E-health: Traditional Medical Practice is in Transition

Sisira Edirippulige[1,2], Tsuyoshi Hamano[2], Yoshikazu Fujisawa[2]

Key words : e-health, Evidence-based medicine

Introduction

With no doubt, the modern medicine is currently undergoing fundamental changes in many ways. As medical knowledge improved in the last decades, medical sub-specialties have become more sophisticated and the field of medicine has become more complex and fragmented. At the same time, patient behaviour has also changed and the demands for more information and involvement in decision-making have increased. Moving away from a traditional paternalistic medicine model, a more transparent way of practicing medicine which is known as 'mutual participation model of medicine' is becoming a norm . Evidence-based medicine has become the key feature of both clinical medicine and medical education in the current times. There is also a clear change of the role of medical professionals. Many medical duties expected to be performed by doctors are now being delegated to nurses or other allied health professionals. With a recognised shortage of doctors especially in rural practice, there is trend to train general practice nurse practitioners to replace some of the roles of country doctors in Australia and other developed countries.

Among many, one important factor for current changes in health and medical field is recent technological advancements[1]. New scientific inventions, particularly developments in information and communication technologies (ICT) have made noticeable impact on the way traditional medical practice is carried out. These developments have facilitated speedy access to information for health providers and consumers. To an extent, changes have also improved the quality of health care and made services available to wider populace. It is further expected that the current changes in health care would improve the efficiency of medical practice and impact on cost of care.

New pathways are explored to use the ICT to play a greater role in health care. Disparity of care is a global challenge in providing quality health services to communities. The issue is not endemic to under-developed countries. Developed countries also suffer from geographic disparity of care where distant communities are underserved particularly in relation to specialist care. Large distances and poor access in rural and remote locations affect both patients as well as practitioners. Traditional way to provide services to these distant communities has been the expensive methods of transporting patients or specialist. Problems of the lack specialists in rural and remote areas will always remain an issue as specialist are naturally attracted to urban centres. Against this backdrop, some believe that ICT may be an answer to this problem.

In recent times, healthcare has seen an increase in the adoption of e-health technologies. A number of governments around the world have implemented national plans for launching e-health strategies. National initiatives such as National e-Health Transition Authority (Australia), the Health and Human Services (United States) and the NHS Modernisation Program (United Kingdom) can be a few examples.

[1]Centre for Online Health, University of Queensland, Australia
[2]Centre for Community and Stream Care Research, Niigata University of Health and Welfare, Niigata, Japan.
 Corresponding author.   Tel/Fax: +81-25-257-4796   E-mail: ccscr@nuhw.ac.jp

It has been recognised that increased use of technology may be the key to improving quality, safety and ultimately patient outcomes in health care[2]. However, it is also widely accepted that health care has not embraced technology as rapidly as other industries such as finance or manufacturing. For example, while today it is common for consumers to view electronic banking records online, a 2002 study found that only 13 percent of US physician practices had implemented an electronic health recordx [3].

It is argued that the use of e-health can positively enhance the doctor-patient relationship as there are examples already how e-health may promote the mutual participation model of medicine[4]. In this model, there is a shared responsibility in decision making and problem solving. There is more control placed on the hands of the patients compared to the traditional way of healthcare delivery. Advocating the patient contribution has proven advantages in promotion of patient understanding and satisfaction, adherence and compliance and ultimately their psychological wellbeing.

Introduction of e-health has brought about many changes to the existing ways of healthcare delivery. Not only the method of health service delivery but also the fundamentals such as who, where, when and how health care is delivered are changing with an aim to achieve efficiency of quality service delivery to patients.

The role of clinicians as the main source of medical information is also changing with the emergence of Internet. Store and forward e-health usage is changing the traditional time framing of the delivery of health care with much of the consultation continuing to take place outside a clinical consultation with the patient. Simultaneous presence of the patient and the provider may no longer be a prerequisite for a medical consultation. Tele-home care is an obvious example of the change in healthcare delivery, so as the remote consultations.

