Original Contribution

HEALTH: THE TOOL TO SOLVE THE HEALTHCARE DILEMMA

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Abstract: *Brought to life by contemporary changes of our world, eHealth offers enormous possibilities. It is defined as the cost-effective and secure use of information and communication technologies in support of health and health-related fields, including healthcare services, health surveillance, health literature, and health education by the World Health Assembly resolution on eHealth.*

It is impossible to have a detailed view of its potential as eHealth affects the entire health sector and is a viable tool to provide routine as well as specialized health services. It is able to improve both the access to and the standard of healthcare. The aim of this paper is to focus on how eHealth can help in closing the gap between need and demand in healthcare and thus solving the healthcare dilemma.

Key words: *eHealth, healthcare dilemma, cost effectiveness*

Introduction

Over the past decades information and telecommunication technology (ICT) has become an integral part of healthcare. Decision makers, patients, providers, etc. often present ICT applications in the health sector as one of the panaceas for reforming healthcare and solving the healthcare dilemma.

The paper is an attempt to outline whether eHealth is really the solution of healthcare dilemma. The paper will present in brief what has already been achieved and what are the barriers that the wide ICT application in healthcare is facing.

The healthcare dilemma

The healthcare dilemma is the necessity to close the constantly in-creasing gap between the available healthcare services and the demand of ensuring affordable, high quality healthcare to all, 24 hours a day, 7 days a week. If summarized the pressure on healthcare systems worldwide is due to:

- Gradually increasing world population;

- Steadily increasing elderly population in developed countries, going hand in hand with relative decrease in resources (fewer taxpayers) and increasing percentage of chronic patients with multiple disease;

- Increasing healthcare expenses due to: development of new technologies, necessary to secure health services; increasing amount of chronic patients and elderly living alone; growing number of individuals with limited

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health and/or physical disabilities but with the ambition for an independent living; quicker spread of diseases due to worldwide connections;

• Governmental healthcare expenditures growing faster than the economic growth;

• Decreasing amount of health care professionals as compared to the demand of healthcare services;

• Demand of ensuring access to health care for all individuals as one of the basic human rights;

• Need of ensuring the continuity of healthcare.

No doubt, finding a solution to cover the gap between increasing needs, demands and the available healthcare service is a must. The expectations are that application of ICT in healthcare or the so called eHealth is the panacea. It is believed that eHealth may solve the healthcare dilemma by providing (a) easy access to healthcare everywhere and to everybody in an environment of diminishing resources and to do this (b) at a reasonable cost. Is this evidence based?

Before focusing on what is already available it is necessary to clarify the terminology.

eHealth: The tool to solve healthcare dilemma

1 Telemedicine, eHealth, Tele-health

A decade ago, the application of ICT in healthcare was described as telemedicine. Telemedicine is defined as the use of ICT to provide and support healthcare and exchange healthcare information when a distance separates the participants. The term telemedicine is a combination of two Greek words τήλε = tele - meaning "at a distance" and "medicina" or "ars medicina" meaning "healing". The introduction of the word telemedicine is ascribed to Thomas Bird, who in late 1960's had used it in order to illustrate health care delivery, where physicians examine patients at a distance through the use of telecommunications technologies.

In 1980's and 1990's multiple working definitions of telemedicine were introduced. Some of them are very wide such as "something to do with computers, people and health", others – extremely narrow e.g. "the healthcare industry's component of business over the Internet". More on various telemedicine definitions may be found in [1].

The European Commission (EC) has also contributed to the list of definitions. In its communication on telemedicine EC defines telemedicine as the provision of healthcare services, through the use of ICT, in situations where the health professional and the patient (or two health professionals) are not in the same location [2]. The European Coordination Committee of the Radiological, Electro-medical and Healthcare IT Industry (COCIR) has adopted the EC Commission definition on telemedicine underling that that telemedicine is the overarching definition spanning telehealth, telecare and

teledisciplines such as teleradiology, telescreening etc. [3].

Till the end of the 1990's the term telemedicine was widely spread and accepted. With more involvement of the electronic communication systems, the major International Organizations – World Health Organization (WHO), EC, International Telecommunication Union (ITU) and European Space Agency (ESA) - have officially adopted the denomination "eHealth". "eHealth refers to the use of modern information and communication technologies to meet the needs of citizens, patients, healthcare professionals, healthcare providers, as well as policy makers" [4].

In 2005, the World Health Assembly recognized eHealth as the way to achieve cost-effective and secure use of ICTs for health and related fields, and urged its Member States to consider drawing up long-term strategic plans for developing and implementing eHealth services and infrastructure in their health sectors.

