



E-health: A New Perspective on Global Health

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Abstract

e-health is a process of providing health care via electronic means, in particular over the Internet. The term ehealth has been used to describe the variety of activities related to the electronic exchange of health-related data, voice or video. e-health 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. In a broader sense, the term characterizes not only a technical development, but also a state-of-mind, a way of thinking, an attitude, and a commitment for networked, global thinking, to improve health care locally, regionally, and worldwide using information and communication technology.

This paper is commissioned in light of the rising profile of e-health on the international policy agenda and the emerging Indian Programme for Information Technology and related developments in the National Health Service. Few developments in public health today create the sense of energy and opportunity embodied in the word "e-health". The promise of ehealth lies in the manner to build advancements in the development of a health infrastructure. India is actively developing and implementing technological solutions to deliver health information and health care services across the country. These solutions, while exciting and promising, also present new challenges, particularly in regard to acceptable standards, choice of technologies, overcoming traditional jurisdictional boundaries, up-front investment, and privacy and confidentiality.

This paper will discuss how e-health provides the opportunity for the patients to maintain independence longer and for the providers to monitor a condition more closely. It also describes the barriers and challenges to and the current status of e-health. Also, an attempt is made for presenting the ehealth status in the Indian scenario. Further, its technological and financial barriers are illustrated and recommendations are provided for the improvement.

[1] Introduction

Everybody talks about ehealth these days, but few people have come up with a clear definition of this comparatively new term. Barley in use before 1999, this term

now seems to serve as a general "buzzword," used to characterize not only "Internet medicine", but also virtually everything related to computers and medicine. Intel referred to e-health as "A concerted effort undertaken by leaders in health care and hi-tech industries to fully harness the benefits available through convergence of Internet and health-care" [1].

In the present scenario it becomes a frustrating exercise for a patient to physically visit the doctor by traveling long distances under bad traffic or weather conditions. In the Indian scenario, one has to wait in long queues to get advice. Also, patients may contract infectious diseases in waiting rooms. By utilizing ehealth, patients can get treatments sitting at their home without going through all tedious exercises.

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As such, the "e" in e-health does not only stand for "electronic", but implies a number of other "e"s, which together perhaps best characterize what ehealth is all about: more *efficiency* in health care, *enhanced* quality of care, *empowerment* of consumers and patients, *encouragement* of a new relationship between the patient and health professionals, *extension* of the scope of health care beyond its conventional boundaries, *ease* of use, and excitement [1]-[3] .

There are currently thousands of e-health web sites online offering general content on health and medical care including hundred of thousands of individual web pages dedicated to a broad range of topics [2]. The amount of health related information on the worldwide Internet is rapidly increasing. A search using Google for "health information" gives the results as shown in the Figure 1.

The Internet has the potential to revolutionize health care by providing unprecedented access to information as well as health products and services on "e-health" sites. Millions of people worldwide are using the Internet to obtain quality health information directly affecting their lives, making this form of medicine an important tool for improving health.

Cyberdocs offer appointments and 24 hours emergency consultation from anywhere in the world. Some physicians prescribe medication over the Internet without even seeing their patients.

Even as its form and structure continue to emerge, e-health is being used to change business and medical practices. The Internet clearly drives the development and adoption of e-health applications. It has the reach, the infrastructure, and the acceptance to achieve wide spread change [3]. ehealth is perceived as being particularly useful in the operational support of the new decentralized and collaborative health care models being implemented in many countries [4].

Health professionals are increasingly being drawn into evaluating the Internet as a source of consumer information for health and medicine. Practitioners report a growing number of patients arrive at their offices either with questions related to appropriate web sites to visit or a large variety of health-related content gathered from the Internet.

