Invited Speakers

e-Health: Its meaning to development, and its requisites?

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A great interest is manifest worldwide in eHealth, particularly the introduction and uses of TeleMedicine. Reporting of the experience todate is largely from the industrially developed countries, but there is a great deal and an increasing experience in the industrially developing countries. Indeed, many of the issues faced are the same in all countries.

What is the experience in the lesser known parts of the world, and what lessons are being drawn? In particular, are there any indications yet of the relevance and cost-effectiveness of TeleMedicine to these communities? What aspects of TeleMedicine should influence, and can be influenced by, international collaboration?

This address will cite several examples from different parts of the world, and will discuss and assess how the introduction of TeleMedicine is proving to a major step towards eHealth, both at the national and international levels. The address would start with a brief explanation of the relevance and place of eHealth in the national health services, and then briefly describe concrete example, from fully operational to pilot TeleMedicine installations in countries of significantly differing levels of economic development.

The address will argue, with examples, that eHealth links, properly conceived and implemented, can address and are addressing two major health challenges. First, TeleMedicine can be a cost-effective means of providing equitable access to quality health care services, even in the poorest of communities. Second, eHealth improves on, indeed enables, the collaboration in health matters within and between countries, in a variety of ways: from surveillance, to sharing facilities and expertise, to trade in health services.

The experience and economic effects of tele-home-care in Japan

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Based on the author's field research of local governments in Japan, the characteristics and issues of tele-home-care are presented. Tele-home-care systems are divided broadly into two categories: (a) tele-home-care (in the narrow sense); and (b) tele-health management system. Three local governments have been implementing tele-home-care, whereas sixty-four adopting tele-health-management system and 6,050 remote monitoring devices are being utilized as of March 1999. This paper estimates the economic effects of the above two systems. As for tele-home-care, its economic effects are estimated by the substitution method. By focusing on the so-called "social hospitalization of the aged," we calculate hospital cost-savings achieved by tele-home-care. In the year 2050, US$424.3 billion, or 10% of total hospitalization costs of the aged can be saved. As for the estimation of economic effects of tele-health management systems, we conducted a survey of users of the tele-health management system of Kamaishi City in Iwate Prefecture. By asking each user about WTP and estimating its demand functin , we obtain the WTP of approximately US$36.66.

Telemedicine: A methodology for assuring quality of performance of health care professionals

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Quality assurance programmes have been introduced into many medical specialities as a mechanism for assuring a high level of professional competence in diagnosis. Laboratory medical specialities have led in the introduction of quality assurance programmes for validating the technical accuracy of laboratory test results because of the ease with which multiple replicate samples can be prepared and transported to individual laboratories. However, there are significant difficulties in adopting this approach in some laboratory specialities where replicate samples are not easily prepared in numbers sufficient for a rapid response time, for example biopsy, pathology and cytology. Implementing QA programmes in purely clinical specialities that are dependent on direct patient examination is even more difficult using a traditional approach.

Recently, we completed a project in which we determined whether telemedicine technology could be used to supplant and improve the traditional means of conducting the UK National Breast Screening Pathology QA Programme. Employing robotic telepathology and modest bandwidth (6 ISDN lines). It was demonstrated that these technologies enable accurate diagnosis to be made in a timely manner. This study raises the possibility that current conventional protocols for assessing professional quality of diagnosis may be replaced by telemedicine tools. The implications and limitations of this study for the efficient conduct of QA programmes aimed at assessing medical professional competence will be discussed.

Telemedicine as a tool for equalising the distribution of healthcare in the world

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Inequality of healthcare distribution, both within and between countries, is well known, as is the gross variation in mortality and morbidity. The relationship between them is complex and subject to many external influences. The role of technology in influencing them is variable and not always beneficial. Although, with modern communication links, an individual patient could easily receive telemedical help virtually anywhere in the world this would not effect the systematic changes necessary to reduce the gross inequalities in healthcare delivery. Even worse the very credibility of telemedicine could be damaged if scarce resources were spent on inappropriate technological solutions. Great emphasis must be given, therefore, to the application of practical technology to areas where real improvements can be achieved.

