

# ICT for Health

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Over the past several years, information and communication technology (ICT) has become an integral part of our everyday lives. Although the health care systems worldwide use less ICT compared to other sectors, the role of ICT in healthcare is nonetheless substantial, and is growing rapidly.



In many situations, ICT in healthcare is referred to as Health Information Technology, or Health Informatics. In general, ICT allows health care providers to collect, store, retrieve, transfer and disseminate information related to healthcare electronically. To most people, health informatics is synonymous with electronic systems which support both the administrative and clinical aspects of provision of healthcare. ICT based

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systems play a role in management of hospital and healthcare systems; i.e., in financial management, administration, managing staff, purchasing drugs and equipment, etc. In this respect, the role of ICT in healthcare management is very similar to that of any other sector or institution. The role of ICT in clinical care of patients is mainly with regard to maintaining electronic medical records. However, in broader terms, ICT plays a much bigger role in clinical aspects of healthcare. ICT plays a huge role in medical education, both at undergraduate and postgraduate levels. ICT also provides a portal to the world of medical knowledge which can easily be accessed by doctors and other healthcare professionals, as well as patients. This enables the latest developments and information to be available to practicing clinicians, at virtually the click of a button. This is indeed a significant advancement from the old days where, when confronted with a clinical problem, the doctor would have to make a trip to the library to read the latest journal. Of late, ICT has been put to more innovative use, with regards to healthcare. Computer based systems which can be used to assist clinicians to take decisions with regards to patient care, and also

to alert or give early warning signals which alert the clinician with regards to changes in the clinical condition of ill patients, are becoming more widely used. Another aspect of ICT in health is Telemedicine, whereby a patient could access high quality healthcare from a distance. ICT also plays an increasingly important role in

patient and public education on healthcare issues. These different aspects will be discussed further in this paper.

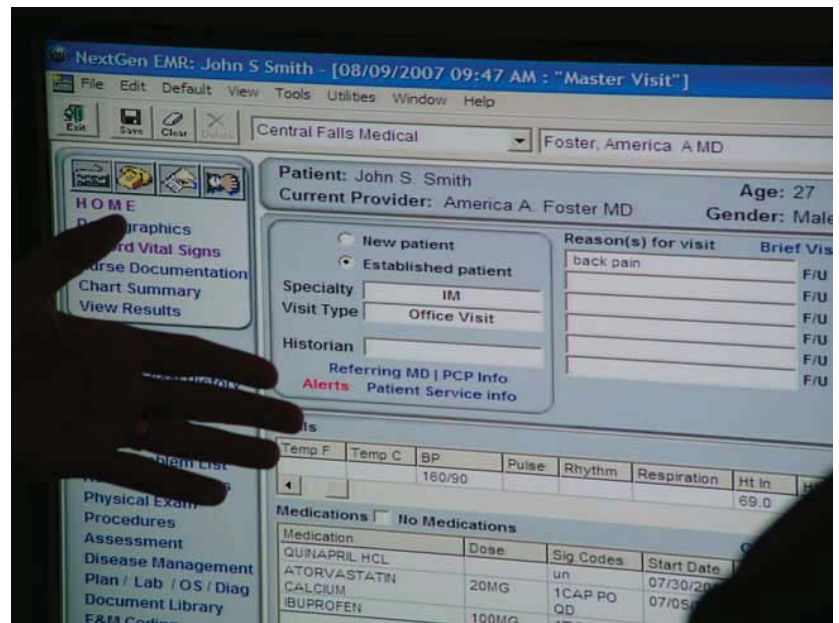
## **Electronic health records (EHRs)**

Traditionally, medical records of patients in hospitals or in other practice settings were maintained on paper, using standard filing systems such as a file cabinet. In such a system, the patient's records could be accessed by pulling out the patients file. Electronic health records were originally envisioned as an electronic file cabinet for patient data from various sources (eventually integrating text, voice, images, handwritten notes, etc.). Now they are generally viewed as part of an automated order-entry and patient-tracking system providing real-time access to patient data, as well as a continuous longitudinal record of their care. The main advantage of such a system is that the patient's medical records could be accessed by different people involved in the care of the patient, instantaneously. Usually, such electronic health records systems are hosted on a network; the patient's records are identified by a unique number, and any member of the treating team who has the appropriate rights to do so could access the patient's information from anywhere on

the network. In most developed countries, all health care units (hospitals, clinics etc) are linked by these networks. Information could also be fed in to the system from any point at which the patient accesses healthcare, enabling patient records to be updated instantaneously. Information transfer between the different healthcare providers occurs seamlessly and efficiently. For example, if a drug is prescribed by the doctor, the prescription will automatically be sent to the pharmacist who will dispense the drug. Another advantage of electronic health records is that error-checking systems can be put in place. For example, if a certain patient is allergic to a particular drug, and someone prescribes the drug to that patient, the system would send out an alert to the person prescribing the drug, and prevent the drug from being issued by the pharmacy. If a patient is referred to another doctor, say a specialist or general practitioner, the patient's clinical records will all be available to the second doctor. In Sri Lanka, such systems are still rudimentary, being used by a few individuals or hospitals.