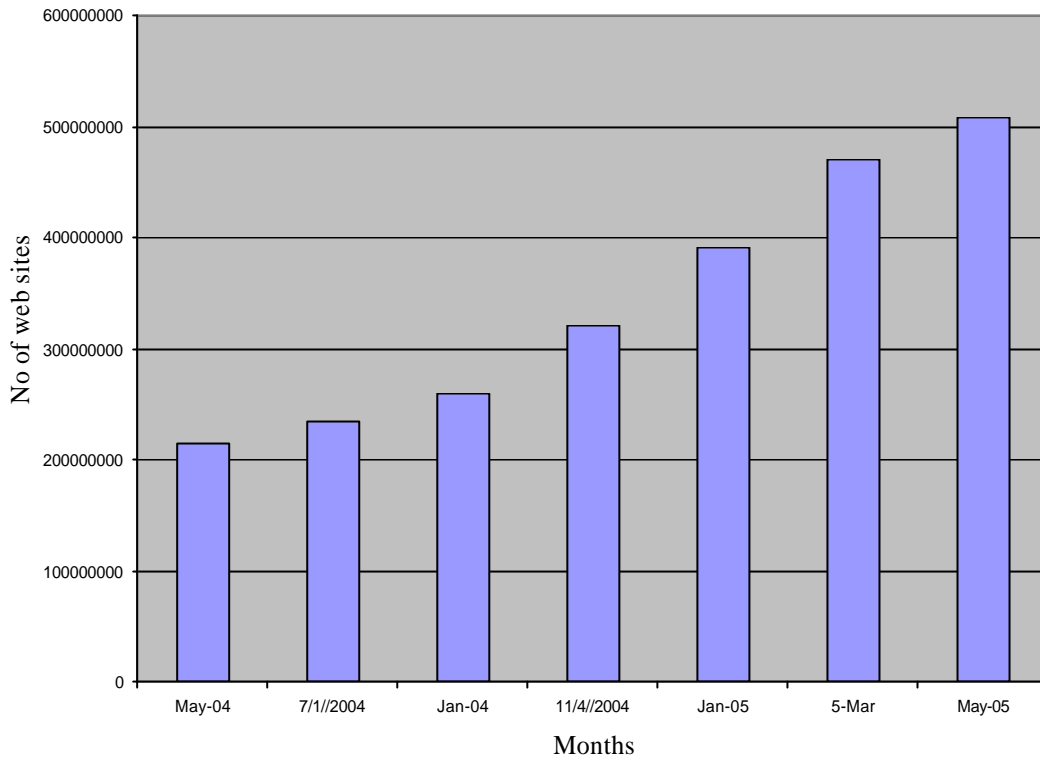


Fig. 1: Growth rate of health information on Internet

[2] Status of e-health

Two types of e-health companies have developed since the Internet was deregulated in the early 1990's.

Brick and mortar companies that provide health-related content and services.

Companies that use the web as their primary corporate environment.

While over thousands of health care sites already exist online, only a few hundred are exclusively web-based. Consumer demand is very high. An estimated 60 million adults used the web to find health related information in 1998. In a survey of 3,269 Internet users, e-health users reported that finding disease specific information was their number one application of the technology.

An attempt is made to get an overview of the research in ehealth. A number of e-health oriented funding programs and repositories of knowledge of research projects and organizations were identified and its research topics and trends were analyzed. Freiburg University's Health Informatics worldwide web site (<http://www.hiww.org/>) provides a regularly updated index of the most relevant links to websites on health informatics. Around 350 organizations from 56 countries were included in the index at the time of evaluation [5]. The results are tabulated in the form of bar graph (Fig. 2) and Table 1.

It has been concluded that the maximum research is going on in the field of Clinical Information Management and Electronic Patient Record while Bio Medical Cognitive Science and Consumer Health Informatics needs to be explored further. Also a considerable research is going on in the field of Telemedicine.

