Healthcare Trends in the Changing Paradigms of Information Technology

Aashish Bhardwaj[1], Vikas Kumar[2]

[1]Mewar University, Chittorgarh-312901, Rajasthan, India

[2] School of Business Studies, Sharda University, Greater Noida, India

ABSTRACT

Healthcare is an important and has a continuous focus on human society. All the governments, organizations and individuals are investing a lot of their earnings on healthcare around the globe. This paper aims to find different trends of healthcare in the changing paradigms of Information Technology. These trends include Electronic Medical Records, Laboratory information System, Pharmacy Information System and Picture Archiving and Communication Systems. Also, finds the usage of cloud computing in improving healthcare of individuals by involvement of consumers, healthcare regulations, digitization and preventive healthcare. Paper finds use of Electronic Healthcare Records in record keeping of patient's data and its benefits. Also, finds a difference of mHealth and eHealth to individuals.

1. INTRODUCTION

In Healthcare sector patient's data is very valuable and needs to be protected. Data has to be protected from third parties such as insurance agencies, agencies outside the country and social networking. Also the rights of patients are important and consent has to be taken before collecting the data from them. A professional secrecy to be maintained while the patient data is processed by healthcare services, medical diagnosis, hospitality care, treatment or occupational medicines. Individuals should have the right to access their own health records and at the time of discharge, get these deleted from hospital records after completing the treatment. This chapter aims to find the existing system of privacy protection and the actual practices in government hospitals, private hospitals and diagnostic laboratories Also, formulates a comprehensive map for the synthesis, structure and implementation of privacy in the healthcare. It finds the provisions of law which facilitates the protection of individual's genetic and personal information. This information is collected by institutions of health care for the purpose of treatment or research. Also, finds the different International practices of privacy protection in countries like Australia, United States of America and European Union. Healthcare of individuals is very important hence the healthcare data needs to be managed very professionally. These requirements have become more stringent with the population aging and the growing attention to healthcare by the people.

Every person in the world is spending a huge amount of its earning on healthcare services. Taking into consideration this, worldwide governments and organizations are working hard to improve the performances, health quality and safety of their citizens or employees. WHO (World Health Organization) has surveyed that total global expenditure for health is US$ 6.5 trillion in year 2012 on different healthcare product [1]. Other main points of the survey are shown in Table 1.

Table 1: Expenditure on Health in various parts of the world

S. No.	Expenditure	Country	US$
1	Total expenditure on health per person per year	Whole World	948
2	Country with highest total expenditure per person per year on health	United States	8362
3	Country with lowest total expenditure per person per year on health	Eritrea	12
4	Country with highest government expenditure per person per year on health	Myanmar	2
5	Country with highest personal expenditure per person per year on health	Switzerland	2412
6	Country with lowest annual personal expenditure per person per year on health	Kiribati	0.02

Occams Business Research & Consulting [2] has forecasted healthcare market using cloud computing for years 2016 – 2022. They have surveyed market shares and opportunities of four different sectors related to health. These sectors are EMR (Electronic Medical Records), LIS (Laboratory Information Systems), PIS (Pharmacy Information Systems) and PACS (Picture Archiving and Communication Systems). To provide a better way for managing and organizing health related data and improve patient's recovery all sectors of health are investing in cloud computing [3]. The survey done by Occams Business Research & Consulting [2] has found following details mentioned in Table 2.

Table 2: Cloud Market overview of different healthcare sectors

S. No	Healthcare Sector	Investment up to 2020 (in Billions)
1	EMR (Electronic Medical Records)	$5.4
2	LIS (Laboratory information Systems)	$2.7
3	PIS (Pharmacy Information Systems	$2.2
4	PACS (Picture Archiving and Communication Systems)	$2.8

2. HEATHCARE MARKETS AND MARKET DRIVERS

Healthcare has been an important and continuous focus of the human society. Demographic trends across the globe will converge at the end of 21st century with the declining births, stabilization in population size, and aging populations [4]. As a result of these aging populations and consumer's interest in wellness, demand for the healthcare products will continue to rise. In this scenario, role of Information Technology (IT) becomes important for the online medical services as it helps to reduce infrastructure costs, simplify access of patients to doctors and hospitals and reduces waiting time for both doctors and patients. IT helps people in remote locations to have easy appointments with doctors, facilitates remote examination and treatment, improves communication for expert consultation and supports the electronic health record sharing. Bates et al. [5] have shown that after automation, physician order entry with decision support can reduce the errors by 55%. There have been many efforts for adopting IT in healthcare services as Electronic Medical records have a potential of improving return on investments [6], [7].

