members in a medical setting – irrelevant of their hierarchial position – are still reluctant to use computer-based help in their daily routine work. It has clearly been shown that for physicians, the "option to possess a gadget" to handle medical instructions is interesting, but this interest soon enough loses intensity after a very short period of time. For the paramedics, however, such gadgets often become integrated for goods into their medical routine, and they are thought to use them much longer, much more intensely, and with a greater understanding of the gadget's practical value.

Clear structures of medical workflows must be elaborated and installed into both software and hardware concepts which allow for a digitalization of medical data in every respect. The acceptance that by ongoing electronification routine aspects of work can be simplified and made more efficacious is crucial for the onset of technology apart from the postulation of user-friendliness and cognitive transparency.

Social and socio-cultural aspects. Many studies have shown that socio-cultural changes of a society towards the incorporation of electronic gadgets into daily life have great influence on the way people think and even expect how medicine should work. Technocracy has become one of the outstanding features of medicine in the opinion of most people. Irrelevant of whether this view is correct or adequate, medicine now is no longer in a condition to reluctantly defy all technological advances made. "The standard of ubiquitous communicability for man has to become a feature of medicine as well". Furthermore, hierarchial structures no longer being accepted the way they used to be, a tendency can be noted which strengthens the individual's "home right": More and more applications and services are directly integrated into the consumers' homes, and they are expected to be both safe and trustworthy.

The use of eHealth applications and services must go out of the hospitals and go into the homes of the health consumers. Healthcare is already being deliverable at home, and the electronic documentation needs to follow. Thus, the concept of continuous socialization (with the family, with friends, etc.) can be upheld better than before, and cases of hospitalization with all their aspects of microbiological contamination and psychological deprivation and de-personalization can be reduced significantly.

Financial aspects. The heterogeneity of legal preconditions for carrying out eHealth applications and services, invariant of the used communication technology still in many countries forms a broad barrier with a national and an international component.

Establishing real world applications and services will, in the near future, definitively have the potential to help to save money, reduce redundancies, avoid a waste of resources, reduce the system-specific administrative overload and keep up and foster international bonds and treaties. Models will have to be developed which offer the same range of applications and services at the same or even better conditions (upstream and downstream velocity, data scrambling,

etc.) for both the health consumer and the healthcare professional based on the most suitable telecommunication access technology.

Legal aspects. A unification of legal preconditions has to be proposed by each country.

Political aspects. Adjourning to the legal problems, the general attitude towards an ongoing electronification in many countries is apparent, the way and direction, however, in which these developments are brought to flourish, are potentially different. In this situation, some coordination actions on an international level are mandatory.

The general direction shall be an "opening of data transfer through closed channels", to transmit data safely from one point to another. Therefore, on the side of the policy makers, medically expert advisors and consultants who not only know the individual healthcare situation perfectly well, but also have deep knowledge of the technology to be used together with a vision of where the whole development is heading to, shall be introduced to offset up the new basic laws to foster the understanding of eHealth on the one hand and help the development of the needed applications and services on the other.

Security aspects. Security threats – not merely in the sense of a technological impact (virus attacks, worms, malicious scripts, etc.), but also concerning human behavior in carrying out national or international conflicts – are most imminent in people's minds when it comes to data security. This issue, however, has nothing to do with the underlying method of communication, but refers to the application and service layers to be applied.

Data transfer has to be made safe and trustworthy. On the one side for the health consumer who wants to be assured that his medical data are not disclosed to anybody else but himself or herself. On the other side for the healthcare professional who does not want his medical workflow data exposed to unauthorized or forbidden benchmarking or other manipulation. Technologies must be developed which guarantee adequate amounts of privacy for all us-

ers of eHealth applications and services. Communication networks, thus, must exclude the possibility that their data stream is being logged and "reverse engineered" to something human readable and something which can be associated to a real human being. Furthermore, patients can have access to the log files of their medical data viewed by "authorized" persons thus implying a control mechanism for the accuracy and integrity of his/her own data.

Just to conclude, the technological basis to support the communication and integration of medical patient data exists and can be used. However, the heterogeneity of middleware in the healthcare sector reflects the real problems for the introduction, installation, and maintenance of such technology. And this situation seems to be mostly independent of the technological nature of communication. But apart from technological questions the main stakes are to seamlessly integrate all of the mentioned aspects into one singular, possibly globally usable concept which enables the empowered citizen to take part in the best medical quality everywhere on this planet. Therefore, some challenges and opportunities are addressed:

- The basic technology deals with communication of medical data. Thus, a standardized document format is needed. Best candidates are the XML-based HL7 together with the specification of CDA and SCIPHOX and other possible document formats to evolve.
- The applications and services presently used and to be developed are independent of the underlying communication carrier.
- Utilities to integrate existing middleware and to convert "older" data sets are needed. The software used has to be transparent and user-friendly to the maximum for all users.
- Technology has to go hand in hand with the health consumers' and the healthcare professionals' needs and demands and must not be used "en soi et pour soi" (role of "technology push" versus "demand pull").

- Socio-cultural changes need to be implicitly taken into account when it comes to developing systems which shall not only be used in a clinical context, but also be able to be integrate able into the health consumers' home.
- Terrestrial infrastructures are nowadays supporting the majority of existing and future applications and services in the eHealth market. Only by developing competing financial models the spreading of the communication technology will come into being demonstrating its values.
- Legal and political aspects have to be harmonized on both a national and an international level. This is the more important on behalf of the growing mobility and flexibility of today's populations.
- The basic demand for the individual's right to be proprietor of his or her own data is that adequate data security is a mandatory step which no longer needs any arguments. The medical data are owned by the patients. External interceptions cannot be tolerated.

Technology push, i.e. the existence and principal availability of technology without defining demands, thus does not lead to the desired effect of a widespread use of eHealth applications and services as long as the demand pull, i.e. the users' demands and needs irrespective of existing or to-be-developed technology, is not correctly identified and integrated into one single concept.

Therefore, interconnectivity for health-care services has many aspects (technical organization, psychological, social and socio-cultural, financial, legal, political, security-associated) which play a substantial intertwined role (network). Only this network texture enables both an efficient and efficacious performance of exchanging medical data through communication structures. With adequate definitions of both existing demand and available technology software applications and there upon established services can be used to minimize efforts and redundancy and to maximize output and efficiency in medical data handling.

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Кореспонденція: *Kldiashvili E.T.*,
75 Kostava str., 0171 Tbilisi, Georgia
E-mail: kldiashvili@georgia.telepathology.org