Telemedicine and Medical Informatics: The Global Approach

F. Lievens, and M. Jordanova

Abstract—Telemedicine is brought to life by contemporary changes of our world and summarizes the entire range of services that are at the crossroad of traditional healthcare and information technology. It is believed that eHealth can help in solving critical issues of rising costs, care for ageing and housebound population, staff shortage. It is a feasible tool to provide routine as well as specialized health service as it has the potential to improve both the access to and the standard of care. eHealth is no more an optional choice. It has already made quite a way but it still remains a fantastic challenge for the future requiring cooperation and coordination at all possible levels.

The strategic objectives of this paper are:
1. To start with an attempt to clarify the mass of terms used nowadays;
2. To answer the question "Who needs eHealth";
3. To focus on the necessity of bridging telemedicine and medical (health) informatics as well as on the dual relationship between them; as well as
4. To underline the need of networking in understanding, developing and implementing eHealth.

Keywords—eHealth / telemedicine, networking, medical informatics.

I. TERMINOLOGY: TELEMEDICINE OR EHEALTH

WHAT is the correct term – Telemedicine or eHealth? How the mass in terminology has emerged?

Initially the word "telemedicine" was widely used. The term telemedicine is a combination of two words – the Greek τήλε = tele - meaning "at a distance" and medicina or ars medicina meaning "healing". Telemedicine is defined as "a delivery of healthcare and exchange of health care information across distance" [1]. Till the middle of 90's the name telemedicine was accepted without questions.

Unfortunately, meanwhile multiple working definitions were also introduced. Some of them are very wide such as "something to do with computers, people and health", others –

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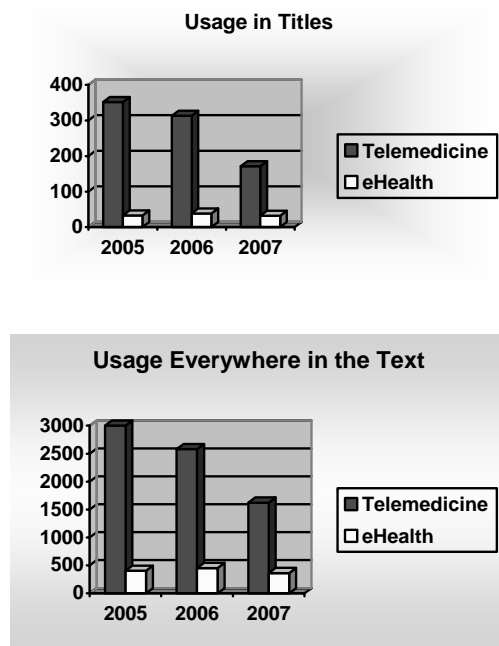
extremely narrow e.g. "the healthcare industry's component of business over the Internet" [2]. Lots of definitions are based on focusing on one or another aspect of the discipline:

- Functions – the common theme is communication. Most definitions cover medical informatics applications for facilitating management and delivery of health care (storage and exchange of data, interactions between patient and providers, training and education, public health information etc).
- Technologies – the stress is predominantly on networking technologies (Internet)
- Stakeholders – ex. healthcare providers; patients etc.
- Geographical aspects - from healthcare service at a single place to organization of global healthcare access.

More about various definitions the reader may find in [3].

With more involvement of the electronic communication systems, the major International Organisations WHO, European Commission (EC), International Telecommunication Union (ITU) and European Space Agency (ESA) have officially adopted the denomination "eHealth". According to European Union (EU) Ministerial declaration from year 2003, 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].

So, what is nowadays the correct term – eHealth or telemedicine? The political consensus is for eHealth.

No doubt, telemedicine is still very popular and widely used. Just to have a look at the available in Internet books and papers on the topic. The use of both terms in the titles of articles and books as well as in the body of the texts is compared on Fig. 1 for the last 2 years and 10 months, i.e. from 1.1.2005 till 27.10.2007. The tendency for decline in the use of telemedicine is clear and stable.