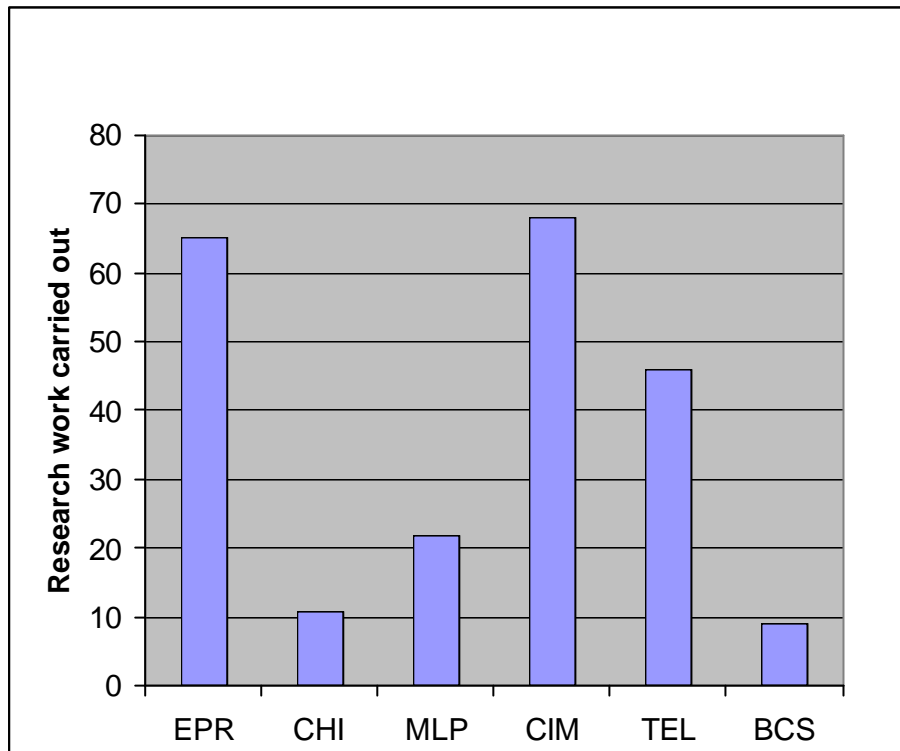


Fig. 2: Research work carried out

Research Areas	Research work
EPR- Electronic Patient Record	65
CHI - Consumer Health Informatics	10.9
MLP-Medical Language Processing	22
CIM-Clinical Information Management	68
TEL- Tele Medicine	46
BCS- Bio Medical Cognitive Science	9

Table 1: Research areas and research work carried out

The medical profession has been developing ehealth technology for over 35 years. The integration of e-medicine and ehealth technologies with the Internet was the next logical step [6].

For merging these technologies a number of sites are already existing for billing, back office functions, marketing, medical records processing, communications, medical supplies and equipment. Some websites, for example www.webmd.com, offer complete virtual offices for physicians. Also, the patients can easily purchase prescriptions, buy products and obtain general consumer information. Health Buddy, a portable device developed by Health Hero Network Inc. of Mountain View, Calif., allows physicians to “monitor” hundreds of patients at once by processing patients daily answers to health questions online, via a telephone look-up. Physicians may access patient information using a password and are alerted to any signs of trouble, including sudden weight gain or failure to take medications. Medtronic.com is developing a new monitoring service that will allow heart patients to use the Internet to relay up-to-date cardiac data from their homes to physician’s offices [7].

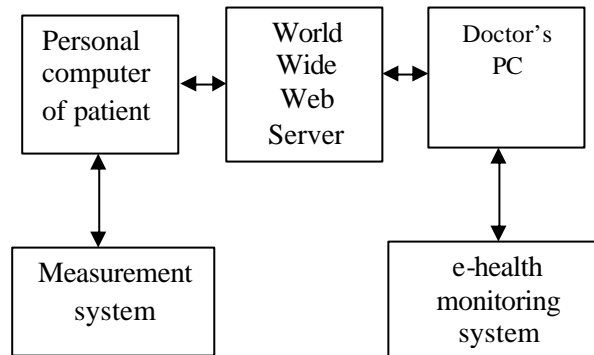


Fig 3 e-health connectivity

e-health care has the potential to improve the quality of health care delivery. Typical home monitoring devices such as blood pressure measurement systems are connected to the personal computer in the patient’s home which is further connected to Internet. The blood pressure measurement system sends the data to the personal computer of the patient which further transmits it to doctor’s PC via the Internet.

Once the health care doctor views the data, if required, he takes immediate steps to intervene by contacting the patient either by telephone or by website real time messaging. Immediately the prescriptions along with data are recorded in the personal file of patient [8].

The electronic connection would use a home monitor to download information such as heart rate and battery status from an implanted pacemaker. The data would then be automatically transmitted to a cardiologist over a secure Internet link. Some websites provide virtual communities, chat rooms for personal issues and discussion hours with professionals. Most leading hospitals have online informational services. Many managed care organizations offer informational services as well as some types of direct care through privately accessed parts of the Internet, known as an “intranet”. Some sites offer daily behavioral health care news, articles, reviews, discussion boards, cartoons, a meditation center and thousands of links to other health care websites.