Healthcare services are having an unpredictable demand for infrastructure, number of users and storage. For example, in case of epidemic conditions or change of clinical guidelines, the demand of doctors, healthcare providers and entries in databases increase to a much higher number as compared to the normal days. In such conditions, there may also be a demand for setting up camp offices in different locations. These requirements are fully met by cloud computing models as they provide features of easy deployment, on-demand storage and on-demand user registration. Cloud computing provides a quick deployment feature with flexibility in maintenance [8]. This is the reason cloud computing is a playing a prominent role in healthcare sector and is expected to accelerate in future also [9], [10]. As per the Association of American Medical Colleges (2016), there will be a big shortfall of Physicians by 2025 in all the sectors, including primary-care and non-primary care. On the other hand, demand will increase by 11-17% for healthcare resources. Association of American Medical Colleges has identified cloud computing as a driving force for healthcare sectors. Cloud Computing is providing a notable improvement for pervasive healthcare [11], [12]. It is empowering doctors not only in urban areas but also in rural areas in secure and flexible ways [13] and [14]. Main advantages are mentioned as:

- **Involvement of Consumers:**

There is a change in focus of healthcare services to value-based instead of volume-based. Consumers will play an important role in decision making for healthcare treatments and coverage. New products in market are also driving the consumers which includes applications on smart phones, wearable gadgets etc. These are used to track exercise records, intake of diets, blood pressure, sugar levels etc. There is also an option to review doctor reports and care facilities. Cloud Computing helps consumers to use best healthcare services among a wide range of available providers.

- **Healthcare regulations:**

They have driven a faster growth in mobile health than in clinical health. This makes it necessary to adopt cloud computing models as they are architect and developed for rapidly changing environments and enabling regulations. Healthcare sector includes requirements for security, privacy, preservation for long time and other stringent requirements. These can be addressed fully by cloud computing models as the providers have capability to incorporate these ever changing requirements in the design of cloud. Example of these is cloud ESB (Enterprise Service Bus) and EHR (Electronic Health Record).

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- **Digitization:**

Information Technology enables consumers to take control of their healthcare parameters. It has been found that with changing regulations on healthcare, IT has to be modernized with cloud computing at the center. Cloud computing provides leverages computing facilities to hospitals, insurance companies, research institutes etc. Consumers are increasingly using healthcare devices to health data on day to day basis. This large amount of data is used for decision making by doctors, insurance companies etc which has evolved a new informed healthcare consumers.

- **Preventive Healthcare:**

Information Technology has decentralized healthcare delivery by providing a wider choice of hospitals, laboratories and Institutions. Standards and procedures for healthcare keep on changing specially in clinical care, pathology and treatment practices. Cloud computing provides a location and time independent approach, which is real time cognitive and consistent. There could be a positive transformation in medical practice and healthcare delivery by using IT enabled applications. These includes iBPMS (intelligent business process management suites), ESB (enterprise service bus) etc.

These healthcare market changing trends will result in replacing traditional healthcare mechanisms with digital options, digitization of healthcare industry, changing role of healthcare actors, employing data integration and comparative analysis, improvement in medical sciences and establishment of new business models for better efficiency.