No telemedicine system, by itself, will redress the imbalance in healthcare delivery in the world. As a tool in an integrated strategy, however, it could be very powerful. The aim should be to support, encourage and educate the indigenous healthcare providers in order to provide a sustainable improvement in healthcare rather than small, high visibility high tech solutions for a small number of recipients based largely on the provision of external resources.

The challenge is not in providing a technologically amazing telemedicine "wonder-box" in a remote location rather it is in producing a relevant, sustainable complete system that will provide long term widespread benefit.

Virtual reality and robotics in medical education

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Teaching patient care skills presents many obstacles. These include: teacher time limitations, general availability of clinical material, and the relative rarity of some procedures. Trauma skills are among the most difficult to teach because of their emergent nature and the speed required to perform them optimally. Virtual reality trainers are one answer to these problems. They can even be stand-alone devices that have built-in scenarios and multiple patients to increase variation. Sophisticated computerized mannequins are beginning to replace simple mannequins in medical education, and surgical robots, similar to those in many operating rooms today, can also be used in teaching surgical skills. The National Capital Area Medical Simulation Center is a unique asset that not only uses state-of-the-art virtual reality simulators and other devices to teach patient care skills to medical students, but adapts existing technology and develops new simulations to teach these skills!

Technologies for global dissemination of telemedicine: Mobile communication, ubiquitous computing and nanotechnology

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Like medicine in general, Telemedicine is highly dependant upon technology. But in contrast, telemedicine does not need to develop its own technology, but rather adapt technologies from other fields – communications, computing and micro/nanotechnology in particular. And by employing these technologies, the use of telemedicine will be disseminated globally. Although each technology is a complete science in itself, the integration of these technologies does result in a world wide system for healthcare delivery.

Communications systems are the most obvious support for telemedicine. What started over a hundred years ago is now a massive integrated network of terrestrial wire and fiberoptic cabling and cellular and satellite wireless communication system. The future of communications is moving toward greater bandwidth, more optical systems and more low earth orbit (LEO) satellites to increase the quantity and speed of data transmission. The changes will only be evolutionary, based upon improvements in current systems. What will be revolutionary is the way the systems are integrated - eg, distributed high-performance computing and data storage, the miniaturization of personal communication equipment (see below) the availability of healthcare 24 hours a day because somewhere in the world it is “daytime”.

Computing is the invisible infrastructure for telemedicine. It is only through the protocol transactions, data processing (such as intelligent support systems), archiving and displaying of medical information that telemedicine can be accomplished. The revolution of ubiquitous computing has begun, both as inexpensive desktop computer distributed “everywhere” for easy access (eventually throwaway) or as wearable computers wirelessly connected to networks to be personally available at all times and places. Together with distributed networking, everyone will have the power of a supercomputer at their fingertips wherever they go. Next generation flexible displays (which fold up like newspaper) with wireless connection to the internet or microscopic telecommunication devices (see below) worn as apparel or even embedded in the body will convert everything we touch from dumb to smart.

Nanotechnology and especially micro-electromechanical systems (MEMS) devices in the submillimeter range will provide the acquisition of information about a person, and the means to instantly transmit and display the information in real-time. Telemedicine will be about point-of-care healthcare – in

the home, workplace, school, or small physician office. Acquisition of the information from micro (and eventually nano) sized biosensors will continuously, assively and transparently monitor the health of patients, with transmission to the closest medical facility. In addition, molecular sized (nano) devices will perform therapy in the form of specific drug delivery systems or mechanical intra-ventional devices and transmit the results through mobile communications into a personal website.

The power of the next generation of global telemedicine is the integration of the three technological advances, resulting in the 5 Ps of telemedicine: Predictive, preventive, point-of-care, parametric, and personalized. Beyond the personalization of healthcare, global telemedicine will make every person a continuous participant in clinical studies and outcomes analysis for evidence-based medicine.

Electronic patient records - Patient empowerment: Personal health records

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e-Health is a new phase in the development of the information society. The Internet is changing health care in many ways. Unprecedented connectivity will replace much of the EDI communication and traditional messaging, as well as traditional telemedicine. New application service providers (ASPs) will offer more economic solutions via the Internet. But the biggest changes are occurring in the practitioner/patient relationship, where there are two major developments. First is consumers' accessibility of health information via the Internet. Some 70 million individuals consulted the Internet during the year 2000. Second is the increasing number of individuals who are placing (or agreeing to have posted) some or all of their health information on a web site that they consider secure. The intent is to make such information not only available to the individual but at the person's discretion to health practitioners (including personal physicians and pharmacists).