Nevertheless, despite of the official agreements positions differ. For some authors telemedicine and eHealth are synonyms. (We also prefer to use them as synonyms and will use them in such a way in the text.) Others accept that eHealth is a broader term and includes telemedicine. Yet another group of authors separate telemedicine and eHealth, accepting that telemedicine incorporates telecardiology, teleradiology, telepathology, tele-ophthalmology, teledermatology, telesurgery, tele-nursing, etc, all tele-medical disciplines, while ehealth comprises of e-Santé, Information and

Usage in Titles

Usage Everywhere in the Text

Fig. 1 Usage of terms "Telemedicine" and "eHealth" in publications, period 1.01.2005-27.10.2007, based on http://scholar.google.comg

Communication Technologies in health (ICT-Health), all types of health communication services, PACS, patient information systems, e-education, e-prescription, etc. Readers that are particularly interested in the semantic meaning of both words may refer to [5] for more detailed information.

In the attempts to distinguish between various aspects of eHealth / telemedicine, during the last 5 year several other terms have been introduced:

- mHealth or mobile health or efficient high-quality healthcare services for mobile citizens and
- u-Health or ubiquitous healthcare that focuses on eHealth applications that can provide healthcare to people anywhere at anytime using broadband and wireless mobile technologies [6].

One more term was introduced and used lately as an even broader description for eHealth, i.e. Modern Communication Health Environment (MCHE) [7]. It combines all aspects of healthcare and ICT as well as the four aspects of eHealth – eCare, eLearning, eSurveillance and eAdministration.

II. EHEALTH: WHO NEEDS IT?

eHealth is brought to life by contemporary changes of our world. Changing demographics and rapid aging of population; globalization; changes of disease patterns; the necessity to be prepared and respond to natural disasters and possible bio-terrorism; cheaper and affordable information and communication technology solutions plus the necessity to cut the costs of healthcare budgets spent worldwide are only some of the catalyzes of eHealth development.

Despite of the uncertainties with the terminology, no doubt, telemedicine/eHealth calls upon several essential components

of the community. It involves an important input at political level such as: health; communication and technology; education and industry. As it is all part of eGovernment both at national and international level, communication and cooperation between all ministries and parastatals is essential. More and more voices are raised with the demand of creating in all countries eHealth Coordinating Standing Committees for a better coordination of all possible actions in the field of eHealth.

But one must never forget that the ultimate beneficiary of eHealth is the patient / citizen via the healthcare professionals.

eHealth has the potential to change our life and people realize that and began ranking it high. A fantastic proof is a survey performed by International Business Machines Corporation, well known with its abbreviation IBM, in 2006. 150 000 people from 104 countries answered the question "Five years from now, which technologies are going to be the breakout hits?" The company narrowed that list down to the five innovations that were the "most impactful" and they are:

- The 3-D Internet;
- Mind-reading cell phones;
- Nanotechnology for energy and the environment;
- Telemedicine;
- Real-time speech translation.

Telemedicine is between the top five technologies! Detailed information about the survey was published on December 8, 2006 and is still available at http://cosmiclog.msnbc.msn.com/archive/2006/12/28/23418.aspx.

eHealth has the potential to change the our life due to it's 10 "e"-s [8], i.e.:

- Efficiency;
- Enhancing quality of care, including preventive care;
- Evidence based – effectiveness and efficiency should be proven by evaluation;
- Empowerment of citizens and patients;
- Encouragement of a new relationship between the patient and health professional;
- Education of physicians and citizens;
- Enabling information exchange and communication between all parties involved;
- Extending the scope of health care beyond its conventional boundaries;
- Ethical;
- Equity.

But in addition to these 10 "e"s eHealth should also be

- Easy-to-use;
- Entertaining (no-one will use something that is boring!) and
- Exciting

in order to be widely applicable.

No doubt eHealth offers a number of golden opportunities. The world can benefit from it by focusing its strength on ensuring better:

- Everyday healthcare – including home monitoring

and care for elderly and housebound; personalization of healthcare services and individual healthcare management;

- Enhanced and life long health education of both citizens and medical staff;
- Prevention and management of chronic diseases;
- Management of emergency situations and disasters results of human activity (globalization and migration, bio-terrorism), climate changes, natural disasters etc.) [9].

