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## **TELEMEDICINE AND eHEALTH**

The eHealth was introduced as a consequence of e-applications, as a further development of the idea of telemedicine. Terms of telemedicine and eHealth are fairly well understood, but are now widely used by many academic institutions, professional bodies, and funding organizations. The meaning and understanding telemedicine and eHealth depends mostly on previous educational background. Unification of mentioned terms require integrated approach and wider discussion and consensus. Nowadays, eHealth is understood as the “use of information and communication technologies locally and at a distance” that combines and integrates health, information and communication technologies. The telemedicine is a new interdisciplinary approach to practice medicine with enormous potential and new perspectives for development. Ethical and medicolegal concerns, human and cultural factors, and reimbursement for services are still unsolved issues of telemedicine. Telemedicine research made mainly by enthusiasts has high impact on world medicine. Better understanding of the meaning and perspectives of telemedicine and eHealth should improve communication and integration among many specialists representing medicine and technology.

## **TELEMEDICINE AND eHEALTH**

During the last decade of 20th century, e-commerce exploded giving new ways to conduct business and financial transactions through the Internet. Various e-terms began to appear and proliferate in combination to Internet development. The eHealth was introduced as a following consequence of e-applications, as a further development of the idea of telemedicine. Terms of telemedicine and eHealth are fairly well understood, but are now widely used by many academic institutions, professional bodies, and funding organizations. The meaning and understanding telemedicine and eHealth depends mostly on previous educational background. Medical education leads to different understanding these issues than technical. Unification of mentioned terms require integrated approach and wider discussion and consensus.

What does those terms mean? Many previous articles have dealt with the question of how telemedicine and eHealth can be or should be defined [1,2,5,9,10,14,28]. The aim of this paper is to discuss the understanding of the telemedicine and eHealth definitions already developed in the literature, which have been published to date, and compare them to clinically oriented definition accordingly to Polish Telemedicine Society [11]. There is a hope that a better understanding of the

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meaning and perspectives of telemedicine and eHealth will improve communication and cooperation of many medicine and technology specialists.

The definition of eHealth is based on wide variety of meanings combining informatics technology and health and wellness, where the concept of wellness refers to public health and health promotion. It also relates to health services delivery (e.g., health care, health system, and health sector or health industry). eHealth represents a new concept of health care. Technology is incorporated into the definition. Additionally, internet and internet related technologies belong to that technology. Finally, eHealth combines and integrates health, information and communication technologies.

The idea of eHealth presents a unique opportunity for the development of public health. World Health Organization and other organizations of the United Nations system have drawn up strategies for eHealth that embody the use of it for public-health purposes, health-care delivery, capacity building, and governance [25]. Main ideas of the strategy focus on "*eHealth for all by 2015*". Distant medical education (eLearning) plays important role for this task.

The term eHealth is currently used by many medical professionals, academic institutions, and representatives of technology in medicine [1,7,8,9]. Despite the lack of clear and precise definition it has become widely accepted neologism. The widespread use of this term suggests the need of electronic Health among the many individuals and organizations.

The target of eHealth is wide and concentrates on improving and increasing the cost-effectiveness of health care at large and to solve problems related to access to care, cost, quality, and portability of health care services locally, regionally, and worldwide [7,8,9]. Telemedicine seems to focus on the same target, but is restricted to relations patient – physician [2,5,6,10,11,]. The final benefits of implemented telemedicine go directly or indirectly to a patient. The term eHealth encompasses a set of disparate concepts, including health, technology, and commerce. It has raised the promise that information and communication technologies will improve medicine and the health care system. The term telehealth was developed to substitute the term telemedicine [15]. In the early years of twenty first century more fashionable terms such as "online health" and "e-health" appeared due to internet expansion. Some authors suggest new terms as approximate synonyms.

The term of eHealth somehow overlap telemedicine that is focused clearly on medical services provided on remote [10]. It is reported that "telemedicine encompasses all of the health care, education, information and administrative services that can be transmitted over distances by telecommunications technologies".

Nowadays, eHealth is understood as the "use of information and communication technologies locally and at a distance". The technology is viewed both as a tool to embodiment of eHealth itself to expand, or to enhance human activities, but not substitute them.

Further benefits for health care improvement and possibilities for patients and professionals are to do the earlier impossible procedures.

The advances in information and communication technologies improve services for health. That may be expressed by utilizing digitalized products and systems. The impact on health systems may become more efficient by improving access to care, especially in remote areas, for people with disabilities and for the elderly. That creates new opportunity for faster and more comprehensive epidemiological surveillance and for better patient care. A global approach to handling data flows should be able to promote standardization and low-cost services. That opens the new platform for international participation and collaboration on information and communication technologies to remove barriers for health data flow. The multinational, multilingual and multicultural collaboration

in eHealth sector lead to develop infrastructure and to strengthen information and communication technologies for public health, health-care delivery, health education and training. Health-care systems for the successful incorporation of eHealth require long-term government commitment. Government support should be based on planned strategy, national awareness of the benefits of eHealth, and availability of skilled human resources.

