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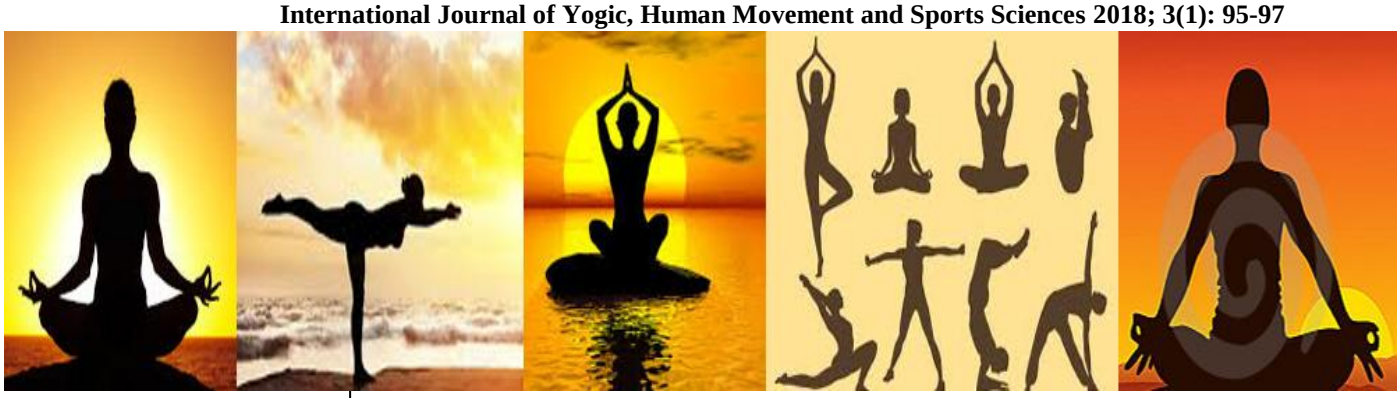

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The role of information and communication technology, (ICT) in health in modern time

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Abstract
Information and communication technologies (ICT) are being widely used in healthcare management systems. Rapid advancements in ICT in the last decade or so provide solutions to the problems in healthcare management systems. These include a wide spectrum of issues such as patient safety, dietary management, telemedicine, digital imaging, document management etc. This paper explores the emerging technologies which are being used for the improvement of the healthcare process and identify the problems and their probable solutions. Telemedicine offers a way of improving the standard of healthcare especially in the developing world. This paper highlights the growth of ICT sector in the developing world and explores its possible uses in health sector. These may help healthcare professionals and community health workers to carry out their work in a better way particularly in remote areas.

Keywords: Information and communication technology (ICT), telemedicine, healthcare, healthcare management systems

Introduction
As an effect of the ageing of the population in general, the number of citizens with chronic diseases is increasing, especially among elderly people throughout the world. This is a great challenge for both the well-being of the citizens and the public health care systems. Health care solutions provided by information and communication technology (ICT), also known as e-Health, offer one solution to this problem. The tools and services which contribute to e-Health provide better and more efficient health care services for all. Healthcare management is the intersection of information science, computer science, information technology and healthcare. It deals with the resources, devices, and methods required in optimizing the acquisition, storage, retrieval, and use of information in health and biomedicine. This includes not only computers but also clinical guidelines, formal medical terminologies, and information and communication systems. Research and development efforts within the healthcare industry and the rapid advancement in ICT over the last two decades have brought about significant advances in the quality of medical services to the patients. Developed countries are spending a lot of resources for the improvement of the healthcare systems and their integration with information technology. The definition of healthcare system has changed due to the advancement in ICT. Quick and fast access to the medical data is available to all the stakeholders through internet and the developing countries may take advantage of it. Having said that, there is a financial constraint as well and most of the developing nations are not in a position to spend huge amount on healthcare projects. Technology transfer and capacity building in healthcare systems is required in the developing countries. Apart from financial constraints the other important thing is the reforms in healthcare policy and a social change which is more difficult to overcome as compared to financial crisis.

Information & communication technologies growth

ICTs have proven to be a tremendous accelerator of economic and social progress. The speed at which ICTs are diffusing has taken many observers by surprise. Interestingly, the developing countries are ahead of the developed ones in the mobile telephone subscriptions. They account for two thirds of all subscriptions, corresponding to a mobile penetration rate just short of fifty. This surge in the usage of mobile phones, internet and related technologies in modern times can be very effectively used to provide health services at low cost.

The penetration can also help in provisioning of health care services in remote rural areas where, otherwise, health care facilities are patchy.