By and by eHealth is becoming the third industrial pillar for health, behind the pharmaceutical industry and medical imaging with an estimated share of €11 bn in 2004 and about €50 bn in 2010 only in EU [10]. It develops around 3 key objectives:

1. Global eHealth area
2. Free patient mobility and
3. Empowerment of citizens.

In a broader sense, eHealth is not only an application of technical achievements in healthcare, but it is also a state-of-mind, a way of thinking, an attitude, and a commitment for networking at all possible levels. eHealth is a global thinking plus the ambition to contribute to the improvement of health services at local, regional, continental and worldwide level by wide application of information and communication technology [11]. eHealth affects a whole range of services in the health sector - from general practitioner to the hospital manager, from nurses to software specialists, from social security funds to every patient. This should also be reached through international networking and joint efforts.

III. eHealth Main Players

Hundreds of publications concentrate on eHealth efficiency and practicality, on how it enhances the reorganization of traditional medicine, where patients have to "climb" the pyramid of healthcare delivery, towards citizen centered healthcare system. But who are the main actors in eHealth and what is its action territory?

It is not easy to enumerate the energetic players at various levels as the group is quite dynamic. At national level these are various associations and societies, institutions, governmental and non-governmental organizations and foundations, Telecom and IT companies, military structures, etc. Everyone knows some of the most prominent international players – World Health Organization (WHO), International Telecommunication Union (ITU), EU and EC, United Nations Office of Out of Space Affairs (UNOOSA), United Nations Educational Scientific and Cultural Organization (UNESCO), United Nations Children's Fund (UNICEF), North Atlantic Treaty Organization (NATO), Peace keeping bodies, associations and societies, international telecom and IT companies, etc. In addition, let's not forget the unique role of science and research as well as the impact of business structures, industries (producers of medical devices, imaging products, pharmaceutical, telecom equipment and services,

satellite connections, providers of service such as insurances, legal assistance, financing, etc.) and administration players. The list is too long but it is necessary to underline that:

- Only WHO is fully dedicated to health issues,
- Other organizations deal with health issues amongst several other activities,
- Therefore it is WHO that has the ultimate coordinating responsibilities.

IV. eHealth Challenges

The Coordination is the main challenge in eHealth area, i.e. to make all the possible players to coordinate their skills and efforts to achieve an optimal development within the health environment using modern communication systems. When this is achieved the benefits will be for all of us as tax payers, as citizens will rely on high quality affordable healthcare at any time, anywhere. A study carried out in USA at the end of the last century has estimated that between 35 and 40 billion dollars could be saved yearly by health structures, only in USA, if applying ICT and eHealth technologies more efficiently.

Introducing eHealth at Primary Healthcare levels is another challenge and is based on the knowledge of ecology of medical care. Put in another words, on an analyses where do people look for medical help. Despite of the predictions and expectations for seeking care at tertiary level facilities at first place, the dominant numbers revealed that at first place are the visits of primary care levels. Understanding and taking into account the ecology of healthcare, pre-defined the choice of primary care level as one of the main application fields of eHealth.

Wide application of ehealth for management of chronic diseases is another importance challenge. Chronic diseases are the leading causes of death and disability worldwide. Disease rates from these conditions are accelerating globally, advancing across every region and pervading all socioeconomic classes. WHO World Health Report indicates that the mortality, morbidity and disability attributed to the major chronic diseases currently account for almost 60% of all deaths and 43% of the global burden of disease. By 2020 their contribution is expected to rise to 73% of all deaths and 60% of the global burden of disease [12]. eHealth has an enormous unused potential to release, at least partially, the burden of chronic disease worldwide.

V. Bridging eHealth and Medical Informatics

Medical or health informatics as it is also named is "the science underlying the acquisition, maintenance, retrieval, and application of biomedical knowledge and information to improve patient care, medical education, and health sciences research" [13].