[3] Benefits and services offered by e-health

There are a number of Internet sites for providing services for the health care industry. Others provide patient health and medical content. Many sites serve multiple functions such as providing consumer information, hosting on-line support groups and providing business support services. Some consumer information sites are run by nonprofit organizations such as the American Cancer Society and provide a wide range of

content. Government agencies often provide information as part of the organization's public mission. For example the National Library of Medicine offers one of the most comprehensive databases of medical information in the world. Some commercial based health content sites provide entry points to other areas or sites that sell products and services and may offer additional benefits such as the ability to store a personal medical record online at a protected site [2].

Rather than providing static content, there are virtual discussion areas for sharing ideas among patients and their family regarding specific health problems and provide a source of mutual support among people afflicted with similar health problems. These support group sites tend to be free of charge and are very popular.

An increasing number of Internet ehealth sites sell prescription medications and non-prescription drugs as well as related products to patients online. Some sites provide basic answers to specific questions submitted by visitors to the sites. A growing number of sites provide actual medical "consultations" including a diagnosis and will issue a drug prescription and treatment plan based on information provided by the visitor to the site. Some questions are answered free but there is a charge associated with providing medical diagnosis and treatment.

There are some e-health sites which are designed to provide specific patient information and services for a closed set of patients. The site provides these services under contract with an insurance plan or employer for covered individuals. e-health sites that provide this facility sometimes use a password protected screen that pops up before the registered user can enter the site. There are many sites which are designed to provide business services for health professionals and health care organizations. These sites also assist the health professionals with financial billing and maintaining records as well as accessing large databases of content [2]. Hence it is observed that a variety of services are being provided by the sites related to e-health.

[4] Barriers to using e-health sites

Before proceeding to deliver service using remote technology one has to obtain training from a recognized training organization or specialist in proper use of specific technologies for remote patient treatment. Health care practitioners will be seeking to deliver remote services via use of videophones or dedicated videoconferencing equipment. Most of the practitioners currently are not trained to use advanced telecommunication equipment and therefore do not fully understand the legal, ethical or practical ramification of using such technologies.

Though e-health continues to explode and computer mediated self-directed programs have also been shown remarkably effective for treating a variety of disorders, but research has not shown the efficacy of any assessment instrument to rule out serious mental illness in the worldwide population accessible through on Internet sites.

The next barrier is privacy. Many practitioners do not know how to completely remove patient files from their own computer hard drives or how to secure email transmissions to protect patient confidentiality. Legal protections for patients and practitioners are still in flux, while federal standards to protect the transmission and privacy of medical information are currently being developed.

From the clinician's perspective, it is more difficult to determine if a person is fully attentive or distracted during the interaction when using remote technology. The practitioners need to be trained or otherwise gain experience in the various possibilities

for misinterpretation when offering service to the public with worldwide connectivity brought by the Internet. Of further importance is the clinician's familiarity with colloquial expressions, idioms, and local variations or word usage, this can be crucial when working with mentally ill, suicidal or homicidal patients [9]-[11].

Chua and colleagues evaluated whether telemedicine and ehealth for new patient referrals to neurological outpatient clinics was as efficient and acceptable as conventional face-to-face consultation in a randomized controlled trial. The study was carried out between a neurological centre and outlying clinics at two different hospitals with the use of video conferencing equipment. Eighty-six patients were randomized to the telemedicine group and 82 were randomized to the face-to-face group. The outcome measures consisted of the following: consultation process (i.e., number of investigations, number of drugs prescribed, and number of patient reviews) and patient satisfaction (i.e., confidence in consultation, technical aspects of consultation, and aspects surrounding confidentiality). It was concluded that although e-health may be a safe and acceptable alternative, the e-health group had significantly more investigations (neurological testing) and had concern regarding confidentiality and embarrassment. This randomized trial suggests that telemedicine may be associated with less diagnostic certainty, resulting in more investigations and is not as well accepted as face-to-face consultation [12].

Currently the e-health world is still very much a "consumer beware" environment. Identifying the appropriate e-health site is not an easy task for most consumers. Health professionals can play an important role in helping patients with this issue. As such, the patients must take the opinion of other's practitioners too.