In Australia, the integration of e-health technologies in routine clinical practice has been most prominent in the field of general practice. A recent survey reported by the Australian Medical Association (AMA) supports this, indicating well over 90 per cent of the Australian general practitioners are utilising computer technologies such as electronic prescribing and communications systems [5]. Another area e-health has been particularly active is in the propagation of web-based health information with currently over 20,000 dedicated health information Internet sites with their usage and numbers only increasing with time. However, in contrast to such trend, other more technologically driven projects, such as tele-homecare or virtual remote consultations are slow to find their place in real-life situations despite of promising results from their pilot studies.

E-health in clinical practice

One of the most readily identifiable e-health technologies is online consultation. The defining feature of online consultation is that the health care encounter takes place outside the confines of a traditional face-to-face interaction within a clinic or hospital setting. Online consultation technologies fall into one of two categories:

- Asynchronous/store-and-forward: Information is collected and stored before being transmitted to the remote site.
- Real-time: There is no delay in information being collected, transmitted and displayed by the e-healthcare system. This allows real-time interaction between both local and at-distance parties.

In Australia, in the last few years government funded incentives have driven the rapid uptake of computers in general practice in Australia. An example of a government initiated e-health program that was initially welcomed by the practitioners was 'Health Insurance Commission

(HIC) Online'. This is the government's online claiming system for Medicare billings. The aim of this project was to simplify and speed up the current Medicare billing process. This has potential benefits for all parties involved. There is a significant cost saving for the government in handling the Medicare payments electronically, the patients potentially can pay only the gap portion of the medical fee as the Medicare rebate is calculated and payed out immediately so will not have to suffer a large up front fees for medical services, and the doctors would not have to bear the long wait for the payment of the rebate potion of the bill. However, in reality, there is a considerable shortfall with this system with a delay in electronic transfer of payments and up to 90 days processing time before the cheque is issued by the HIC. In other words, without further refinements to the current system, this program does not add any advantage to the manual way of handling the private billings for the patients or the doctors.

The primary incentives for the doctors to take upon an e-health program will be the foreseeable improved patient outcome and gains in efficiency in delivery of health services. A study in the UK illustrates the general practitioners' expectations and concerns about a new technology [6]. Twenty six general practitioners participated in this survey and these are some of their perceptions of a store-and-forward tele-dermatology program. Despite of limited prior knowledge of tele-dermatology, the study population perceived tele-dermatology positively so to provide a quicker access to specialist opinion, decreased specialist referrals and increased convenience to the patients. Teaching aspects of the program was also regarded important as well as the ability to discuss various treatment options with specialists online. The negative aspects raised were the potential increased workload, patient confidentiality and medical liability issues and worries regarding difficulties with using new

technology. The overall expectation to the program was a quick, easy to use, efficient and reliable system.

Online consultation removes many of the traditional structural challenges for physicians in proving services - the most notable being physical distance. Several researches have demonstrated that e-health applications enable physicians to provide services avoiding distant travels. Also there is evidence that e-health technologies can bring significant cost savings.

They report a high level of satisfaction of patients receiving online consultations. High levels of satisfaction are associated with improved compliance to treatment regimes and thus improved patient outcomes. Research suggests that the structural changes which e-health technologies facilitate, such as providing a more time and cost convenient services to patients, is having an impact on patient care.

Health information utilization

With the current explosion of medical knowledge, both clinicians and consumers are increasingly turning to contents delivered by ICT, such as Internet as the information source. Statistics, particularly from developed countries suggest a staggering proportion of their population is utilising the Internet for health-related information[7]. For example 52 million Americans have gained health information through over 20,000 health related websites in 2000. Online information sources refer to Internet technology which is providing an increasing amount of health-related information to health consumers and professionals. Diaz et al estimated in 2002 that 100,000 websites were in existence - a figure which has in no doubt grown. To match the presence of this information has been the better means to access it - currently 53% of Australians have broadband Internet access at home [8].