Medical informatics deals with all aspects of medical information, except its content. Not how best to manage one disease, but rather how information on management this particular disease might be stored, retrieved, and applied. The
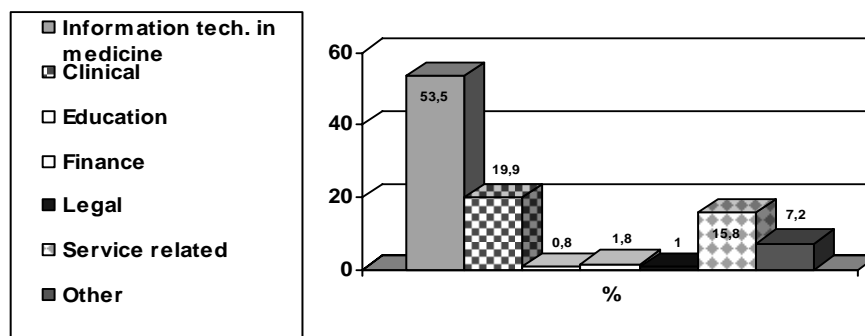
Fig. 2 Publication of eHealth papers in various journals, based on [2]

results of this work are information systems that are often challenging to understand, measure, evaluate, and improve the way healthcare is delivered.

Having in mind what is eHealth and what is the essence of medical informatics, both of them not only overlap but are also very closely related to one another. The links are everywhere:

- In definitions;
- In discussions and publications;
- In the research and technical development.

To give just two examples:

- The definition of eHealth by Eysenbach [11]: "eHealth is an emerging field in the intersection of medical informatics, public health and business, referring to health services and information delivered or enhanced through the Internet and related technologies." eHealth is defined via medical informatics as medical informatics is a discipline that exists for a longer time.
- Publications of eHealth research in various resources are another examples of the close relations between both disciplines. A survey was performed by Dr Claudia Pagliari, Senior Lecturer in Primary Care, Division of Clinical and Community Health Sciences. The aim of the study was to answer the question: "What journals do ehealth articles appear in?" The results for the period 2004 - 2005 are shown on Fig. 2 [after 2].

The results are more then illustrative! Most of eHealth publications are accepted in medical informatics journals.

Medical informatics supports the wide application of eHealth. It also has a significant role in making it more user-friendly and attractive. Medical informatics is more or less a tool (supportive) of eHealth.

The interactions and interdependence eHealth and medical informatics result in development of:

- New tasks,
- New problems,
- New solutions,
- New perspectives

- New points of view, etc.

Practically speaking, the mission of medical informatics and eHealth (telemedicine) is one and the same - to help people use information to improve health.

VI. NETWORKING

Within the world of eHealth, it is crucial for all the players to be aware what is globally going on. Therefore cooperation and networking are the most important factors. Let's focus on a few specific networking enabling initiatives:

The International Society for Telemedicine and eHealth (ISfTeH, www.isft.net) is a not-for profit membership organization of national, regional, international associations and others, institutions, organisations, corporations, individuals and students, established under Swiss law. ISfTeH is the international representative body of national and international Telemedicine and eHealth organisations and is dedicated to broadly promoting telemedicine, telecare, telehealth, eHealth around the world. ISfTeH supports the start up of National Associations or Societies and facilitates their international contacts. Its aim is to disseminate knowledge, information and experience and to provide access to recognized experts in the eHealth field worldwide.

As part of ISfTeH educational activity, a Working Committee "Education" is now functioning, chaired by Prof. M. Mars, South Africa. The mission of this Committee is:

- Listing already existing programs on Telemedicine /eHealth
- Establishing basic eHealth / Telemedicine templates for fundamental training programs
- Coordinating eHealth / Telemedicine educational efforts around the Globe
- Assisting the set up of new courses in eHealth / Telemedicine
- Defining the needs of universities and specialists for basic and continuous education.

eHealth science, practice and market need a meeting place. Such place is Med-e-Tel (The International Educational and Networking Forum for eHealth, Telemedicine and Health ICT http://www.medetel.lu/index.php).

Med-e-Tel is highly specialized event that brings suppliers of specific equipments and service providers together with buyers, healthcare professionals, decision makers and policy makers from many countries around the globe and provides them with hands-on experience and knowledge about currently available products, technologies and applications. Med-e-Tel is a forum where state-of-the-art products, ideas, projects, etc are presented and discussed. Year after year it becomes a nesting place for new co-operation and partnerships between scientific groups/institutions, small, medium and large size enterprises, etc from all over the world. 2007 edition called together participant from 48 countries. WHO, EC, ESA, ITU, were only part of the major players that took part in the event.