[5] E-health in India

India has a major role to play in the international e-health services industry. The Ministry of Communication and Information Technology (MCIT) has undertaken an initiative to build the national framework for "Information Technology Infrastructure for Health - ITIH" through health information standards. The objective of this undertaking is to achieve the following in the Indian health care system: (a) ? Simplify administrative processes (b) ? Enable sharing of information between disparate systems (c) ? Ensure greater access to health care in a cost-effective manner.

Apollo Health Street Ltd. (AHSL), a subsidiary of the Apollo Hospital group supported the MCIT in defining the framework for ITIH in India. Though these initiatives have been met with a lot of enthusiasm and user acceptance, their commercial viability is still under consideration. The government has been taking some proactive measures in a regulatory and financial capacity to boost the e-health environment in India. Money has been invested in telemedicine centers in regions that lack quality health care. Standards for telemedicine have been declared to maintain and promote quality in health care delivery through telemedicine. A health information infrastructure is being built to promote standardization in the capture and dissemination of health information. Some forward-looking state governments, such as the government of Andhra Pradesh, are using the Internet to increase health awareness and for promoting preventive health care. The developments in the domestic health care environment are promoting international business by positioning India as a practitioner of global best practices [13]-[15].

The presence of world-class health infrastructure and health care professionals enables it to be one of the leading e-health services providers in the world. Through it was found

that India has made good progress in offering e-health services to the developed countries. In 2002, more than \$60 million in revenue was generated through IT-enabled services. At the current growth rate, this figure could reach over \$10 billion by 2010 [14]. On the domestic front, many ehealth initiatives were taken by the government and private sectors, most prominently telemedicine.

[6] Barriers and challenges for e-health

(a) Technology Barriers

Insufficient bandwidth is the primary technical barrier dogging the IT-enabled health care services industry today. Many health care claims processing companies work directly on the clients' databases in real time, which requires very high bandwidth. Claims processing involves a large amount of documentation. Current bandwidth does not support easy transfer of scanned documents.

Many systems used in the country are not compatible with the advanced systems of other countries. The infrastructure problems of the country mainly refer to the unavailability of an un-interrupted power supply, limited Internet connectivity, lack of an efficient public transportation system, lack of commercial spaces for business establishment, etc [10].

Telecommunications and connectivity issues such as bandwidth, telephone call charges, Internet access, etc need to be addressed for growth and development of the services sector. Additionally health care applications used today are outdated; they are not interoperable across different platforms.

(b) Financial Barriers

The financial sector in the country with respect to delivery of health services and the e-business environment involving the foreign direct investment, facilitation of e-commerce, etc. is mostly favorable. The major issue has been regarding transactions with foreign currency. Indian banks charge the customer for foreign currency transactions. Nationalized banks charge up to Rs. 200-350/- per transaction. Private banks such as ICICI charge up to 0.25% of the transaction value. Historically the failure of medical transcription companies has dissuaded people from investing in health care related businesses. However things have changed today. There are no financial barriers today. In fact, many companies that operate in the old economy industries, such as Godrej, TVS group and Bhilwara group are investing in medical transcription companies. Cost differentials that the Indian companies were offering are decreasing [13].

Today Indian service providers offer an overall cost reduction of around 50% to a client in the US for providing different types of e-health solutions by using Indian manpower. Lack of trust in the new mechanisms of payment, and credit card culture are few of the reasons for failure in fully realizing the potential of e-business. There is lack of transparency in the financial sector leading to partial distrust affecting the nature and volume of investments in the foreign country where transparency refers to, that there should be no gaps between the ideal and reality. For example, firms often delay release of statements, or provide no quarterly or semi-annual updates, or purposely omit footnotes with detailed information. When financial statements are not transparent, one can never be sure about a company's real fundamentals and true risk.

There should be a clear demarcation between central and state provision and financing of various health services. Both health provision and financing is considered to be a state's subject. On average, out of the total government health spending, the

state's share is about 80 percent. To address these needs, the government, both at central and state level, should encourage private and public establishments to develop and reinforce the key aspects of infrastructure that mainly refer to technology, real estate, power, telecom, transport, etc.

India is actively promoting e-health initiatives both independently and in collaboration with foreign stakeholders. Most state governments are coming forward to address the infrastructure issues and enabling a conducive environment for the setting up of new business units to promote cross border trade in health services [13]-[15].