Emerging technologies

Telemedicine

Recently lot of stress is being made on the field of telemedicine which is a merger of advanced telecommunication and computer technologies. Telemedicine is the use of information and communication technologies to provide and support healthcare services at distant locations. Telemedicine can give a new model for interaction with the patients or other important entities such as hospitals, pharmacies, physicians and governmental agencies. On the other side very advanced telemedicine technologies are on the way such as Telesurgery where robotic instruments will perform the surgery on the basis of the audio and visual data received by the surgeon present at a remote or a distant location where there it is impossible to move a patient immediately. Another important technology is the use of video conferencing, allow clinicians/surgeons and physicians to interact with a distant patients due to time factor in a real time and give his/her expert advice and even interact with the patient. The video conferencing also help the physician to interact with different experts at the same time and make a decision. The modern technology provide the ways to not only store digital images such as MRI, X-Rays and Radiographs but to transmit them effectively and efficiently using tele-radiology to the consultants which saves precious time and without any significant loss of data.

E-health

E-Health technologies empower patients to take more responsibility for their own health and quality of life, and they lead to better cost-efficiency in the health sector. The use of eHealth technologies allows a mutually beneficial collaboration and involvement of patients and medical professionals in the prevention and treatment of chronic diseases. Overall, ICT can be used to ensure the top-quality health care of citizens. Although basic e-Health technology is widely available on the market, the absorption of new knowledge and acceptance to use ICT in health care is varying remarkably among citizens and medical professionals. The wider use of ICT in healthcare is a basic condition for the development, implementation and further generation of innovative health care technologies. Advancements in information and communication technologies have paved way for provision of cost-effective e-services to the people around the globe. The combination of such wireless technologies with e-health is known as m-health. In general terms, m- health can be defined as mobile computing, medical sensor, and communications technologies for healthcare. The applications include the use of cell phones and other communication devices to gather health data, delivery of healthcare information to doctors, researchers, and patients. It also includes real-time and direct provision of health services. It can help improve clinical outcomes, and contribute to better public health monitoring and education. This system will be very handy in locations where there is a dearth of healthcare facilities and infrastructure. The availability of ICT infrastructure will be used to get medical advice from health professionals at remote location through the support centers working round the clock. Several platforms have been proposed to provide easy to use and cost effective solutions for seamless remote patient doctor interaction over a cellular network. M-Health systems are created as a synergy of emerging mobile medical computing, medical sensor technologies, and communication technologies.

Bar code technology and radio-frequency identification

Barcode technology in healthcare management has involved applications at the point of care. Bar code technology specifically in health management improves the security, safety and quality of healthcare. The right treatment is not the only issue but to make sure that the right treatment is given to right patient at right time. It prevents from potential errors in identifying or validating a patient. Barcode technology verifies the patient and treatment information by using a decision support system. Similarly, Radio-frequency identification tracks patients throughout the hospital, and links lab and medication tracking through a wireless communications system. The technology, once common may serve as an alternative to bar coding. RFID is the use of an object (typically referred to as an RFID tag) applied to or incorporated into a product, animal, or person for the purpose of identification and tracking using radio waves. Some tags can be read from several meters away and beyond the line of sight of the reader. The technology wirelessly transmits a unique serial number with the use of radio waves and signal transponders.

Clinical decision support system

Clinical Decision Support System (CDSS) provides doctors, nurses and other paramedical staff with real-time diagnostic of the patients as well as treatment recommendations. Such systems have built in inference engines (Expert System) that a medical knowledge base and patient data to generate medical advice. As data models have incorporated more semantics to interact with CDSS a temporal dimension has evolved.

Picture archiving and communication system

A picture archiving and communication system (PACS) is an electronic and ideally filmless information system for acquiring, sorting, transporting, storing, and electronically displaying medical images. This technology captures and integrates diagnostic and radiological images from various devices (e.g., xray, MRI, computed tomography scan), stores them, and disseminates them to a medical record, a clinical data repository, or other points of care.

Key requirements for improving healthcare services

Information access to doctors, patients, researchers, healthcare professionals and others to get desired changes in behaviors and outcomes of all the stakeholders. Design less expensive, robust and more realistic methods of testing the effectiveness of alternative clinical practices. Construct better measures of healthcare outcomes, delivery system characteristics, and other variables that may affect outcomes. There is a considerable need to devise quantitative and statistical tools that provide vigorous and correct analysis of data. Electronic patient database must be developed which provides an easy and quick access to large databases and data can be easily accessed and transmitted through communication medium. Decision support systems are required to facilitate the physicians and doctors in decision making.

Conclusion and recommendations

Telemedicine and e-Health offers a way for improving of the standard of healthcare particularly in the modern world. The developing countries such as India, where large portion of population has access to ICT can exploit these to give better healthcare services and education. India has a very good human resource in IT and medicine which is working in India and abroad especially in developed countries such as England and in North-America. Government and private sector should work together to take advantage of such a viable human resource to come up with the solutions of the problems in healthcare management in our country. Healthcare systems present great opportunities for improvement by providing better, reliable and secure services to the patients, physicians, staff and other stake holders within the boundaries of a hospital and also to distant patients where no physical healthcare infrastructure is available. Pakistan has a potential to take lead in healthcare management but it is only possible if the policy makers, decision makers and all stake holders sit together and lay down the steps and guidelines for an effective healthcare policy. It is very important to identify strategic objectives and the desired short term and long term goal before start spending on healthcare projects.

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