3. ELECTRONIC HEALTH RECORDS (EHR)

EHR is an electronic data related to health of patient and population which can be shared across different platforms [15]. As per [16] millions of patients die in hospitals throughout globe due to poor record-keeping of atient's data. Patient's data related to their blood sugar levels, blood pressure, allergy with certain substances etc are not properly maintained and this leads to innocent mistakes during hospitalization. This way bad records of patients leads to even deaths and not negligence or bad luck. Stanberry [16] has listed many benefits of using Electronic health Records (EHRs) of patients which are accessible worldwide. Different benefits of Electronic Health Record (EHRs) [17] are:

- **Cost Reduction:** It is observed that EHRs would save around US$20 billion per year in public sector and US$30 billion per year in private sector [16]. This will increase the use of resources for relevant purposes in the healthcare. Cost reduction in healthcare will boost patient's health.
- **Record Portability:** A patient may be transferred from within a nation or anywhere in the world. With the use of EHRs patient's records are portable and can be transferred globally anywhere for their help. This provides a good background for new health worker to care for the patient.
- **Improved Quality of Care:** EHRs provides an improved quality of care by storing medical and diagnostic treatment records. This provides a fast access to medical best practices done by experts at present and current literature for reference. This reduces medical errors and provides improved safety for patients.
- **Malpractice Exposure:** The Institute of Medicine has identified different sources of waste which include missed prevention opportunity, frauds, high prices, inefficient deliveries, administrative costs and unnecessary services. Among all these losses unnecessary services has a highest loss of US$ 210 billion which leads to malpractices in medical services. Implementation of EHRs will reduce the vulnerability to malpractices.
- **Record Keeping:** EHRs systems have the flexibility to connect other medical records for reference purpose. This helps patients to fix appointments and track down records easily while they are changing doctors or hospitals or changing locations like cities or even countries.

4. mHEALTH AND eHEALTH

mHealth is term associated with taking care of patient's health and population through use of mobile phones, smart watches, other wearable products, etc. This a sub term associated with eHealth which is taking care of patient's health by use of Information and Communication Technologies (ICT) like computers, internet, satellites etc [18]. They are used for many health related activities like call centers, toll-free emergency, telemedicine, appointments, surveys, awareness campaigns, survelliance, clinical decisions etc.

In the present era mHealth is acting as an extension to eHealth because of the ease of usage and availability of mobile phones than computers and laptops [10]. mHealth applications are equipped inherently with connections which supports data, video and voice communications. This provides a real and correct condition of the patient's health to physicians. Also, helps doctors by providing decision support systems. mHealth is increasing becoming the primary source of information for patients and their relatives. It is used for tracking health related data in real time. Monitoring

of medication by suggested by doctors can also be checked by use of Internet of Things very quickly. Most the applications are also compliance with national health acts laid by different countries.

5. CONCLUSIONS

The paper has found important trends of healthcare in the changing paradigms of IT. It has found that a huge amount of an individual's hard money is spent on healthcare throughout world. Government and corporate are also investing the same in handsome manner on healthcare. The latest trends include opportunities in Electronic Medical Records, Laboratory information System, Pharmacy Information System and Picture Archiving and Communication Systems. Use of cloud computing helps to reduce IT costs, provides security, feature like pay-as-per-usage reduces many overheads. Electronic Health Record helps in record keeping and providing access of records throughout world with availability at all times. A difference between mHealth and eHealth are also found in the paper.

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Aashish Bhardwaj received his Master of Science in Electronics from Kurukshetra University, Haryana, India and further Masters in Technology in Computer Science and Engineering from the same University. He is a member of Indian National Science Congress Association, Indian Society for Technical Education, Institute of Electronics& Telecommunication Engineers and Computer Society of India and has contributed many research papers to reputed journals and conferences. Presently, he is working for PhD degree in Computer Science & Engineering from Mewar University, Chittorgarh, India.

Vikas Kumar received M.Sc. in Electronics from Kurukshetra University, Haryana, India. This was followed by M.Sc. in Computer Science and further Ph. D. from the same university. His Ph.D. work was in collaboration with CEERI, Pilani and he has worked in a number of ISRO sponsored projects. Dr. Kumar has designed and conducted number of training programs for the corporate sector and has served as a trainer for a number of Government of India departments. Along with six books, he has more than 100 research papers to his credit in various national and international conferences and journals. He was the Editor of International Quarterly Refereed Journal "Asia-Pacific Business Review" during June 2007-June 2009. He is a regular reviewer for a number of international journals and prestigious conferences. Presently, He is a Professor at the Sharda University, Greater Noida and a visiting Professor at the Indian Institute of Management, Indore.