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Abstract

Healthcare technology can be defined as the application of science or engineering to a particular need within the healthcare industry. As medicine and healthcare delivery have become increasingly competitive, knowledge and innovation are essential for the survival.

In this paper, integration of Internet technology and healthcare system and its delivery are exploits. e-healthcare acts as a bridge to translate the needs of these healthcare units for the info-communication technology applications.

Key words: Healthcare technology, Internet, innovation, medicine and healthcare system.

1. Healthcare Industry And Internet Technology

e-lifestyle is becoming increasingly evident in the global Internet community. The e-lifestyle experiences e-communication, e-transactions, e-learning and e-entertainment. They comprise:

- e-communication
  - e-mail
  - instant messaging
  - Internet Relay Chat (IRC)
  - e-communities

- e-transactions
  - online shopping
  - online government transactions
  - job search
  - online financial services
  - information search and retrieval

- e-learning
  - distance learning
  - library services

- e-entertainment
  - online games
  - web-casts
  - music downloads
  - Internet radio

An e-lifestyle also offers opportunities to extend and to upgrade community services and knowledge to healthcare and services delivery process. The dramatic increase in the scope of the healthcare system, and the ever-greater prominence of this sector to the economy, have greatly heightened interest in
understanding the way the healthcare service functions. As healthcare and medicine have become increasingly complicated, the importance of the healthcare services to the national economy and individual well being cannot be overstated. As a result of escalating technology level and keep tight margins in a highly competitive business climate, relatively too little has been done to learn theoretical and practical aspects of managing healthcare technology in a rapid technological change process. In the digital age, together with healthcare and services delivery, e-health is usually defined by the key words, “instantaneous” and “affordable”.

The traditionally solo practice of physician-practice focus has evolved to multi-disciplinary such as that of group practice, where physicians and other practitioners come together to share resources, medical records, staff, income and expenses; office based or hospital as a provider of ambulatory care services. For hospitals, clinics, emergency rooms, and outpatient departments have long offered services to ambulatory patients. Ambulatory surgery, urgent care and emergency services are other services that hospitals have come and seen a dramatic growth. Considering patients are the customers of most core-activities, the relationships among customers and various healthcare players are shown in figure 1.

Global competition and impact of the Internet technology are forcing many corporations and industries to rethink how they compete. Inspiring from ‘2000 the year of e-everything’ (S. Charmonman & K. Wongwatanasin), with the e-revolution sweeping the globe and e-technology transforming the world of commerce so rapidly, every research shall constantly reassess any emergent new technology that may be relevant to their own industry. Whether it customer supply chain management, enterprise resource planning (ERP) or even customer relationship management (CRM), Internet and information technology (IT) are the key components embedded in these initiatives to help organizations leverage on their networks.

Figure 1 Patient-based relations among healthcare players
2. Promises of Web-Based and E-Healthcare Delivery Services

With Internet revolution sweeping the globe and Internet technology transforming the world of commerce so rapidly, recently e-healthcare has become recognized as a new and important strategy throughout the healthcare development, and it entails the participation of different disciplines in the business process.

Today, what patients are afraid of asking their doctors, they will ‘ask’ the Internet. By taking advantage of technological devices, services and applications, one can save time and broaden ones knowledge. Internet has changed the doctors and patients relationship. With an estimated 100,000 medical web sites, patients can look up any disease, drug or medical condition in seconds. Web sites include sites put up by hospitals and medical centres looking for business and by individual doctors, some of whom provided links to articles in medical journals and others whom says they have secret cures. They also include countless chat rooms for patients, their families and the worried.

Knowing the purpose of the web site is important. Using the Internet as a medium of communication or treating the web site as a business will result in different strategies. To understand how healthcare service providers can create these networks, it is necessary to look at how most parties manage their information.

2.1 Managing Healthcare Online

An e-healthcare offers ones a world of convenience and benefits, enriching ones life in many ways. Internet makes information accessible as long as ones have computing devices. Accessibility of medical information in the Internet is a wonderful source of education. It is a form of technology that not only aids the consumers of healthcare but also the service providers. Medical professionals can thus deliver personalized support to their patients on an ongoing basis and receive up-to-date information on their patients so they can better track patients and intervene before potential problems escalate into life threatening emergencies. Computer technology acts as gateway to promote the use of Internet in a secured, private and confidential environment.

Another form of technology is considered where all patient data and health information would be computerized. The automated services allow healthcare providers to collect more data on their patients more often. The healthcare providers can thus spend less time filling out paperwork and more time caring for their patients. Consequently patients feel better informed and more connected to their healthcare provider. Information that ranges from medical conditions to prescriptions has been consuming in a comprehensive network. This would allow for patients to obtain an alternative safer prescription when required. (See figure 2)

2.2 Consultation Online

Medical professionals are available for consultation 24 hours of the day, and 7 days a week on the Internet for minimum costs. Moreover Internet provides easy access for second consultation can be obtained at others web-sites for patients to confer and discuss with registered medical doctors. Besides Internet-patients can obtain ‘alternative forms of medicine’ available in the Internet in addition to support group and networks of diseases are readily available. An example of health services provider, namely DoctorGeorge.com has global partners that
route surfer to the Philippines arm of the organization. All queries from Asia are routed there at this moment. (See figure 3)
2.3 Medical Record Online