The main lines of the strategy for the telemedicine societies are to integrate eHealth applications into health systems and develop norms, standards, guidelines, information and training materials. National centers and networks of excellence will mobilize collaboration for determining evidence-based eHealth. eHealth for citizens, patients and health professionals should meet quality, safety and ethical standards. The value of eHealth is to improve the quality and the economy of the present Health systems. However, many eHealth and telemedicine applications are currently unregulated or insufficiently regulated. Any adverse, negative, harmful, or disadvantageous effects are rarely mentioned while describing eHealth or telemedicine [13,14,17,21].

Recognition of the telemedicine as "An integrated use of telecommunications and information technology in the health sector" has led to define "e-health" as an umbrella term "to describe the combined use of electronic communication and information technology in the health sector"- "for clinical, educational and administrative purposes" [7]. Della Mea pointed out that e-health was introduced as the "death of telemedicine". Telemedicine was expected to no longer exist as a specific field. Mitchell also described that "e-health can be considered to be the health industry's equivalent of e-commerce". Rationale explanation by Rosen [20] have shown some differences related to the use of the words "telemedicine" and "e-health." He turned the attention that investors look for investments that can produce high returns even after several years. The telemedicine may not fit adequately to this purpose. The e-health seems more promising for business. Traditional equipment sales model of telemedicine was compared by Rosen [20] with more interesting, service delivery oriented e-health.

Allen [1] discovered that telemedicine remains linked to medical professionals, while e-health is driven by non-professionals, patients, consumers for their empowerment through access to information and knowledge.

It was observed that business plays important role in e-health. Even researchers rarely put the generic term e-health while writing key words. They rather use Medical Informatics, Telemedicine or Electronic Health Records.

The telemedicine is a new interdisciplinary approach to practice medicine with enormous potential and new perspectives for development. One can say that if any medical service is served on remote or the consultation takes place between physicians located in different centers, the telemedicine is implemented. Perednia and Allen [19] in 1995 created definition of telemedicine which says that is medical service or medical information utilizing telecommunication. Their definition is very common but it underlines the medical service. The understanding telemedicine and eHealth depends deeply on previous educational background (medical or technical). Due to different understanding of those issues, mentioned terms require integrated approach and wider discussion and consensus. Craig and Patterson described telemedicine [5] as the delivery of health care and the exchange of health-care information across distance. It is neither a technology nor a separate or new branch of medicine. This interdisciplinary branch of medicine becomes the area where medicine, information and telecommunications technology meet together [17,18, 21, 23, 24]. The evaluation of clinical

applications of telemedicine lead to establish statement that telemedicine is "the use of electronic information and communications technologies to provide and support health care when distance separates the participants" [2, 19].

Wootton defines telemedicine [28] as an umbrella term that encompasses any medical activity involving an element of distance. The medicine at a distance [5] delivers health care and the exchange of health-care information across distances and borders. The prefix 'tele' derives from the Greek for 'at a distance'; The whole range of medical activities including diagnosis, treatment and prevention of disease, continuing education of health-care providers and consumers, and research and evaluation is encompassed. Grigsby and Sanders [14] pointed earlier defined telemedicine as "the use of electronic information and communications technologies to provide and support health care when distance separates the participants" or the specialty which "encompasses all of the health care, education, information and administrative services that can be transmitted over distances by telecommunications technologies" [14].

American Telemedicine Association (ATA) points out that telemedicine means exchange between distant places employing electronic communication, medical education to serve medical procedure for the patient or to support another physician to improve the quality of medical service. Accordingly to telemedicine definition the physician has to be present on one side, on the other side patient or another physician has to be the receipt in of the service. Any other service that is not able to meet the criteria should be classified as e- Health. The value of the e-health is not lower but only different. Internet resources are full of telemedicine definitions. Telemedicine is considered in the one of developing medical specialties but it is only interdisciplinary approach utilizing telecommunication and Informatics technology to provide medical service. Its elements consist of medical teleeducation, teleconsultation, teleassisted surgery, telesurgery including robotics.

Medical information in the meaning of telemedicine becomes only the supplement. Similarly, telecommunication and informatics are complementary media making the telemedicine possible.

It is hard to implement telemedicine into the routine health services in some areas. In many countries wide introduction of telemedicine services is impeded without scientific evidence for its clinical application and cost effectiveness. [27-29]. The investment may not be recommended in unevaluated technologies.[6] Teleconsultations have been introduced into daily practice many years ago. For example the description of telemedicine as new medical care concept in Poland has been published in 1996 [10,11].

Telemedicine subjects include the interaction between the medical service receiver and the expert (i.e. real-time or prerecorded). Neither health care provider nor medical service receiver is moved, but only information is transmitted (e.g. text, audio, video). The telemedicine practice is now performed in industrialized countries, but there is an increasing interest in the use of telemedicine in developing countries. The telemedicine should be practiced when there is no alternative or when it improves existing services. Benefits of telemedicine include improved access to information; provision of care not previously deliverable; improved access to services and increasing care delivery; improved professional education; quality control of screening programs; and reduced health-care costs. Disadvantages lead to a breakdown in the relationship between health professional and patient or other health professional and information safety, organizational, and bureaucratic difficulties. More research in telemedicine should raise the benefits and reduce or eliminate the obvious drawbacks. Telemedicine brings the promise of improving access to health care and reducing costs. Its implementation is especially attractive in areas where geographical barriers exist.