EHR systems clearly have benefits, however whether they actually improve the quality of healthcare is still a matter of some debate, and few large scale studies are available on the subject. Delivering quality health care requires providers and patients to integrate complex information from many different sources. Thus, increasing the ability of physicians, nurses, clinical technicians, and others to readily access and use the right information about their patients should improve care. The ability for patients to obtain information to better manage their condition and to communicate with the health system could also improve the efficiency and quality of care.

While the advantages of EHR systems are obvious, there are certain important issues that warrant consideration. The availability of patient information, which is confidential, on a wide network, brings up the issue of confidentiality. This is usually ensured by



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permitting only authorized persons to access, modify or enter data. Different levels of access are usually granted – for example, some individuals, will like the main physician treating the patient, to have permissions to create new patient records, enter new data, modify existing data, and of course view all data regarding the patient. On the other hand, an administrative

officer in the hospital may only be permitted to access or modify data with regards to scheduling of clinic visits and investigations etc. A pharmacist may have permissions to access only information regarding allergies and appropriateness of the drugs prescribed to the patient, and so on. This kind of system prevents unauthorized persons from accessing potentially confidential information.

There are several obstacles to the implementation of EHR systems, and the most important one is cost. An EHR requires a considerable initial investment in terms of computer hardware; servers, networks, and workstations, which are necessary for the system. In addition, good quality EHR software is hard to come by, and is very expensive. Each system will also have to be adapted and modified to the needs of the system in that country, and such modifications to existing systems are

also very expensive. In addition, trained staff are also required to operate and maintain such systems. High cost has been one of the main obstacles to the implementation of EHR systems, particularly in developing countries. Both the private and public sectors have been engaged in numerous efforts to promote the use of ICT within health care institutions, and across care delivery settings. Activities include developing and promoting industry-wide standards, funding research to investigate the impact of ICT on quality, providing incentives that encourage investment in ICT, and giving grants to those investing in ICT. In a developing country such as Sri Lanka, it is likely that private sector providers will identify the potential place for developing EHR systems, with mutual benefit to themselves and the healthcare system.

### **Picture archiving and communications systems (PACS)**

This is an ICT based technology which captures and integrates diagnostic and radiological images from various devices (e.g., x-ray, MRI, computed tomography scan), stores them, and disseminates them to a medical record, a clinical data repository, or other points of care, where they can be viewed by the clinicians treating the patient. Such systems are widely used in developed countries. One of the biggest advantages of such systems is that previous images can be stored on the system for future access. This is thus a far superior system to conventional methods of storing the hard copies of these images, which could easily get lost or degrade with time.

### **Decision support systems**

Decision support systems are being increasingly used in healthcare. These systems provide physicians and nurses with real-time recommendations with regards to diagnosis and treatment of their patients. The term decision support systems cover a variety of technologies. The simplest systems are alert systems which alert the clinician regarding newly available investigation results, and systems which alert the clinician about possible drugs or therapies which might not be appropriate to the patient. More sophisticated systems analyze a wide range of patient information, and offer diagnostic or

therapeutic solutions to the clinician. Simple systems use simple algorithms, while more advanced computer technology is used for the more advanced systems. Two basic principles are used in sophisticated decision support systems, namely; expert systems, and neural networks. In an expert system, a computer program is fed with a detailed complex algorithm, which accounts for all possible permutations and combinations of clinical data; in simple terms, the system is 'taught' to become an 'expert'. In a given case-scenario, the system then uses this expert knowledge to synthesize a decision. Neural networks are slightly different - a learning system is fed with large amounts of actual data from clinical situations, and the systems 'learns', based on a system of pattern recognition and input-outcome association.

Newer systems use both these methods. True complex decision support systems are akin to artificial intelligence systems, and are still in the rudimentary stage.

### **Healthcare management systems**

Healthcare management systems are slightly different

– they are basically similar to management information systems used in other sectors or institutions. They are used for financial management, staffing issues, scheduling of appointments for investigations and clinical consultations etc. They are also used for determining requirements of consumables and other equipment etc. Most hospitals, even in Sri Lanka, use such systems to a varying degree, especially in the private sector. Since inevitably such systems help in streamlining the accounting system, they are more easily adopted by administrators, in comparison to patient care related systems which only have an indirect effect on profit making. An example of such a system in Sri Lanka is the e-channeling system, whereby patients could make appointments with consultants through the web, through a mobile phone, or from a local centre.

