An Evaluation of the Impact and Usability of Health Information Technology

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ABSTRACT:

There are many technologies who can play the role to cut the cost of cure of diseases. Health information technology (in short HIT or Heath IT) provides potentials to update and simplify health amenities and to connect up different patrons and stakeholders in the e-health environment. It is a medical data related to a person. It includes disease, symptoms, diagnose and procedure, etc. modern days computers changed the way people interact with each other. In this paper, user needs for health information technology are discussed to facilitate the design and development of an efficient platform that enables patients, citizens, and health professionals to communicate. A patient portal and a personal health record are examples of platforms that will allow information to be exchanged across systems in a seamless manner. It is important, however, to design systems according to the needs and requirements of diverse users. In addition to telemedicine, electronic health records (EHRs), hospital information management systems, e-learning technologies, digital health knowledge resources, and health informatics, health information technology plays an important role in health care delivery. Moreover, in order to increase the accessibility of Health Information Systems such as Personal Health Records (PHR), patient portals, etc., methods evolving from usability engineering need to be functional. Additionally, the paper discusses some of the obstacles and challenges that e-health system face. It is challenging to get users across the e-health environment by means of information technology when internet access is not available in all areas, infrastructure is lacking, policies, guidelines and standards are deficient, and human resources are not available. Moreover, the health care system needs to be protected sufficiently from the security threats, fraud and other threats.

1. Introduction

Health IT is measured one of the most encouraging areas of technological development in the field of healthcare. From last few years' everybody, especially people from health and medical science industries are talking more and more about e-health, e-health records and Health Information Technology (HIT). Health care filed is among the fastest to adopt IT enabled solutions. It is the main driver in health care industry and getting enormous attentions [1]. Different people have different perceptions about health information technology. So, the question arises what exactly is the health information technology? Basically, health information technology is an electronic health care system which is responsible to store, share, generate report and analyze health data. In fact, HIT is very broad concept which comprises a collection of technologies. It is use of computer hardware and software infrastructure to keep an eye upon clinical, administrative, financial and other information management. Generally, a Health IT includes electronic health records (EHRs), electronic medical records (EMRs), personal health records (PHRs), privacy & security, and electronic prescribing (e-prescribing). It is computerized information management system which is also responsible for secure exchange of health data among patients, service providers, doctors, payers and other medical staffs [2].

Due to the cumulative role of Health IT and electronic data storage in clinical environment, it is important to assess the role of technologies in supporting and decision making [3]. Information Technology is bringing revolutions to many industries. One of the fastest developing industry to inherit this prospect is healthcare. It is providing a new market based on health information technology. The incorporation of Health IT into the collective health care setting has been basically changing

the approach health care is carried. Health IT has good possibilities to advance the quality, competence, and wellbeing of care in important ways. Though, with the intention to fully attain these capabilities, we need to look into the new mental tasks brought by the beginning of health information technology into the health care domains.
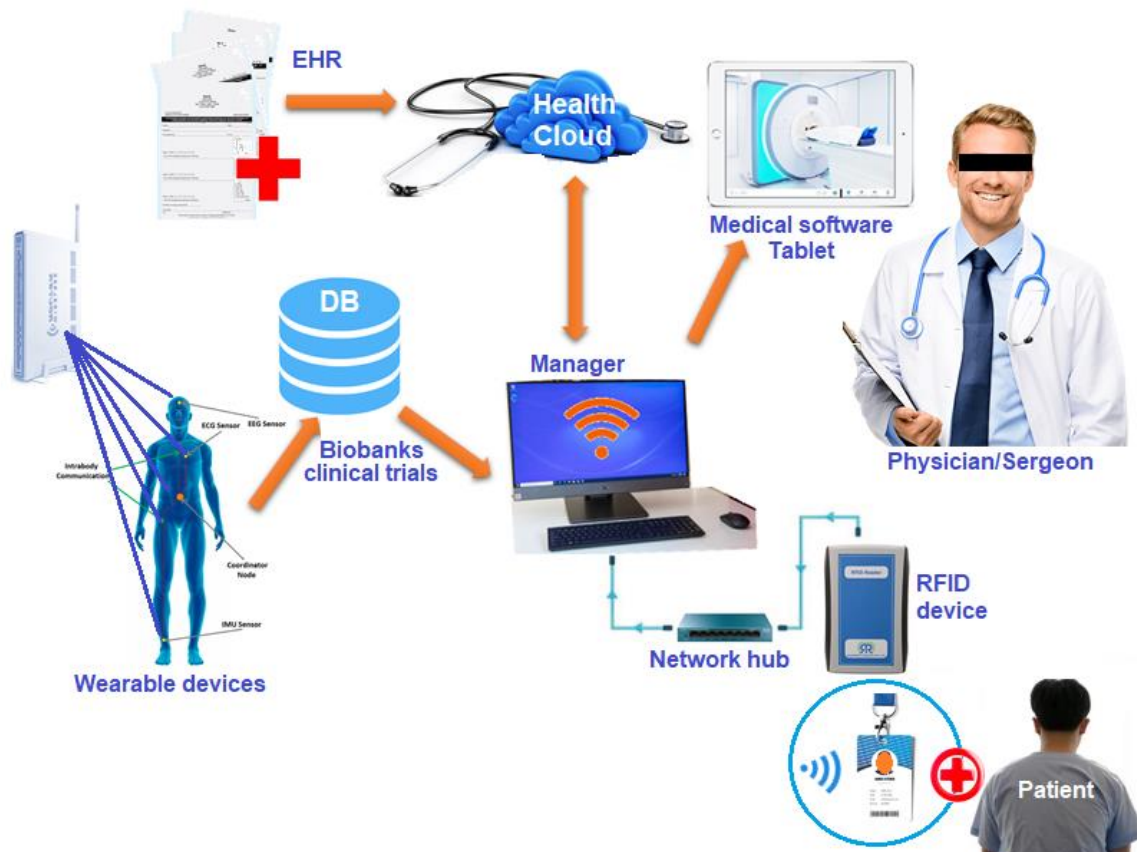

