

Role of IT and IOT in Healthcare System

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Abstract- Medical science is a central pillar to all aspects of life of people contributing a very important ingredient of improved health and wellness. At the same time Information Technology comes up to aid Medical Science, from saving paper in maintaining record to artificially intelligent IOT based robots performing surgeries, IOT supported pacemakers, and making highly efficient machine learning based software's predicting personalized drug combinations, procedures and diagnosis of diseases more accurately than actual doctors. A big heap of cases of patients and doctors stored on computers worldwide are considered merit of medical information technology which can be used later on for references and case studies. But a foreseen demerit is information technology itself; we do not know how deep this analysis of data should be carried out, how much detail should be enough for making predictions. Time and space complexities of algorithm are more relevant in medical science because here we are dealing with lives of living beings. Healthcare and information technology both are as vast as ocean, it has to go a long way to become a perfect combination.

Keywords- *IoT, Healthcare, Telemedicine, Quality*

I –INTRODUCTION

Medical Science works on observational principles and techniques for evolution of more advanced set of tools, medicines and procedures to help in healthcare facilities for living beings. Information technologies in medicine and healthcare are a complicated package of hardware, software, natural intelligence, and beware which includes all medical technologies.

Many developed countries are already investing in healthcare information technology. The aim which is foreseen for such big investment plans in medical science field is to achieve patient engagement, health management on a large scale, reducing healthcare costs,

remote treatment, intelligent systems helping medical decisions and a large virtual but secure backbone of interoperability and health informatics.

Now a days cloud technology is touching sky. Cloud technology is basically a storage buffer which is not on the same system but stored at some server and we can derive the data using internet any time. This technology is widely used in the field of internet of things. Internet of Things(IOT) if explained in layman terms is the technology which is widely responsible for automation and coordination of multiple devices or machines but commands can be carried out remotely since the instructions are stored on cloud and can be executed over internet. Healthcare is a very critical field to experiment therefore researches are focusing on accuracy with understanding of diseases, preventing and curing the disease and promotion of healthcare. Many big researches and experiments are under progress to make humanoid and robotic surgeons which can save a doctor's time to utilise for other patients providing better functionality to medical science. Advancing medical technologies and procedures generate a whole lot of data which should be analytically analyzed but that do need advanced tools which help to handle core of this data. New technologies like applied statistics and probabilities, machine learning and neural networks are capable of intelligently converting raw data into substance knowledge. Decision making techniques are also being incorporated to provide ideal guidance for the actions of human actors of healthcare.

Using information technologies and internet of things in healthcare improves overall functionality, efficiency, quality and safety which may provide:

- Improved digital healthcare systems.

- Check for medical errors and increase healthcare accuracy and procedural correctness.
- Reduction in healthcare costs.
- Deciphering large clinical data.
- Exchange of real time healthcare information among healthcare professionals all around the world.
- Optimisation of Electronic Healthcare Record (EHR).
- Expand in access of healthcare in remote places.
- Healthcare information and data security.
- Artificially intelligent clinical decision making support system.
- Large scale health management.

The research paper focuses on roles and use of information technology and science of internet of things in healthcare.

II- USES IN MEDICAL EDUCATION

Many advanced medical colleges are introducing their students to new technologies which can be helpful in their education as well as practice period. Medical Education has seen a revolutionary change in teaching and learning methodologies. Computers are widely used by students since the information is readily available via internet and personal devices. Information Technology is assisting medical students by making them digitally connected to the institution. Healthcare started using human patient simulators for practicing. Virtual reality and computer assisted learning are also popular options. Conceptually difficult topics can be easily understood from resources and speedy information available over internet and CAL(Computer Aided Learning) is considered a suitable and enjoyable medium for this.

III -USES IN HEALTHCARE DATA MAINTENANCE

In twenty first century healthcare is generating exabytes of data of patients, their illness, their treatments and doctors. This data can be highly useful to closely monitor the patient's health status with use of IOT implemented wearable healthcare devices. This data is also taken as reference for similar cases as well as research. Department of Health and Human Services is integrating the pool of data and reporting of patient safety . For medical professionals AHRQ has been working to feature user friendly data management system. Electronic Healthcare Record is designed to reduce errors in handling clinical data such as drug

prescription, preventive care, diagnosis and procedures. Advancement in technologies of capturing and sharing large amounts of in situ data easily and automatically. All information about assessments, actions, situations, comprehensions and all events related to patient and procedures, team of medical professionals, flow of activities and experiences are precisely recorded with the billing system included so that institution economics can also be kept in check. Optimisation of EHR is the main action that has been used to maintain large pool of data unlike twenty years back when handwritten clinical points and printing of reports were a major issue. Considering that the administrative and paperwork typically accounts for one-sixth of their work hours (often underpaid or not paid at all), the staff will definitely appreciate the streamlined efficiency, an EHR brings to the process. The majority of physicians have reported that their moral and job satisfaction has improved after the EHR adoption as they could now waste less time on routines and focus on delivering better healthcare and establish better patient-to-doctor relationships.

Various database management systems are there to help in storage, retrieval, backup and recovery of information. Nowadays cloud storage is also used for central storage among the institutions, states, countries and worldwide which provides easy access as distributed system approach is technically implemented. Data Redundancy which initially was a big issue now is be easily tackled using suitable software.