[7] Recommendations for strengthening the Indian e-health Industry

The growth of e-health services environment has so far been dependent on the aggressive initiatives taken by the private sector, aided with some friendly policies by the government. It has not had a major impact on the domestic health care market. A more efficient and robust domestic health care system could further strengthen our competitive edge in the international e-health services market, particularly the quality of our health care professionals and communication infrastructure.

By improving the quality of computer education there will be an increase in the output in terms of e-professionals. Both the domestic and international service providers can benefit from it. Also the prices of Internet bandwidth for health care service providers should be reduced. Higher bandwidth will increase the throughput of Indian service firms and will also enable them to utilize more data/picture intensive and high value-added work. This move will also give a fillip to domestic e-health services, especially telemedicine and tele-education. Uninterrupted power supplies should be offered, for the same reason as mentioned for essential services. Incubators should be built to spur the entrepreneurial activity in areas such as biotechnology. It should be made mandatory for all health care entities to follow health information standards in a phased manner. This will reduce much of the administrative costs for the government, will reduce medical errors and will make it easy to exchange health information among different entities in our health care industry.

Laws must be framed that will protect the privacy and confidentiality of health information. This will ensure that health information is not misused by the providers or payers who capture this information. By doing so, India will project itself as a safe environment to do business for international health care companies.

Implement a licensing mechanism to ensure quality of service for domestic e-health service providers, as well as make the necessary changes in the employment laws that will enable night working hours for women in ITES (Information Technology Enabled Services) industry. Also improve the quality of English at all levels of the education system. There is a need of (a) ITES qualification tests – in order to ensure a basic quality of inputs going to the ITES industry, design an ITES employability test and make it mandatory for everyone wanting to work in this industry (b) Develop health care domain skills – courses in health care administration (transcription, coding and billing) and health care financing (health insurance) and on HIPAA (Health Insurance Portability &

Accountability Act) should be developed and offered to both corporations and individuals (c) International business – special courses on international business practices and work and consumer culture should be introduced (d) Introduce vocational courses to speed up the skill development for ITES jobs. There is a need to increase the number of medical and paramedical graduates per year. This will not only help the ITES industry but also cater to existing demands for health care in rural areas. Also the computer literacy level in the health care system should be increased and IT (information technology) education must be compulsory for all medical and paramedical graduates. Incentives must be provided to health care organizations for training their employees in basic IT applications. Increase venture funds for capital investment and the number of long gestation projects in areas such as biotechnology should be increased [13]-[17].

[8] Future of e-health

The health care industry has traditionally been seen as conservative, and slower to adopt technological innovations than industries such as banking, finance and telecommunications. In 2002, IBM produced a report outlining their vision of e-health ten years hence, in 2012 [3]. It also identified a number of key technological enhancements that will drive improvement in health care provision, including:

- ? Increases in bandwidth
- ? Advancements in wireless technologies
- ? Improvements in storage capacity
- ? Screen resolution enhancements
- ? Decision-support system enhancements
- ? Increased acceptance and use of the Web in everyday life
- ? Integrated clinical and business application software
- ? Developments in telemedicine
- ? Improvements in e-business transactions
- ? Developments in data warehousing and data mining

Advances in the digitization of sensory information, in particular smell, may allow enhance remote diagnosis through capture of data from devices such as the 'enose', which can analyze gases exhaled from the nose in order to determine levels of bacteria and hence the likely presence of infection [3],[18]-[20].

[9] e-health Internet sites

An attempt is made to summarize some health related sites for ready reference of the readers:

- ? <http://www.nhsdirect.org.uk>: This site offers health information range from publicly-funded health sites such as NHS Direct Online.