Medical record online serves as a virtual compilation of actual health data recorded about a patient over the years. It includes data such as facts, observations, interpretations, investigations, plans, actions and outcomes. It is an electronically maintained information about a patient’s lifetime health status and healthcare that replace traditional paper medical record. With the advance of Internet technology, it could become the primary source of information for healthcare, meeting all future clinical, legal and administrative requirements. Medical record online plays a key component in e-healthcare. This virtual environment facilitates a web-based clinical management system allowing medical information and data, to be displayed from multiple record keeping sites of all the different healthcare providers that a patient has visited into a single computer screen. This integrated electronic medical record system is operated with the objective of consolidating the individual efforts by some hospitals and medical institutions to form a centralized medical-records database that maintained by the government. In doing so, it aims to provide an effective and efficient total healthcare solution for its communities.

![Image](http://www.meetdoc.com/)

2.4 Pharmaceutical Products Online

Pharmaceutical products and drugs are currently available through Internet. Pharmaceutical products are made available online for consumers to purchase. Consumers do not have to wait in long queues. Just click onto the computer and voila, and the product would be at ones doorstep. Pharmaceutical online is a virtual retail drugstore store and information hub for health, beauty, wellness, personal care, and
pharmacy products. The virtual drugstore provides a convenient, private, and informative shopping experience that encourages consumers to buy products essential to healthy everyday living. With the aid of Internet technology, virtual drugstore could offer thousands of brand-name products, a larger selection of products than a typical store-based retailer, at competitive prices. In addition customers can review in-depth product information, interact with customer service representatives by phone or e-mail, and order products for delivery right to the home. To order drugs through Internet needs to fill out a questionnaire. The information is then sent to a doctor who decides whether or not to send the drug. Some sites ask for name and telephone number of the patient’s doctor, in case ‘additional checks’ need to be done. However, the quality, purity and potency of prescriptions and drugs bought over the Internet cannot be guaranteed. One may be risking one’s health and life since the possibility that the drug could be altered or out-of-date.

Figure 5 http://www.drugstore.com/

3. Next Frontier In e-Healthcare Delivery Services

With millions of web sites already on the World Wide Web (WWW) and others are emerging every minute, an unattractive web site will be lost among the multitudes online. That is because all these web sites will be competing for the eyeballs of millions of
Surfers who have pretty short attention spans. It is not surprising that Internet related companies have disappeared just as quickly as they have appeared. Some of these web sites included theories which have been developed on the basis of experimental evidence, but in virtually every instance, it makes the idea more easily understandable, applicable and commercial.

Patients are using the Internet technology to discover and research their illnesses, but often misdiagnose symptoms or stumble across quack cures. The problem is that the information on the Internet varies from sound to irresponsible.

Therefore, a framework is needed to facilitate the collaboration among the various disciplines involved. A fixed template that will guide the disciplines involved as they attempt to find that elusive combination which will generate the best results. At the core of this template will be the leveraging of communication technology, particularly internet technology, to facilitate the flow of information between different disciplines or overseas branches/suppliers and aid in the making of more informed decisions.

Figure 6 Principle of healthcare services delivery in the new technology era
As shown in figure 7, ‘Services provided’ knowledge is the knowledge held in mind of an individual (services provider), and as such is available only to him, or through him. ‘Feedback’ is the knowledge possessed collectively by a social system. It is available freely and equally to all customers through its records.

It is obvious that the definitions given of services provided and customer feedback are not intended to imply that they are mutually exclusive. Indeed, it is true to say that all ‘services provided’ is knowledge has at some time been the ‘feedback’ knowledge of an individual. It is also possible to state that ‘feedback’ knowledge is an essential source of ‘services provided’ knowledge.

3.1 Blood Appeal through Web

When a patient needs blood, the Internet is the quickest way to find potential donors. In the old days, the only way to find blood was to advertise in newspapers. A website could be launched devoting to verify outdated blood donation appeals, and to sort out fresh appeals from those that have long since achieved their aim.

Some features carrying authenticated appears, donor database for rare blood groups, donor education for children and a pool of regular donors who can be contacted quickly. (See figure 8)

3.2 Workflow Management

Medical technology as information (patient records) or an artifact (X-ray) or approach (cardio-vascular surgical procedure) may be studied in terms of their economies, marketing, or organization behaviour. Hospitals typically use photocopiers to make a physical copy of a patient’s identification
document, which they then archive in a filing cabinet. Instead of photocopying, they can scan the identification document, which can be electronically archived automatically. Similarly switching to digital technology will increase efficiency in images storage and retrieve, such as X-rays film, laboratory test results.

3.3 Mobile Phone Power

Mobile phones are becoming quite useful and they are more than communication devices. They are gradually becoming information devices from which you can get up-to-date information. Today one can buy movie tickets or get a restaurant, movie or music review. Ones just dial a number and hang up, seconds later the information arrives in the form of Short Message Service (SMS) on mobile phones. All this is even before the promise for GPRS (General Packet Radio Service) becomes widely implemented. GPRS enabled handsets will give users the always-on Internet link and more bandwidth, thus more innovative services can be expected.