How is the personal health record different from the provider-based health record?

Historically, the definition of a medical record was straightforward it was considered the contents of the paper chart created by the care team. Patients had limited interest in or access to the information contained in their record. A patient's provider-based health record plays many unique roles:

- It represents a provider-based view of that patient's health history.
- It provides a method for clinical communication and care planning among the individual healthcare practitioners serving the patient. The decision-making process related to care given (or not provided) and care actions delayed for insurance or organizational reasons are part of this medical record.
- It is important in documenting the specific services received by the patient for reimbursement purposes.
- It serves as the legal document describing the healthcare services provided
- It is a source of data for clinical, health services, outcomes research, and public health.
- It serves as a major resource for healthcare practitioner education.

The five types of personal health records

1. Off-line personal health records

   The idea of a personal health record is not new. For decades, public health services in many countries have been giving parents of newborn infants a booklet to record early health data. Millions of parents

routinely start a paper-based patient record for their children. Of course, the vast majority of individuals do not keep the information up to date. Of course, these off-line applications are only used by a limited number of people, except the Children's Health Booklets, which are issued in large numbers, although many are not kept up or are not continued after the child grows out of infancy.

2. Web-based commercial/organizational personal health records

   The Internet makes it possible to store one's health information on a (more or less) secure web page. This means that accessibility is almost unlimited geographically. Wherever there is telephone access through a wired or wireless telephone connection, a person can access the information or authorize a practitioner or pharmacist to access certain information from the website of choice. There are four types of providers of this service:

- Commercial organizations that derive revenue from sponsors or from data mining
- Commercial organizations that charge the person a fee for maintaining the information
- Professional organizations that provide this service to their members or other affiliates (for a fee or as a service bundled with other charges and benefits)
- Local, regional or national health organizations that provide this service to specified population groups.

3. Functional/purpose-based personal health records

   These are web-based personal health record systems that are offered in connection with a related service. The service may be an interpretation of a health record and/or the legal advice regarding a person's care situation. The most common function is that of providing emergency or health services to business people outside the geographic boundaries of their primary healthcare provider.

4. Provider-based Personal Health Records

   Increasingly, providers, i.e., hospitals, clinics, and health plans make some of a patient's health information available on the website. This service is usually part of the care provided, and there is no charge. Such information typically includes appointment information, medication information and allergies.

5. Partial personal health records

   Some 24,000 web sites have detailed health information for consumers. Most of the sites get their revenue from data mining and advertising. In many cases, an individual has provided not only identification but detailed health information in order to access the information or to benefit from the website.

Each of these the personal health records is very different from the "official" provider-based health record. Except for the records described in (4) above, it is not created by the caregiver or healthcare provider but by the patient herself, or by another organization that is often not related to the care process. The practitioner community has not always welcomed personal health records. Some of the more traditional practitioners have indicated some resentment and distrust of these personal health records.

World Health Chart, a new enjoyable tool for display of health statistics

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Perceptions about world health development seem to be mainly based on massmedia images, even among health professionals. As a collaboration between undergraduate training in Global Health at

Karolinska Institutet and the WHOs effort to provide better evidence for health policy we have developed a new computer program for visual display of health statistics. This World Health Chart proves to be a forceful tool for problem based learning and hypothesis generation about determinants of health development. A beta version of the program will be demonstrated and it will soon be available free of charge for download on the net.

Can eHealth cross the digital divide?

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The healthcare sector has now firmly embarked on an eHealth journey from which there is no turning back. The most recalcitrant supporters of medicine being delivered in the “old hands-on way” and even those staunch defenders of the term “telemedicine”, are changing their positions and coming behind the term eHealth which embraces so many of the healthcare reforms made possible by an IT enabled environment.

It is relevant to set out what we mean by eHealth.

To me, the term eHealth captures the four principal pillars of activity, which stand in an ocean of opportunity, which in itself, makes up the most interesting component of all.