Not only consumers but also students studying

Table 1. *Knowledge and perceptions of e-learning*

Statement	Response		
	Yes %	No %	Not sure%
I am familiar with the term e-learning	43	22	35
I regularly use e-learning modalities in medical education	19	48	33
I regularly use multimedia resources	25	47	28
I have access to multimedia resources at the university	13	20	67
I use web-based learning in my studies	11	49	40
e-learning modalities are useful tools in medical education	56	20	24
e- learning must be expanded in medical education	49	12	39

health and medical science fields have acknowledged the importance and advantage of e-health information. For example, the researched conducted by international research collaboration pointed out that medical students encouraged themselves to use ICT to acquire medial knowledge, although their physical conditions are not fitted to fully utilize ICT [9].

And online health information sources allow consumers and other health professionals to become informed about diagnoses, surgery or health promoting behaviours, prepare for a visit to their doctor or hospital, share information and give and receive support [10]. From health care professionals' point of view the Internet is useful for continuing medical education, conducting online peer review research and access the latest evidence based guidelines.

Online health information sources are not just limited to the websites. Internet has also been useful resource of health information by providing facilities such as online discussion lists and newsgroups - virtual groups of Internet users with an interest in a particular healthcare topic. Another resource is Internet subject gateways - high-quality, categorised directories of healthcare information resources. In addition the Internet is now used widely to access professional health and medical journals - allowing consumers to access the same information their clinicians use [11].

The need for development of computer-interpretable guidelines has been raised by clinicians. Beilby et al made a proposal for the electronic decision support systems (EDSS) to be created and available for the general practitioners in Australia to facilitate their clinical decision making based on available evidence [12]. National Electronic Decision Support Taskforce has now been established under the ministerial National Health Information Management Advisory Council.

However, there are number of issues still needs to be resolved before health care sector can fully benefit from ICT, such as the Internet. The accuracy of the information on Internet sites is still a matter of concern. Being an open environment where control and screening of information is extremely difficult, the Internet can also be a potentially harmful resource. Thus the need for guidance in finding information sources and assistance in interpreting the obtained information is often articulated.

AS one can see, emerging technologies have brought about sweeping changes in health care. Traditionally, clinicians were the only source of information for patients. Clinicians often adopted authoritarian methods where patients were given little information and left uninformed about conditions and treatment. Today, clinicians have begun to see patients as key partners in treatment and feel happy to educate patients about their conditions. However, the scope of this education

is still limited selectively by the clinician. It remains to be expected that in the future, patients and clinicians may create a comfortable form of balanced relationship where patients can access information themselves using online information sources, with some guidance from their clinician.

What future holds?

Despite of innovative ideas brought about by the integration of ICT in healthcare, the diffusion of e-health applications for wider use has been limited. Majority of e-health projects are funded by the governments and often become dysfunctional after funding ends. There is little evidence of e-health applications becoming routine practice. In an already overstretched health system, introduction of technology can become a burden if without the needed support.

An attempt at systemic review of current literature on tele-consulting applications by Jaatinen, et al[13] found that telemedicine projects dealing with direct communication between patients and healthcare professionals was rare where just over ten per cent of the reviewed projects describing a such set-up. Despite of the promises and excitement the real-time tele-consultation, non-realtime methods were shown to have proven more manageable and remained sustainable in clinical practice.

There are also technical limitations to the current tele-health technology. For example, the inability to deliver sensory and non-verbal data has been shown to negatively affect the quality of doctor-patient interaction in telemedicine consultations[14]. Even with the more traditional audio and video information that can be easily transmitted with current technologies, the quality of data transmission can influence the clinical outcome where a poor quality data transfer would negatively affect the accuracy of medical assessment, diagnosis generation, patient comprehension and treatment monitoring. Technical problems during a tele-consultation would likely divert the attention from the medical problem at hand and a poor consultation as a result. High quality communication required would also mean an increased cost to set up and maintain.

The technical aspects of telemedicine including hardware, software and support services are likely to improve and the cost may diminish in the future. However, more attention needs to be paid in the clinical process of healthcare delivery in order to ensure a successful implementation of e-health. The human interactions that are particular to tele-medicine and the organisational process that makes the communication possible are some of the major issues that require a new focus in research.