It is necessary to underline that "e" in the eHealth does not stand only and exclusively for electronic and IT industry and services (hard- & software, Internet, e-mail, etc.). It characterizes in details what eHealth is all about [5], i.e.:

• Efficiency;
• Enhancing quality of care;
• Empowerment of consumers and patients or patient-centered medicine replacing the traditional model of patients moving upward, unchanged for 6000 years;

• Encouragement of a true partnership between the patient and healthcare professionals;
• Education;
• Exchange of information;
• Extending the health care beyond national boundaries;
• Ethics;
• Equity;
• Easy-to-use …

In addition to eHealth, one more term has been introduced and widely used recently - Telehealth. This is the means by which technologies and related services at a distance are accessed by or provided for people and/or their careers at home or in the wider community, in order to facilitate their empowerment, assessment or the provision of care and/or support in relation to needs associated with their health (including clinical health) and well-being. Telehealth always involves and includes the service user or client. It includes remote patient management, too.

What is the correct terminology? Unfortunately, to this very moment, the terminology has neither been agreed at European nor at worldwide level. Positions differ and the preferences are usually influenced by individual experience, personal and professional viewpoints. Thus for some authors telemedicine and eHealth are synonyms. Others accept that eHealth is a broader term and includes telemedicine. A third group separate the terms, accepting that telemedicine incorporates telecardiology, teleradiology, telepathology, tele-ophthalmology, teledermatology, telesurgery, tele-nursing, etc, while

eHealth comprises of e-Santé, Information and Communication Technologies in health (ICT-Health), all types of health communication services, PACS, patient information systems, e-education, e-prescription, etc.

Further in this paper the terms eHealth will be used.

2 Who needs eHealth

eHealth has been brought to life by the contemporary changes of our world. Changing demographics and a rapidly aging population; globalization; changes in disease patterns; the necessity to be prepared for and respond to natural disasters and possible bio-terrorism; cheaper and affordable information and communication technology solutions, and the necessity to cut the costs of healthcare budgets spent worldwide are only some of the catalysts for the eHealth development.

Despite the uncertainties with the terminology, there is no doubt that eHealth calls upon several essential components of the community. It involves an important input at the political level (governmental or community as is the case of the countries in the European Union and Commonwealth of Independent States) in health, communication and technol-

ogy, education and industry. As it is all part of eGovernment, both at the national and international levels, communication and cooperation between all ministries and all bodies (companies, agencies, etc.) owned or controlled wholly or partly by the government is essential for its successful adoption.

But one must never forget that the ultimate beneficiary of eHealth is the patient / citizen via the healthcare professionals. No matter whether the patients are living in remote areas or in a metropolis, they all could benefit from eHealth applications. In remote islands or regions, eHealth applications may solve the critical issue of access to healthcare and reporting the results. In densely populated areas the situation is not much different. Management of chronically ill patients, hospice care, or receiving a second opinion for difficult cases are just some of the applications of eHealth in densely populated regions. The reason that eHealth is applicable everywhere is that it does not have the goal of changing the essence
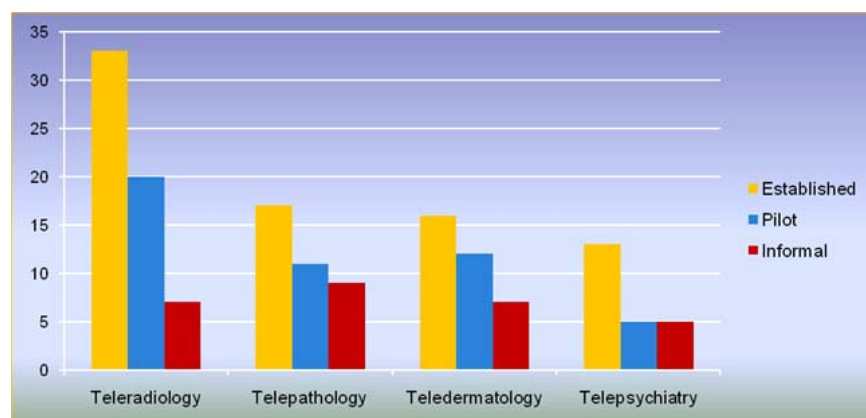

Fig. 1 Global levels of development of some services as % of countries reporting eHealth development: Established = continuous service supported through funds from government or other sources, Pilot = testing and evaluation of the service, Informal = services not part of an organized program

of healthcare service. It is just optimizing it, including currently available technology.

