ROLE OF INFORMATION TECHNOLOGY IN MEDICAL SCIENCE.

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Annotation: Information technology (IT) is the application of computers and telecommunications equipment to store, retrieve, transmit and manipulate data, often in the context of a business or other enterprise. Today information technology is used in wide range of fields and one of the upcoming fields is of Medical Science, which is known as Health Information Technology (HIT).

Key words: HIT, IT, CPU, communication technology, CAL, VR

No-one can deny that information technology (IT) is changing the way that medicine is practised. The fact that you are actually reading this editorial is clear evidence of it. This journal would probably not be in existence if it weren't for the availability of effective and affordable IT.

Most of the early applications of IT were geared towards number crunching. The heart of any computer is the central processing unit (CPU) where arithmetic and logic operations are carried out. In the early days of computing, emphasis was on pure processing power for mathematical and statistical purposes, and at this time the impact on medicine was minimal. Things changed however when the focus of attention shifted to the relationship between the human and the computer and the ways in which a human can become more productive and information-efficient with the help of IT. There followed a systematic analysis of human tasks and activities and an attempt to improve these by means of computer applications. Medicine then became fertile ground for development, and the concepts of expert systems in medicine emerged, with systems for computer-aided history-taking and diagnosis. In the long run, however, it was the more mundane IT applications such as word-processing and database management systems that penetrated the everyday practice of the working clinician, and even more the world of health services management. The first sectors of hospital activity that benefitted tangibly from IT were patient administration, laboratories and accounts – not surprising, considering the large volumes of numeric data that these sectors handle. At the same time, clinical activities involving calculations were greatly facilitated – the days of nomograms were numbered.

The next significant development was the convergence of information and communication technologies. This led to a veritable boom in networking both within and between organizations. The first major effect of this, in the early 90's, was the evolution of data sharing concepts and the emergence of integrated information systems. Hospital information systems developed and started to take rich data (sounds, images, movies) on board. The acquisition, storage and transmission of medical data, especially from medical instrumentation, became

increasingly digital, rendering the total electronic health record feasible. The second major effect of networking, in the mid 90's, was the explosive growth of the Internet.

It became feasible to move data and information quickly and cost-effectively between any two networked PC's on the planet. This increased the potential for the communication of medical information among health professionals and patients immeasurably. The full impact of the Internet on medical practice has still to emerge.

There is no sign of slowing down in the rate of development and proliferation of information and communication technologies. In the next ten years we can expect more sophisticated human-computer interfaces with efficient voice and handwriting recognition; the penetration of techniques such as tele-surgery into mainstream clinical practice; sophisticated undergraduate and postgraduate computer-based training; and better structuring and portability of integrated electronic health records. The challenge for health professionals is to harness the new power at their disposal for the benefit of their patients.

Health information technology (HIT) is the application of information processing involving both computer hardware and software that deals with the storage, retrieval, sharing, and use of health care information, data, and knowledge for communication and decision making. HIT, technology represents computers and communications attributes that can be networked to build systems for moving health information. Let's have a brief glimpse at the background of the information technology in medicine.

Worldwide use of computer technology in medicine began in the early 1950s with the rise of the computers. In 1949, Gustav Wagner established the first professional organization for health informatics in Germany. Health informatics also called Health Information Systems is a discipline at the intersection of information science, computer science, and health care. It concerns with the resources, devices, and methods required for optimizing the acquisition, storage, retrieval, and use of information in health and biomedicine.

Health informatics tools include computers, clinical guidelines, formal medical terminologies, and information and communication sytems. It is applied to the areas of nursing, clinical care, dentistry, pharmacy, public health, occupational therapy, and (bio)medical research.

Specialized university departments and Informatics training programs began during the 1960s in France, Germany, Belgium and The Netherlands. Medical informatics research units began to appear during the 1970s in Poland and in the U.S. Since then the development of high-quality health informatics research, education and infrastructure has been a goal of the U.S., European Union and many developing economies.