Online consultation, remote wireless access and online information sources are all changing the clinician-patient relationship. In particularly, online information sources have facilitated a change in the balance of knowledge between patients and clinicians which may place stress on this very important relationship. Tann et al note that well-informed patients may be seen by some clinicians as "time-consuming, threatening" or as a "nuisance"[15]. On the other hand, clinicians with poor Internet literacy may be dumped by Internet-savvy patients[10].

If we are to move towards a model where patients and clinicians form a partnership, however, clinicians need to ensure that they are able to cope with patients who have gathered information on the internet. In fact, Tann et al suggest that clinicians should drive the use of the Internet by patients. This can be achieved by integrating computer based training into patient education, having clinicians provide suggested website reading to patients or browsing the internet together during patient consultations.

Patients must be made aware of the risks associated with the location and misinterpretation of information as this may lead to poor self-diagnosis. By ensuing that the patient and

clinician have a balanced, information-sharing relationship, this situation can be avoided.

Ensuring patients and clinicians are adequately educated about proper use of new technology, testing software and hardware systems thoroughly prior to implementation and implementing backup-plans to ensure that patients are not harmed can be some of the solutions to the problem.

Conclusions

For an e-health initiative to make an impact in real-life practice there should be a clear benefit over the existing system that can be achieved by implementing a new technology. The system should be simple, not threatening and with a full support to make it work in an optimal way. The expectations and concerns the care providers have towards the proposed project should be considered and the problems addressed to ensure a successful adaptation of e-health into practice. There should be a continued effort to make further refinements to the projects to improve the system so it becomes more attractive to the medical professions to readily see the benefits and to embrace the technology.

In planning e-health programs, information regarding the clinician's perceptions and concerns and patient satisfaction and fears in accepting technology into clinical medicine are essential to make technology useable. The limitations and newly emerging concerns regarding the use of e-health will need to be further studied before a wide acceptance and implementation of e-health can be achieved.

Acknowledgements

References

1) Fieschi M. Information technology is changing the way society sees health care delivery. *International Journal of Medical Informatics*, 66:2002, pp.85-93.

2) Hersh, W. Health Care Information Technology: Progress and Barriers. *Journal of the American Medical Association*, *292*(18), 2004, pp. 2273-2274.

3) Miller, R H. Physicians Use of Electronic Medical Records: Barriers and Solutions. *Health Affairs*, *23*(2). 2004, pp. 116-127.

4) Miller E. The technical and interpersonal aspects of telemedicine: effects on doctor-patient communication. *J Telemed Telecare*. 9:2003, pp.1-7.

5) Nesbitt J. Potentially good system still has rough edges. *Australian Medicine*. 17(13):2005, p15.

6) Collins K. General practitioners perceptions of store-and-forward tele-dermatology. *J Telemed Telecare*. 6:2000, pp.50-53.

7) Newnham G, et al. Attitudes of oncology health professionals to information from the Internet and other media. *Medical Journal of Australia*. 183(4):2005, pp.197-200.

8) Trewin, D. 2005 Year Book Australia. Canberra: Australian Bureau of Statistics, 2005.

9) Sisira Edirippulige, Anthony C Smith, Rohana Marasinghe, Yoshikazu Fujisawa, Walisundara B Herath, Mohamed T M Jiffry, Richard Wootton E-learning experience of medical students: Results of a survey in Sri Lanka. Distance Learning & the Internet 2006 Annual conference of Association of Pacific Rim Universities.

10) Fox S, Fallows D. Pew Internet and American Life Project, 2003.

11) Yellowlees, P. Your Guide to e-Health St Lucia: University of Queensland Press 2000.

12) Beilby J, et al. Electronic decision support systems at point of care: trusting the dues ex machina. *Medical Journal of Australia.* 183(2):2005, pp.99-100.

13) Jaatinen P, Forsstrom J, Loula P. Teleconsultations: who uses them and how?. *J Telemed Telecare.* 8(6):2002, pp. 319-324.

14) Miller E. Telemedicine and doctor-patient communication: an analytical survey of the literature. *J Telemed Telecare.* 7:2001, pp.1-17.

15) Tann J, Platts A, Welch S, Allen J. Patient power? Medical perspectives on patient use of the Internet. *Prometheus* 21(2), 2003, pp. 145-160.