### **Telemedicine**

Telemedicine is a rapidly developing application of clinical medicine where medical information is transferred through the phone or the Internet and sometimes other networks for the purpose of consulting, and sometimes remote medical procedures or examinations. The

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simplest form of Telemedicine is where two health professionals discuss a case over the phone or by email. The more advanced systems are far more complex, and enable the patient to consult an expert who is far away, possibly in another country, live in real time. This usually requires a high-speed internet connection with video conferencing facilities. The clinician could discuss the patient's problems with the patient and the local treating team. Investigation reports and images (x-rays, ECGs, CT scan images, ultrasonographic images) are transmitted in real time to the expert. Sometimes, peripheral devices can be attached to the system which allow the remote clinician to look into the patient through an endoscope, or listen to the patient's heartbeat through a stethoscope. Most often, for such systems, a telemedicine centre is required. The patient, and possibly the local doctor, would come to the telemedicine centre, and the tele-consultation takes place in real time. The main advantage of telemedicine is to provide expert clinical opinions on clinical care to any part of the world. Another experimental extension of telemedicine is remote robotic surgery. Here a surgeon operates a robotic device by which he could operate on a patient thousands of miles away.

### ICT in medical education

ICT plays a large role in medical education; both in undergraduate and postgraduate training programs, as well as in continuous medical education for practicing doctors. Many universities have established learning management systems, creating virtual learning environments for teaching medicine. This is known as e-learning. e-Learning is best delivered through a Virtual Learning Environment (VLE). A VLE is a computer-based software system designed to support teaching and learning in an educational setting, i.e. school and university. A VLE provides a wide collection of tools such as those for interactive learning, assessment, communication, uploading of content, return of students' work, peer assessment, administration of student groups, collecting and organizing student grades, questionnaires, tracking



tools, etc. Originally created for distance education, VLEs are now used most often to supplement face-to-face teaching. VLEs allow instructors/teachers and learners/students to interact in an online community, without being present in the same physical location or time frame. The core of a VLE is a Learning Management System (LMS), which is a collective term used to describe a set of well configured, regularly monitored and centrally managed software tools designed to handle user learning interventions. In Sri Lanka, such VLEs have already been established. The Faculty of Medicine, University of Colombo has a Virtual Learning Environment for teaching and learning medicine, with online lectures and a large resource of educational material. Similar systems are available in other universities.



Practicing clinicians also use IT in their continuous medical education, and also in accessing the latest information regarding patient care. The internet provides a huge database of medical information, and with the increasing availability of internet access, the modern day clinician is always in touch with the wealth of medical knowledge

available. Clinicians frequently search the internet to find out the best possible care for their patients. Many clinicians, even in Sri Lanka, use palm-top devices and smartphones to search the internet for information while engaging in their practice. Access to medical information was never so easy.

### Patient information

The amount of information available to patients through the internet regarding diseases, preventive health, and access to health care is enormous. While no doubt this information is of immense value, care must be taken to evaluate which information is valid and accurate, and which information is not. Obviously, information put up by reliable sites (reputed universities or hospitals, medical associations) is likely to be valid and accurate. In particular in Sri Lanka, the internet can be used to provide health education to the people.

### Conclusion

ICT plays a large and important role in healthcare. In the developed world, IT is used widely in healthcare, although in Sri Lanka its use is still not adequate. The high cost of ICT based solutions, and the reluctance on the part of providers to invest in a market which is more service based than profit based, is one of the reasons for health informatics to have not evolved in Sri Lanka. There is no doubt that health information technology will improve healthcare. The Postgraduate Institute of Medicine of the University of Colombo has just commenced an MSc in Bio-informatics for medical graduates, with the intention of training doctors in health informatics. Sri Lanka also has a Health Informatics Society (HISSL - <http://www.hissl.org/>). These measures will serve to enhance the involvement of ICT in healthcare in Sri Lanka.



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## VIDUMANPETHA

### Sri Lankan Science Website!

Today, in this electronic era, internet (web) is one of the most important resource which we can grasp knowledge. Scientific knowledge and information in the Web is available in English and other foreign languages. Therefore, the people who can only understand these languages have the opportunity to take the advantage from this web based knowledge. Unfortunately, due to the language barrier, most of the Sinhala speaking people are not in a position to benefit from this enormous knowledge.

To share the scientific know-how with Sri Lankans, Institute of Fundamental Studies has developed a Sinhala Science web site named as "Vidu Mang Petha". [www.vidu.ifs.ac.lk](http://www.vidu.ifs.ac.lk) is the address of our web site. On line/downloadable English-Sinhala Science Glossaries, On line/downloadable Dictionaries, E-booklets in Science, methods to build a home laboratory, Chemistry games, Science experiments for kids, information on Terminal illnesses and giving hope for patients/ providing information about new treatment methods are included in it.

Though we are sharing the scientific know-how with Sinhala speaking people at present we are in the process of making the Tamil translation of this web.

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