The four pillars being:

- Tele-Consultations, being the clinical applications including the transfer of electronic medical records for the seeking of more specialist opinions and clinical support software – surely the medical encyclopaedia of the modern age.
- eDissemination of Healthcare Professional Education – to all members of the healthcare professional body.
- Public Health Information – focussed on raising the knowledge of the general public in healthcare matters so that they take on more responsibility for keeping well.
- LifeTime Health Records – involving a comprehensive recording and innovative usage of prospectively gathered healthcare event information which when combined with social and environmental data and genomic information enables a sea of invaluable information to become available for data mining. Such data can be used for national – and even global – healthcare strategy planning and ePrevention, which is surely the essential tool for human development in the future generations.

The fifth element in this scenario is The Ocean of eHealth Opportunity is where the multiplicity of eHealth services, which now become possible through the creation of an eHealth enabled environment, reside.

National eprescribing services linking hospitals, clinics and pharmacies, homecare monitoring for the more vulnerable (especially the elderly) members of our communities, eNursing services and linkage into the Social services are all powerful steps towards an improved health environment for all.

We must not forget our responsibilities to those developing nations whose access to healthcare services – taken for granted in over developed countries – have long been denied. It is to those fellow citizens that we can deliver the greatest prize in eHealth and we should not forget our responsibilities as all members of the global community.

Can eHealth bridge the digital divide? – A response to Dr. Ricky Richardson

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The benefits that the direct application of information and communication technologies can bring when used in direct combination to meet the specific needs of healthcare are by now well known and well documented. Indeed, such applications are not infrequently offered as a panacea for solving many of the health problems affecting the developed, newly industrialised and developing worlds.

But such aspirations for the Internet and telemedicine are contingent upon a number of fundamental requirements such as the existence of an adequate telecommunications infrastructure, the availability of bandwidth, a reliable power supply and cheap, robust and affordable equipment that can be easily maintained - not to mention the trained professionals, creativity and industriousness necessary to achieve the crucial four "c's" of e-health: care, content, connectivity and commerce, all of which can be provided through these media.

These crucial factors, all more-or-less taken for granted by many patients and citizens of the developed world, still elude those in developing countries. Together, they contrive to divide global healthcare consumers into the digital "haves" and "have nots" of the Information Age.

In this presentation we therefore present the argument that information and communication technologies for health will not and indeed, cannot improve the health of the citizens of this planet that are most in need of them without a wholesale revision of the priorities and politics of some of the developing and developed world's most powerful governments.

Supporting this argument, we focus particularly upon the ongoing work of the Centre for Law Ethics and Risk in Telemedicine (CLERT) in evaluating the development of e-health and telemedicine in countries such as South Korea, India, South Africa, Cuba and Wales. We argue that greater benevolence on the part of the protaganists of globalisation and the politicisation of e-health and telemedicine are vital - not only in bridging the digital divide, but also in preventing it's widening into a chasm that will be forever uncrossable.

Using the Internet: Patients and providers develop new forms of care

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The Internet has provided a new tool to health "consumers" and patients. Where once the family physician was the primary source of information, and the office visit the most important way we shared information, the Internet now gives patients and physicians a new tool to find evidence-based results, clinical trials, second opinions, the support of other patients, and new ways to communicate with providers. In this presentation, we will discuss how some patients and physicians are re-designing care using the most basic of all Internet tools: e-mail. Without sophisticated applications or special interfaces, patients and physicians in Sweden and elsewhere have made fundamental changes to the patient experience. We will present examples and discuss the experience of physicians who use e-mail with their patients.

Prevention and care on the net – Virtual services on drugs and alcohol

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The possibility of letting people regulate the social and psychological distance and the degree of anonymity is the factor that makes ICT a particularly useful medium for alcohol and drug prevention and mental health promotion. In many respects, telematic methods give people more freedom and enlarge their territory. The possibility of self-assessment and interactivity lower the threshold of dealing with sensitive issues. The possibilities of the Internet, support phones, computer programs and videoconference training in drug and alcohol work were tested in a series of pilot projects of Prevnet Euro and are now being further developed by the members of a pan-European Prevnet Network. There are projects on *virtual clinics* where treatment, research, inter-professional consultation and training would be added to the existing telematic services for a seamless integrated service chain with traditional face-to-face services. In the future it will be possible to seamlessly mix the real and the virtual by using new technology. It may be that this complete addictive behaviour takes over all partial virtual experiences, which we can now achieve with substances or other means. Virtual reality is at the same time a very promising working method.