Med-e-Tel provides many educational opportunities through its extensive program of presentations, panel discussions, workshops and satellite symposia. Med-e-Tel 2007 was accredited by the European Accreditation Council for Continuing Medical Education (EACCME) to provide maximum of 18 hours of European external CME credits for medical specialists. The EACCME credits are also recognized by the American Medical Association towards the Physician's Recognition Award (PRA).

Next edition of Med-e-Tel will take place again in Luxexpo, Luxembourg, April 16-28, 2008. Med-e-Tel 2008 will follow the standard format including exhibition, scientific program, media corner.

ISfTeH and Med-e-Tel are working together. They are as the two sides of a coin. They both lead the way from needs to practical applications, highlights quantitative numbers and results, serve networking – meeting real people, real business, real achievements, real products, discussing real problems, and education for business, science, practitioners and citizens.

VII. Conclusion

eHealth is no more an optional choice. It already is a must, a fantastic challenge for the future but it requires cooperation and coordination at all possible levels. The main challenge is to be sure that these options are used optimally and in a coordinated manner to ascertain that the desired effects do come through and that resources are indeed not diverted away from basic needs.

References

[1] R.Wootton, J. Craig, *Introduction to Telemedicine*, London, Royal Soc. Medicine Press, 1999
[2] C. Pagliari, "Welcome and Introduction", Available www.chs.med.ed.ac.uk/gp/downloads/eHealth/presentations/may2005/Claudia%20Pagliari.ppt
[3] H. Oh, C. Rizo, M. Enkin and A. Jadad, "What Is eHealth (3): A Systematic Review of Published Definitions", J Med Internet Res. 2005 Jan–Mar; 7(1): e1., Published online 2005 February 24. doi: 10.2196/jmir.7.1.e1. Available www.jmir.org/2005/1/e1/
[4] EU Ministerial Declaration, eHealth 2003, High Level Conference, Brussels 22 May 2003 – Available http://europa.eu.int/information_society/eeurope/ehealth/conference/2003/index_en.htm
[5] TM Alliance Final Report from 2004, "Telemedicine 2010: Visions for a Personal Medical Network", Available: http://www.euro.who.int/eprise/main/who/progs/tme/about/20021009_1
[6] P. Ray, Su-M. Hsu, H-S. Chen and M. Lee, International Initiative for Ubiquitous Healthcare (u-Health), Available - http://www.ehealthcom.org/uhealth.htm
[7] F. Lievens, M. Jordanova, An Approach to the Global Vision about Telemedicine/eHealth Keynote presentation, Med-e-Tel, Luxembourg, April 21-23, 2004 Available: http://www.medetel.lu/index.php?rub=educational_program&page=opening_session_2004
[8] P. J. McCullagh and W. P. Patton, eHealth: Tackling the Demand for Citizen Information On The Internet, 9th Annual Conference and Scientific Symposium, 10-11 November, 2004, Stillorgan Park Hotel, Dublin
[9] F. Lievens, M. Jordanova, eHealth / Telemedicine: A State-of-Mind, International School for Junior Scientists and Students on Optics, Laser Physics and Biophysics, SFM'07, September 25-28, 2007, Saratov, Russia, Available http://optics.sgu.ru/SFM_Files/2007/report/396/
[10] J. C. Healy, European eHealth in a WHO perspective, Med-e-Tel 2005, Available http://www.medetel.lu/index.php?rub=library&page=2005
[11] G. Eysenbach, What is e-health? Journal of Medical Internet Research 2001;3(2):e20 Available - http://www.jmir.org/2001/2/e20/
[12] WHO: Integrated chronic disease prevention and control, Available http://www.who.int/chp/about/integrated_cd/en/index.html
[13] C. P. Friedman, J. Wyatt, J. C. Wyatt, Evaluation Methods in Medical Informatics, Springer Verlag, Germany, 2006.

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