3 eHealth World

What is the current situation with eHealth implementation worldwide? Thousands of papers, reports and presentations are published annually. Each of them provides a glimpse at the eHealth application in a region, country or community. In sum: The technology is in hands. Various devices have been developed offering solutions for optimization almost every aspect of healthcare service. The range varies from wireless pill dispensers in Australia and portable heart monitors and blood glucose meters imbedded in mobile phones in Germany to hospital trains equipped with tele-consultation centers and satellite antennas in Russia or motor powered canoes containing an operating room, recovery room, a consultation office, and living quarters in Ecuador. An annual updates of eHealth achievements are summarized in [6-10] since 2008.

All devices and/or solutions support optimization of healthcare either via directly influencing patients' care (increased access to services; improved availability of different types of services; timely and controlled care, etc.) or with opportunities to optimize the work of healthcare professionals. The final result is not only better quality healthcare, but a lower stress for both patients and healthcare professionals and an increased psychological comfort for all, which also reflects on the quality and quantity of health services.

One of the most extensive surveys providing a global picture of the eHealth world is the WHO Global eHealth Observatory [11, 12]. The results from 114 countries covering 81% of the world's population revealed the development of the 4 most widely implemented areas of eHealth – teleradiology, telepathology, teledermatology and telepsychiatry (Fig. 1). The reasons that these 4 areas are most widely developed are rather pragmatic. Specialist in radiology and pathology are lacking in all countries, their qualification needs significant investment and years of additional education, while the conclusions of radiology and pathology examinations are crucial for the diagnosis and the treatment. Teledermatology is in the top list as globally every fourth patient looking for medical care has dermatological problems. Usually dermatological diseases cause significant psychological disturbances that made the treatment even more complicated. As for telepsychiatry, it is in the top list due to the clear trend of increasing of mental disorders (depression included) in the years to come and the heavy burden that these kind of disorders place on individuals, families and communities all over the world. Detailed analyses revealed that provision of these 4 eHealth services is far less progressed in upper-middle, lower-middle and low-income countries than in high-income countries; this is the case for the proportion of countries with established services and the overall proportion of countries of-

fering telemedicine services. The African and Eastern Mediterranean Regions generally had the lowest proportion of countries with established eHealth services.

When the applications of mobile health technologies (mHealth) are concerned the expectations are that they would be highly available, especially after the reports of ITU that there are over 5 billion wireless subscribers and that over 70% of them are living in low- and middle-income countries. WHO survey revealed that 83% of WHO Member States reported offering at least one type of mHealth service and many countries offered four to six mHealth programs. The four most frequently applied services are: health call centers (59%), emergency toll-free telephone services (55%), managing emergencies and disasters (54%), and mobile telemedicine (49%). Unfortunately, with the exception of health call centers, approximately two thirds of mHealth services are in the pilot or informal stage.

Consistent with eHealth general trends, higher-income countries are more active in implementation of mHealth than do lower-income countries. Countries in the European Region are currently, as per 2010, the most active and those in the African Region the least active. More information is available in [11, 12].

In sum, despite of the significant funds and efforts dedicated to the development of eHealth services they are not as widely implemented as it has to be expected. And this is not because the services are not accepted.

4 Acceptance of eHealth

No doubt, we all need eHealth. But are we ready to accept it? Success or failure of eHealth is a question of acceptance by both the patient and the healthcare provider.

Numerous studies have revealed patients' satisfaction with eHealth applications [13-15]. What is more, active patients play the most important role in evaluating and forcing the distribution of innovative medical solutions. The increasing acceptance of eHealth applications in a number of areas of health care such as chronic diseases and chronic heart failure [16, 17], psychiatry [18-19], psychology [20], care for elderly and house bound patients [21] is already proven.

If summarize to above: eHealth technology solution are available and are welcome. But are they cost effective?

5 Cost effectiveness

Optimization of healthcare with eHealth also concerns its cost effectiveness. Initial studies were definite – there is no good evidence that telemedicine is a cost effective way to deliver healthcare [22].

Perhaps one of the reasons for these conclusions is that some of the analyses were based on literature reviews of projects from the late 90s. The majority of these studies were based on samples with fewer than 100 participants. Plus, most of the studies from that time do not reported the time

frame, which is an essential parameter in determining long-term cost benefits.

Data from more recent research on cost effectiveness focusing on large scale studies (i.e., either based on a large number of consultations or years of experience) are just the opposite.

Especially interesting and convincing are long duration studies performed in countries actively developing eHealth services such as Russia and Brazil. According to the estimates of West Siberian physicians, the patient paid approximately 40 times smaller fee for the virtual consultations rendered by a Moscow expert, than it would have taken to make a trip to Moscow to consult this same expert. The quality of the service is the same [23].