More information: *Tammi, Tuukka & Peltoniemi, Teuvo (eds.):* Telematic drug & alcohol prevention. A-Clinic Foundation nr 33. Helsinki 1999. (www.prevnet.net/guidelines/Guidelines.pdf) www.paihdelinkki.fi (Contains an abbreviated English version), www.prevnet.net (In English)

Creating partnerships with users to develop and evaluate telemedicine support services for older people and their family carers

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The Swedish ACTION-concept is developed from the EU project ACTION(Assisting Carers using Telematics Interventions to meet Older persons' Needs), which was designed to increase the autonomy, independence and quality of life for frail older people and their family carers by the use of information and communication technology (ICT).

A short introductory video highlighting the major features of the ACTION system and services will firstly be shown, namely the multi-media caring programmes and models of video-telephone support. These have been developed in partnership with older people and their family carers and evaluated in their own homes, and in additional care settings with professional carers, across the partner countries of England, Northern Ireland, the Republic of Ireland and Portugal.

Secondly, ways in which Swedish family carers, older people and professional carers have been involved as active partners in the research, development and evaluation process will be outlined. For example, the family carers' user group, and the use of user trials, focus groups, interviews with users.

Finally, ways in which the Swedish ACTION has empowered older people and their family carers will be demonstrated by online videophone communication with family carers involved in the project as well as professional carers from a local care setting for older people.

A live video demonstration of a clinical round with an expert panel from the university hospital supporting the staff and patients at a distant district hospital

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A live video demonstration of a clinical round with an expert panel from the university hospital supporting the staff and patients at a distant district hospital. Typical patients with various gynecological disorders (benign or malignant diseases) will be discussed in detail and their present/future handling/treatment outlined.

Baltic International Telemedicine NETwork – The BIT NET project

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The BIT NET Project has established telemedicine communication between the three Baltic countries, Estonia, Latvia and Lithuania and Uppsala County in Sweden. Uppsala University Hospital is the coordinator for the project. The project is financed to 40 % of the the Swedish Government through its Baltic Sea IT-Fund. The rest of the financing comes from the Health Care and Industrial partners.

The project was accepted July 1999. Contracts were signed for Sweden and Estonia in March 2000, for Latvia May 2000 and for Lithuania December 2000. It will be finished January 2002.

Six large and seven smaller hospitals and four Primary care/Family medicine units are interconnected in a PC based network run by PSTN with standard modem including internet communication and ISDN for some applications (radiology and videoconferencing). Neurophysiology, 3 D – dose planning for radiation therapy, diagnostic radiology and videoconferencing facilities are used by several different specialities. Different examples of our experiences will be given.

Sjunet – the IT-infrastructure for healthcare

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Carelink – Swedish Network for Healthcare Communication – is an organisation for national co-operation to promote the use of IT within Swedish healtcare. Four Swedish healthcare actors have founded Carelink: the Federation of County Councils, the Association of Local Authorities, the Private Health and Social Care Employers´ Association and the National Co-operation of Swedish Pharmacies. Carelink is in charge of Sjunet - the IT-infrastructure for healthcare.

Background: Sjunet was started as a project by seven County Councils in the beginning of 1998 in order to connect the hospitals and healtcare-centers. The objective was to provide the healthcare community with an infrastructure cosisting of a basic network and added services. The requirements of the basic network were:

1. Broadband with multimedia capabilities
2. Internetbased

3. Secure (Ipsec) connections by a VPN (Virtual Private Network)
4. Simple connecting points for an easy adding of new actors.

The planned services were secure e-mail, a videoconferencing platform, an e-catalogue with certificates, IP-telephony and a population database. The main project initiated six telemedical projects and thre e-commerce project.

The basic network was running in January 1999 and several of the services were tested. In the end of 1999 the County Councils decided that Sjunet should be established as a common infrastructure for the whole healthcare community. In the end of 2000 all County Councils have joined the Infrastructure.