Use of IT in Medical Education. With the development in IT, there has been a significant change in medical education all over the world. The changes is that majority of the medical students are computer literate these days. New information on medical topics is readily accessible via the Internet and handheld computers such as palmtops, personal digital assistants (PDA). Information Technology can assist medical education in various ways such as in college networks and internet. Computer-assisted learning (CAL), Virtual reality (VR), Human patient simulators are some options. With the help of college networks and Internet, the medical students as well as the teachers may stay in contact even when they are off college. Rapid communication can be established with the help of e-mails and course details, handouts, and feedbacks can be circulated easily. Many medical schools these days use online programs such as "Blackboard" or "student central" to underline and coordinate their courses. Such programs allow speedy access to information and quick turnaround of evaluation and

messaging, and allow all tutors, assessors, and students at any site to look at the curricular context of their own particular contribution. Similarly, the Internet provides opportunities to gain up-to-date information on different aspects of health and disease and to discuss with colleagues in different continents via net conferencing. Free access to Medline, various medical journals, online textbooks and the latest information on new development in medicine also encourages learning and research.

CAL is considered as an enjoyable medium of learning and very suitable for conceptually difficult topics. Interactive digital materials for study of histopathology, anatomy and heart sounds are used widely.

Development of anatomical three dimensional atlases of various internal organs using computed tomography and magnetic resonance imaging are very illustrative and help the students to understand the subject matter clearly.

Another development is of "Advanced Life Support" (ACLS) simulators and Haptics "the science of touch" simulators are used in medical education to develop various clinical skills such as ECG interpretation, appropriate intervention such as ABC, drugs, injections, defibrillation without working on a real patient. These days, highly sophisticated simulators "virtual reality" with highly advanced medical simulation technologies and medical databases are available in the advanced medical schools that expose the medical students to the vast range of complex medical situations. It can emulate various clinical procedures such as catheterization, laparoscopy, bronchoscopy etc. With new technology, the students can virtually go inside each and every organ and see how they actually look like from outside as well as from inside.

Information technology has been very helpful to the healthcare sector. One example of a significant advancement that IT has provided to hospitals is the development of electronic medical records (EMR). This technology can convert medical information into a single database. Not only does this technology reduce paper costs, it allows healthcare providers to access pertinent patient information such as medical history, medications, insurance information, etc with just the click of a mouse.

EMRs hold great promise in the clinical arena. The ability to care for patients with a record that is integrated with laboratory and pharmacy information, and provides point of service information regarding preventive services, diagnosis, treatment, and follow up represents a dramatic advance in patient care. Improving and measuring quality would be instantly improved if all clinicians used EMRs. For example, it would be easy to prompt clinicians that their patient with diabetes needs an eye examination or a hemoglobin A1C level.

Drug prescribing patterns of individual clinicians could be carefully evaluated and compared to established standards. In fact, computer based clinical support as part of an EMR has been shown to improve physician performance and patient outcomes.

Reducing medical errors has become a priority all over the world. Specifically adverse drug events are an important source of injuries in hospitalised patients. In response to the need to improve patient safety, computerised physician order entry (CPOE) systems have become increasingly more common. In general, CPOE systems force physicians to write all orders online. These systems have the capacity to verify that written orders are correct, that is, based on a patient profile, they can automatically check the dose and contraindications of a specific drug. They have been shown to dramatically reduce serious medication errors.

Computerized provider order entry (CPOE), formerly called Computer physician order entry, can reduce total medication error rates by 80%, and adverse (serious with harm to patient) errors by 55%. A 2004 survey by Leapfrog found that 16% of US clinics, hospitals and medical practices are expected to be utilizing CPOE within 2 years. Recent study says that CPOE adoption reduced drug errors and concluded that CPOE could substantially reduce the annual number of those errors if widely implemented. In addition to electronic prescribing, a standardized bar code system for dispensing drugs could prevent a quarter of drug errors. Consumer information about the risks of the drugs and improved drug packaging (clear labels, avoiding similar drug names and dosage reminders) are other error-proofing measures.

There is no argument over the influence of IT in medicine and education. But there are still many areas which need to be improved before we could utilise IT to its full extent. Last but not the least, however advanced the technology gets, it can never replace the interaction the doctors and students require with the patient and the clinical judgments which make great doctors. So, in the pursuit of modern technologies, we should be careful that the doctor patient relationships do not get overlooked

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