IV- IMPROVING HEALTHCARE QUALITY

Healthcare requires equal efforts by providers and consumers, thus, functional influences of information technology are a major merit to quality of services of Healthcare. On average, a patient interacts with 3 to 5 different healthcare specialists during a hospital visit. As a result, each member of doctor's team tends to have limited interactions with the patients and, hence, develop a somewhat incomplete view of them. As a result the team's overall view of the patient becomes clustered, with incomplete data and fragmented knowledge of the symptoms.

An EHR system in place can easily solve this problem as it offers the complete picture to anyone on the healthcare team in just one click. A custom-built system organizes the patient files and auto-updates it – meaning everyone is always up to date on the treatment, medication and planned visits. You can, for instance, set up notifications to alert respective providers when the

patient is at the hospital and proactively follow up. Fewer forms to fill means that a specialist can devote more time to the patient without transcribing everything they say. Patients won't need to go over again each time and explain their condition to a new clinician. The doctor will also have immediate access to the past records and will ask the right type of questions based on the earlier treatment a patient have received.

V- REDUCTION IN HEALTHCARE COSTS

The most obvious way to reduce cost is automation and hence less man hours and less human resource cost. Doctors spend less than one-third of their time on seeing patients and majority of their time is consumed in administrative tasks. Automation of desk task and administrative tasks can squeeze efficient time by just using EHR. Simply making app or website of health institution can save time and labor and at the same time patients are provided easy interaction interface. Healthcare has been reported with slower pace to cope with economics of supply chain management due to various cultural and regulatory obstacles. However new analytical technologies can be used for inventory management, waste management using RFID tags, whole life span of items can be easily monitored. Currently this is expensive and inefficient for small scales but at large scale and in more focused healthcare organizations, implementation of data analytics and automation tools makes management of entire supply chain much more useful and attainable.

VI -DATA SECURITY

Healthcare Data consist of a wide variety of important and confidential data which is prone to hackers and can be used for serious unethical issues like bio-terrorism. A biological attack means intentional release of viruses, bacteria, or other pathogens to kill or sicken living beings. Basic personal data can be gathered, and that can be used for spam, data mining, profiling. Financial data can be gathered using the record as it consists of details of your bank. If you have a medical insurance and opting for it at the hospitals, you have to provide your bank details. Any critical research information which can result in favor of human destruction has been secured from public which may include terrorist organisations or individuals, so cryptography plays a very important role here. In 2001, Anthrax biological attack was occurred which was detected by advanced monitoring systems in United States and hence preventive measures for bio-terrorism are taken all over the world since when would

next bio attack will take place is unforeseen.

Medical Confidentiality or Hippocratic Oath also prohibits disclosing information about patients case. This starts from as simple as securing network and goes to premium all rounder security services. Encryption of all or selective data can be very helpful in securing and sealing the confidential information. Information technology has various fields which are directly related to different types of data which has been generated in healthcare and hence managing and securing it in a virtual safe is all done with the help of different algorithms of Artificial intelligence.

VII -TELE-MEDICINE

Tele-medicine is part of IT that provides healthcare facilities in remote areas without medical professionals being physically present. Basically it makes it possible for physicians to treat patients whenever needed and wherever the patient is, by using a computer or smart phone.

Technically this facility is provided over internet using some computer or mobile devices which uses an online account and the doctor on the other side is there to accept or decline the requests of patients. Artificially Intelligent chatbots are used widely and it has been seen that these AI infused chat-bots are way more precise than doctors in diagnosis using the symptoms and the drug suggestions. This has saved a lot of time of patients and doctors as well. Many areas which lack doctors this tele-medicine technology actually a boon for them.

VIII- IoT

IoT usage in the healthcare industry is growing immensely, each medical device is used as IoT application to give the best result to the patients. The manufactures such as Medtronic, Cisco Systems, Honeywell Life Care Solutions, Stanley Healthcare are innovating IoT in all possible direction in the healthcare industry where it be the clinics or the hospitals or research centers especially in the regions such as North America, India, Europe, and Japan. Wearable healthcare devices have changed the treatment techniques and now with use of IoT, doctors are capable of monitoring patient's status even on their mobile devices and any emergency situation can be monitored quickly and effective treatment can be started. IoT is lifesaving in many cases and provides better decision making and improved patient wellness using analytics of data collected. Robotic arm surgeries are nowadays a trend and new doctors are being trained on how and where do they need to use artificially intelligent robots to do

procedures on human beings. Many scientists are continuously working to improve this technology in healthcare so as to improve lifespan of human beings and wildlife.

IX- CONCLUSION AND RECOMMENDATIONS

It is very clearly seen that information technology and internet of things are playing lifesaving roles in healthcare all over the world. This advancement of technology is appreciated everywhere for the contribution it made in techniques of treatment, diagnosis and decision making is beyond imagination of doctors back in twentieth century. Management of data and equipment or devices is so good that IT blooms as a boon for doctors and patients. A big threat to healthcare for using IoT is there which can be harmful for a large section of users whether it be patients, doctors or even the organisations. Hacking this critically confidential information or the devices which may be inserted in human body and are connected to some device like the pacemakers, this can be hacked and manipulated for unethical and deadly reasons. Medical professionals must be given all sort of knowledge to handle such crisis as it may result in new form of terrorism in future since use of such technology is increasing rapidly day by day. It is very evident from above paper that diffusion of two different sciences can do wonders if done intelligently with ethical intent but any carelessness can result in destruction.

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