Status now: The most common usage of Sjunet is storing and forwarding of radiology files, ECG, EMG, echocardiography but there is also a lot of videoconferencing on the network. Nearly all telephone traffic between two County Councils are by IP-telephony. Nine County Councils are using a common e-catalogue with ”business card”-information.

Plans: There are several Local Authorities, Healthcare product Suppliers and private Healthcare who are interested in joining Sjunet. There are also plans for enhancement of the infrastructure to allow increased videoconferencing and streaming video. The services will be further developed according to set objectives.

Neurophysiology in the national IP-net

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The consultants in clinical neurophysiology are all situated in the university hospitals in Sweden. With the use of the national IP-net, the knowledge can be transferred to the local remote hospitals. Much of the clinical work involves signal analyses ie electroencephalography (EEG) and nerve conduction studies (CV). The data are acquired by technicians at the local hospital and the analyses is performed by the consultant at the university clinic. The consultant will have access to the remote local server containing the data, through the national IP-net. The analyses is performed by the use of software developed at the university clinic but the original data will stay at the local server where the archive is created. The consultant will thus “visit” the local servers, analyse the data and create a report that easily will be sent to the referring clinician preferably by e-mail. Most local EEG laboratories are equipped with digital machines for acquiring EEG data and performing nerve conduction studies. Even though different software might be used for acquisition, the reading software will handle all kinds of file formats. The are no reasons why the national IP-net could not be international. A national “on-call” organisation for acute EEG recordings could also be achieved with the use of the national IP-net.

Copyright vs community in the age of computer networks

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Copyright developed in the age of the printing press, and was designed to fit with the system of centralized copying imposed by the printing press. But the copyright system does not fit well with computer networks, and only draconian punishments can enforce it.

The global corporations that profit from copyright are lobbying for draconian punishments, and to increase their copyright powers, while suppressing public access to technology. But if we seriously hope to serve the only legitimate purpose of copyright--to promote progress, for the benefit of the public--then

what must be done is either to reduce copyright powers or effectively eliminate them, depending on the kind of work. Governments must now protect the public's right to copy.

Telemedicine development at the third millenium

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TeleMedicine has prompted a new medical practice promoting multidisciplinarity and a partnership approach. New fields of applications that still call for a clearer definition shall be covered by TeleHealth, e-Health, Health Telematics and Health Computer Science. Research programs are underway for remote medical practice such as the Teleoperated Robot and CAMUVON (standing for MultiUser Automatic Capitalisation of Numerical Orthopaedics Volumes).

The Internet is a powerful tool whose indications will have to be defined more precisely along with network safety limitations. The enduring success of TeleMedicine in the third millenium will be conditioned by throughputs that meet the needs, investment and operating costs and an international charter based on a consistent rules and regulations policy, a legal expression and a high sense of Ethics ; this being a prerequisite for any Act or Regulations. The harmonious development of TeleMedicine aiming to give equal access to care to all in developing and emerging countries supposes in the longer term the definition of recognition criteria and fees that are inherent in this medical practice.

Organizational aspects of telemedicine

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Great things have been expected from telemedicine technology in health care organizations during the 1990’s. However, there is a discrepancy between the expected outcomes of telemedicine usage and the actual impact telemedicine usage has had on health care operations. There are reports that indicate that telemedicine usage most has been a concern for physicians with a passion for technology, and organizational obstacles and problems of acceptance still remain as barriers for a comprehensive and integrated use of telemedicine. The aforementioned problems might not be a surprise is if the technology and the organizations there it would be used are closer examined.

Telemedicine can be considered as an open technology, which means that fields of application are not on beforehand defined, and the installing of the physical equipment does not imply an immediate use of the technology. What we now about the telemedicine is that it offers the possibilities of transmitting sound and pictures. This feature has to be translated into fields of application these are appropriate in the daily operations, and the process has to be conducted during the usage of telemedicine. In order to facilitate this process, technology users are to be given resources in form of time to search and develop appropriate fields of application. A second problem when telemedicine should be used is to mobilize the potential users, who already are engaged in other activities. This problem originates from the fact that users often have to be mobilized *ad hoc*, here and now. Thus, a crucial task for managers of telemedicine will be to inquire the fit between ordinary activities and activities triggered by telemedicine usage, in order to discover needs for development of routines that allow the potential user to include telemedicine usage in her/his ordinary activities.