- ? <http://www.besttreatments.co.uk>: This site offers patients informed advice on specific conditions.
- ? <http://www.patient.co.uk>: Online information is also provided by many other organizations offering advice on using the web for health care purposes. For example, Patient UK offers resources such as leaflets on specific conditions, lists of support groups, a directory of online resources, comparison of medical insurance policies.
- ? <http://www.drfooster.co.uk>: This site offers guides on a variety of health topics as well as a utility to locate a hospital or specialist, and to find or compare performance-related data for specific hospitals.
- ? <http://www.telemmed.no/>: The Norwegian Center for Telemedicine (NST) is a research and development center that aims to gather, produce and provide knowledge about telemedicine and e-health both nationally and internationally. The NST works actively to ensure that telemedicine and ehealth services are integrated into health service provision.
- ? <http://www.atasp.org> The Association of Telehealth Service Providers is an international membership-based organization dedicated to improving health care through growth of the telehealth industry
- ? <http://www.ieha.info/> International e-health Association (IeHA)
- ? <http://news.bbc.co.uk/1/hi/health/> popular news web sites, such as the BBC's online presence, have sections focused on health.
- ? <http://www.cancerbacup.org.uk/> Organization supporting specific conditions having web sites and providing information for patients and their relatives and friends. For example, Cancer BACUP offers extensive information on cancer-related conditions.
- ? <http://www.bbc.co.uk/dna/ican/>: Consumer-issue web sites, such as the BBC's iCan can be used as an efficient way to raise consumers' awareness of their rights and expectations, empowering them by easing channels through which complaints can be made, and thus impacting on health care delivery by professionals and organizations.
- ? The Telemedicine and e-health Information Service (TEIS, <http://www.teis.nhs.uk/>) and the Health Informatics Worldwide web site (<http://www.hiww.org/>) both provide comprehensive lists of research activity in the e-health arena.
- ? <http://www.YourHeart.org.uk> discussion forum is an on-line discussion forum providing a facility for discussion on specific health-related topics, in this case for heart patients and their friends and relatives. Postings are moderated, but allow patients to share experiences with one another, and communicate with health care professionals.
- ? <http://www.ehealthwebsites.org/>: Provides a collaborative link between a number of websites involved in collating and disseminating information about e-health and telemedicine."
- ? <http://www.ehealthnurses.org.uk/>: This network, first established by a small group of nurses in 2000, is an independent initiative, freely open to all nurses and health and social care colleagues with an interest in developing e-health in order to maximize the professional delivery of effective patient care.

- ? <http://www.medcom.dk/health-telematics/>: The objectives of the Center are ?to strengthen the quality, service and coherence in the health care sector by establishing electronic communication between parties in the health care sector.
- ? <http://www.ihealthcoalition.org/>: The mission of the Internet health care Coalition is to improve the quality of health care resources on the Internet.
- ? <http://www.isft.net/>: The ISFT (International Society For Telemedicine) exists to facilitate the international dissemination of knowledge and experience in telemedicine and ehealth and to provide access to recognized experts in the field worldwide [6]-[11].

[10] Conclusion

e-health provides immediate access to the information that is relevant to patients as well as health care providers. Patients are taking more responsibility and initiative for making their own health care decisions. There will be a major shift in the 21st century enabling health care consumers to increase their ability to go beyond their geographical boundary. New health care consumers will seek information about diseases, illness prevention to intervention, choice and types of care that are available to them.

Questions regarding security and confidentiality issues are still hampering the development of e-health. It is recognized that security and confidentiality of electronic medical transactions over networks is a major concern for both telemedicine providers and patients, and should not be overlooked at any cost or in any way. Security and confidentiality of electronic medical transactions over networks is a legal and legislative issue that requires national governments and international organizations to develop legal frameworks and laws to govern these issues. The role of international organizations in proposing and developing guidelines is essential. Countries and health care institutions that have initiated or developed ehealth activities should share their experience and exchange information on their progress. Countries should conduct needs assessment prior to implementing e-health initiatives and avoid copying experience from the developed world, especially with regard to legal, social, cultural and technological differences.

Countries should introduce technological developments as part of the national economic development plan. These developments should be integrated for health care support to bring both social and economic benefits. There should be an integration of informatics training into education as early as possible. Special emphasis should be put on medical informatics training for health professionals. India should forge partnerships for ehealth projects with international organizations and the private sector. National standardization bodies and international agencies should develop common standards and protocols for e-health applications.

In the end, a very important part of making appropriate selections regarding e-health is having the appropriate information. The consumer has to visit multiple sites to obtain a second opinion. Visiting multiple ehealth websites is critical when seeking the reliable services over the Internet. Of course this is the most reliable way to check the accuracy of health information and to obtain sound medical advice whether from the Internet or elsewhere.

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