Another brilliant example is the tele-cardiology service at the State of Minas Gerais in Brazil (territory equivalent to France, population 19 M inhabitants living in 853 cities). It has been operating since June 2006 in 82 remote and isolated villages in the state. Preliminary results of the evaluation of economical feasibility of telehealth systems have shown that the savings resulting from a 1.5% reduction on the number of treatments outside the village are sufficient to cover the operational cost of the system [24-25].

Let's give one more example. Since 1994, an eHealth service has been offered in Nishiaizu Town, Japan. Vital physiology parameters are transmitted to a remote medical institution monitoring patients diag-

nosed with high blood pressure, cerebral infarction, strokes, diabetes. In several papers Tsuji et al. [26] analyzed the cost effectiveness of the system. They outlined that medical expenditures for lifestyle-related diseases of eHealth users have dropped by 20.7%. The authors also demonstrated that long-time eHealth users had lower medical expenditure than those who used it for a shorter time.

Wisely chosen eHealth applications are beneficial everywhere. The strongest evidence for the efficacy of eHealth in clinical outcomes comes from home-based monitoring of chronic disease management, hypertension, diabetes, and AIDS. There is also reasonable evidence that eHealth is cost saving and with an equal quality to face-to-face care in emergency medicine, and is beneficial in surgical and neonatal intensive care units, as well as patient transfer in neurosurgery [27].

All the examples above are evidences that eHealth is really able to solve the healthcare dilemma. Experts admit that eHealth has a vast and still unrealized potential. The question then is what hinders the wide implementation of eHealth.

6. Barriers
Experimental data and literature reviews support that the 10 most common barriers to implementation of eHealth services are as follows: cost, legal and cultural issues, lack of infrastructure, lack of demand for such services, lack of adequate policy at national level, not including eHealth as a priority in healthcare development as

well as lack of knowledge, experts and standards [12, 28]. While there is an agreement that these are the main obstacles, for the different communities the rank of the barriers differs. Developing countries are more likely to consider financial issues such as high costs of equipment or running the service, the inadequate infrastructure and the lack of technical expertise to be the most significant. Developed countries are more likely to consider legal issues, standards, data privacy and confidentiality as the most important. For the EU especially important are:

• Licenses - medical licensures are geographically restricted in order to protect the patients and the general public from malpractice and incompetent practitioners. Nowadays this turns out to be an obstruction on the full implementation of eHealth across the borders.

• Legislation - specific laws focused on eHealth applications are lacking in most countries with some exceptions – Malaysia, India and France. Even EU has not yet adopted explicit eHealth legislation valid for the entire community. eHealth services are partially included in two important documents – the European Innovation Partnership announced in October 2010 and especially in Digital Agenda for Europe, adopted in May 2010 by the EC. The Digital Agenda for Europe plans to foster development and application of EU-wide standards, interoperability testing and certification of eHealth systems by 2015

through stakeholder dialogue. In addition, Digital Agenda's Key Action 13 underlines the commitment of EU to undertake pilot actions to equip Europeans with secure online access to their medical health data by 2015 and to achieve by 2020 widespread deployment of eHealth services.

• Ethics – extremely complicated area as the spectrum of ethical issues arising is rather broad because of the complexities around the health, personal, economic, political and organizational aspects of eHealth. More details the thematic of ethic in eHealth and telehealth is presented in the Foundation Paper 2: Ethics and Good Practices [29].

• Standards - if the standardization problem has to be summarized, its core is that:

• Various data standards exist – standards in clinical practice, standards for bioscience tests, standards for picture transmissions etc.;

• For some services too many different standards have already been developed and yet there is a lack of unified standard – just to use as an example distributing and viewing any kind of medical image - ASTM, ANSI X12 (EDI); CEN, DICOM, are part of the applied standards;

• There is no common strategy in developing standards and as a result the community is witnessing multi-level, multi-scale developments, competing initiatives, fragmentation, lack of information, lack of computability, etc.

Thus, the future of eHealth depends on overcoming at least these major challenges.

Conclusionc

eHealth is no longer an optional choice. The technology solutions are available and ready to be implemented in the healthcare system. eHealth services are advancing and are acceptable to both clients/patients and medical professionals.

As shown by the examples given, if carefully implemented, taking into account the needs of the community, eHealth is able to improve both access to and the standard of healthcare, and thus to close the gap between the demand for affordable, high quality healthcare to everyone, at any time, everywhere, and the necessity to stop the increase in healthcare budgets worldwide. It is the tool to solve the healthcare dilemma.

eHealth is already a must, a fantastic challenge for the future, but it requires cooperation and coordination at all possible levels. It requires networking and planning, readiness to learn from the others, and no efforts to re-invent the wheel. The main challenge is to be sure that available options are used optimally and in a coordinated manner and to ascertain that the desired effects do come through and those resources are indeed not diverted away from basic needs.

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