3.4 Patient-care Services

In Singapore, Patients at the National
Healthcare Group has been provided with online personalized healthcare with the new health service. The service is not limited to those who register at this Internet portal to get instant access to their medical history and reports, in addition they can authorize general practitioners to do so. Moreover they can check, make or change their medical appointment dates online, or be reminded via e-mail, pager or short messages on the mobile phone. (See figure 9)

3.5 Telemedicine Services

Though telemedicine service, patients live in rural area or sick people, particularly the elderly and the invalid, would not have to make a trip to a clinic or hospital to get a consultation. The system consists video camera and computer screen. Doctor and patients are communicating through modern info-communication technology. Basic medical information, such as body temperature and blood pressure can be measured by the nurse from the remote patients-site, and these information can be transmitted to the doctor / hospital with real-time video images. With the advance in technology, medical data such as heart rate (HR) to blood pressure (BP), electrocardiogram (ECG), electroencephalogram (EEG), the amount of red blood cells (RBC), white blood cell (WBC) count, arterial blood gases, stating the amount of oxygen, carbon dioxide, bicarbonate and much more available and transferable at any time anywhere. With these computer-assisted consultations, the system save on trips, but can still ‘see’ a doctor. Subsequently, the follow-up medical checks and consultations are equally easy. The telemedicine service is targeted non life-threatening semi-emergencies. With appropriate handling, it is indeed as good as a personal consultation.

3.6 Cyber-Chondria

Medical doctors are seeing the appearance of a new syndrome dubbed ‘cyber-chondria’, with patients coming to them armed with medical knowledge gleaned from the Internet technology. Most of the cyber-chondriacs are young and tech-savvy. When a doctor suggests a drug, patients go online to find out about its side effects. And when they arrive at their doctor’s office, more and more patients are bearing pages of information printed from websites. They decided beforehand what they think their condition is or what drugs they need or do not. It will definitely become an increasing trend that patients challenging doctors with web-based diagnoses.

Unfortunately the Internet usually provides general information that may not apply to the patient’s situation. The medical information may not necessarily be in context, and it is still mainly superficial and is not situation-based. If patients skim through the online material and actually become discouraged from taking prescribed medicine, the situation could become dangerous.

On the other hand, the State of Geneva, the Geneva University Hospital, the Swiss Institute of Bioinformatics, and Sun Microsystems, the major sponsors of the Health On the Net Foundation (HON), created in 1995, is a not-for-profit International Swiss Organization. HON’s mission is to guide lay persons or non-medical users and medical practitioners to useful and reliable online medical and health information. HON provides leadership in setting ethical standards for Web site developers.
3.7 System Security

Network security is complicated to implement because a comprehensive solution must be cobbled together from a vast assortment of products. Organisations implement a wide range of business processing and medical records systems to keep track of their transactions and generate critical information for decision-making. However the implementing phase alone is insufficient to ensure that the systems are trouble-free. There can still be input errors, where users make mistakes or where there is an inadequate segregation of duties, because of management lapses. Other problems may surface from unauthorised access to confidential information, unauthorised downloading of data, output reports that are not reviewed, lack of training, staff turnover, outdated user manuals and system changes that are not documented.

All healthcare service providers shall report medical blunders and ‘near misses’ to an ‘agency’. This independent ‘agency’ will publish anonymous details of so-called ‘adverse events’ and issue advice to the healthcare industry on how to avoid the same mistakes in the future. Internet–based clearinghouse of medical mistakes made by doctors and hospitals, with the intention of helping them to avoid such errors in the future. These mistakes include surgery, medication, and other services. Medical mistakes and voluntary information can be collected routinely.

Addressing concerns about patient privacy, web master shall strongly cautioned that no patient names or other personal information would be transmitted.

4. Concluding Remarks

With the advent of info-communication technology as one understands it in this day and age, the medical scene has also taken several steps in harnessing technology to improve its services. Moreover, researchers intend to introduce their innovative idea to medical groups, public health agency and medical software developers. Some of these applications are: electronic documentation of medical records; making real-time appointments through the internet; viewing of medical dossiers, e.g. visit history, past prescriptions, bills, discharge-summaries, selected laboratory results; online requests for medical records and payment.

In any organization, one must be careful in using innovative technology. It should be thoroughly assessed first before it can be implemented fully.

Attention could be focused in new medical technologies development and beefing up of existing capabilities. For an example one area in new medical technology can research into liver dialysis. Such technology could be introduced in the critical-care unit as a way of increasing the capability of the intensive-care unit. Beef up the existing healthcare services refer to engaging appropriate technology in service so that patients stricken with major diseases like stroke, heart attacks and kidney disease will not have to be subjected to long stays or repeat visits to hospital. Hence as societies and nation develop, their healthcare and its delivery will become efficient and effective.

This paper demonstrates how new technology is strategically planned and implemented within the healthcare community, with numerous examples of the illustrations from healthcare portals available on the Internet.
References and Further Reading


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