Forcing a technical "solution" on the health service without understanding the problems by vendors and telecommunications companies may lead to unsuccessful results. [16]

Two different problems may appear in telemedicine: a lack of technology or organizational problem of knowing how to take advantage of the technology.

Medical services require a lot of educational events teaching medical practitioners how to deal with new forms of technology, such as the internet, smart cards, and satellite communications.

Telemedicine in many countries matures slowly along with wider range of implementations. In that it enters the public consciousness, although often in association with excessive expectations.

However, the change of attitudes toward telemedicine and organization of services is much harder than simply to deliver new equipment [24].

The telemedicine develops when there is no alternative for it (e.g. in emergencies in remote environments), or when existing conventional services require improvement. Research in telemedicine has begun in mid 1970s, increased steadily in the late 1990s, and recently the quality of the research in telemedicine drive toward Evidence Based Medicine [1,3,4,6,12,14,15,17,21,26,27].

In general practice, the provider and the recipient of medical services must be present in the same place and at the same time. The information and communication technologies are able to overcome this condition. Finally, the patient benefits from telemedicine. Benefits include travel reduction, quicker access to appropriate specialist, and access to unavailable services. Relatively little information exists about telemedicine cost effectiveness [24,27], but a lot of interests prompt research in this field.

In industrialized countries the telemedicine is now practiced on daily base, but there is an increasing interest in the use of telemedicine in developing countries. However, it is not a cure for all of the world's health-related problems. Health-care professionals can not be replaced by telemedicine.

Practicing medicine at a distance should derive from real need. It should not concentrate on the technical solutions only, but the practical reason is required.

The experience of telemedicine may have the potential to change certain medical problems.

Telemedicine covers a wide range of technologies. Real-time or "stored and forwarded" interaction may appear as an example of telemedicine. The types of information being transmitted via telemedicine connections are still images, audio, video, text, movies and online videoconferences. Decision support systems, Computer Aided Diagnosis, robotics and virtual reality interfaces have been introduced into some experimental applications [22].

The modern telemedicine was born because of advances in electronic methods of communication and the pioneering efforts of a few organizations and individuals. The space-flight programs of the National Aeronautics and Space Administration (NASA) in the USA and space exploration in former Soviet Union supported additionally the idea of telemedicine.

A major step on the way of the development of telemedicine was the introduction of television. Medical personnel entered closed-circuit television and video communications to use it in clinical situations [3,6,26]. Two other steps were improvements in digital communications and the introduction of low-cost computing and settlement of the Internet and recent developments of mobile phones and satellite communications.

Most operational telemedicine services concern medical education, diagnosis (e.g. teleradiology) and clinical management at a distance (e.g. telesurgery).

Telemedicine is characterized by a number of separate attributes including feasibility, acceptability, cost, effectiveness, safety, sustainability. By scientific meaning it may lead toward Evidence Based Medicine like no other discipline. So, its use may make a lot of improvements in existing conventional medical services.

If the question is asked whether the telemedicine is better than conventional medicine the answer is negative, because it can not be considered as a new specialty in medicine. It is only a new approach to practice it.

Advantages for each specialty have been described in remote or rural areas, even in urban areas by improved access to medical services, information, and sometimes by cost reduction.

Higher employment of telemedicine around the world is transiting health care now, however it may not be so widely implemented once clinical effectiveness and cost-effectiveness have been demonstrated.

Ethical and medicolegal concerns, human and cultural factors, such as resistance to change, lack of infrastructure, linguistic differences and illiteracy, and technical and organizational factors are still unsolved issues of telemedicine.

One of several factors impeding the expansion of telemedicine is often the lack of reimbursement [1,5,8,21,24]. Licensure for practice telemedicine has not been regulated by national medical authorities' yet. National and international regulations of medical licensure will require adaptation to adjust it to practice telemedicine. It will influence liability and malpractice and whole insurance system for physicians. Additionally, technical and technology adjustment should be considered to avoid of diagnostic errors due to image or other medical signals of inferior quality. It is also required to set detailed areas of telemedicine introduction into medical practice. There is a great concern about the obligatory secure systems of medical records. No unauthorized person can obtain access to confidential medical data.

Governmental and nongovernmental institutions would combine their efforts to evolve legislative and organizational fundamentals for telemedicine.

Telemedicine research has been made mainly by enthusiasts. This should be partially replaced by clearly defined programs. Technological development and its use should spread, but expenses should be lowered. The cost-effectiveness of telemedicine must also improve.

As the conclusion, it should be noted that a better understanding of the meaning and perspectives of telemedicine and eHealth will improve communication and integration among the many specialists representing two different "worlds" – medical and technical.

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