Fig 1: A typical Health IT in practice

Health information technology (HIT) also has its impact on patient safety and privacy [4]. It improves the safety of patient's sensitive data as well as medication errors. In an ultimate environment, broad and consistent utilization of HIT would increase health care efficiency, improve health care quality, increase health care accuracy, prevent medical errors, reduce health care costs, increase administrative efficiencies, decrease paperwork and reduce idle work time, provide better real-time communications of health informatics among health professionals and expand access to affordable care [5]. Information technologies traceability property allows the hospitals to collect and store detailed information about the preparations by creating a record of every patient's treatment which can be used for research and at the end to prepare a detailed and beautiful visualized report [6]. ICT have the excessive potential to support and improve the public health by using health care system in developed and developing countries. ICT can contribute enormously in improving health care delivery, health management, disease control and monitoring, preventive care and researches [3]. Specially shared decision making is the area of decision making which along with Health IT has received important attention. According to American Medical Association (2012), "Shared decision making is a process or tool which helps both patients and medics to work together to form a best treatment opinion based on medical evidence and patient's urgency to care" [7].

2. Objectives

This research paper aims to find out the scope of impact and usability of Information Technology in the Medical domains from the patient and health professionals'

perspective. Especially in hospitals, clinics and health care centres.

3. Methodologies

The study is based on independent reports, research articles, policy analysis, literature review, and key informant across hospitals in India (privately owned and government-owned) located in Delhi-National Capital Region, Tamil Nadu, Uttar Pradesh and Karnataka. These states are well known as the health care hubs for India and have good domestic and global health systems. The study is also based on report of Safir et. al [8], "Building an Improved Primary Health Care System in Turkey through Care Integration". The report provides analysis and means for integration inside the primary care stages as it looks a good entry point within the Turkish context for integrated care [8].

4. Types of Health Information Technology

All characteristics of healthcare can be positively impacted by IT. The following areas given below are covered by HIT [9]:

- EHRs
- Medical billing
- PHRs
- Regional networks
- Electronically assisted prescription
- Telemedicine
- Digital libraries
- Remote health monitoring
- Hospital Information Systems (HIS)
- Medical Practice Management System
- E-learning technologies and application in health care
- Online communities of professionals and citizens
- Biomedical informatics for biomedical researches
- Online training and distance education programs
- Secure messaging
- Master Patient Index (MPI)
- Videoconferencing etc.

This paper explains few major modules of health information technology given below:

Electronic health records (EHRs): It sounds very simple, but the implementation of EHRs is a great decision. In very less time span, a paper-based system to manage health records are being digitized and negotiated [10].

EHR allows medics to better keep track of patient health information and they could enable to see it when you have a problematic situation even if offices are closed. It provides easy access of health information to authorized health professionals from database. It also makes easier for doctors to exchange information with super specialists.

Personal health records (PHRs): PHR is more like an EHR, except that patient control what type of information goes into the system. PHR includes vitals (blood pressure, heart rate etc.), food intake, exercise timings etc. It also provides easy access of health information. One can use a PHR to keep an eye of information from the doctor's visit.

Privacy and security: All of these technological systems can increase the safety of your health information. Trust plays crucial role in security and privacy. Trust is confidence to know that how a person or organization will do in a given situation. It involved confidentiality, security and privacy of sensitive data [11]. They provide a secure way of exchange of information from one place to another. Because security and privacy of any patient data should be top priority of any system.

Electronic prescriptions (E-prescribing): E-prescribing is a system which allows medical professionals to use e-system to write and send to a particular pharmacy in place of hand-written prescriptions. It is possibility of paper prescription to get lost. It is also possible that prescription may misread if handwriting is not clear. E-prescribing overcomes to all of these. It provides doctors to connect directly with pharmacy. It means that patient can directly go to the pharmacy to pick their medicines without any paper prescription.

Master Patient Index (MPI): Sometimes it is called as Patient Master Index or Patient Registry. It involves Unique patient id, Patient name, Date of birth, Gender, Address, Race, Alias, Biometrics e.g. fingerprints and National identification number/passport number etc. MPI is the record of each patient who is registered at hospitals or health clinics. It is used to avoid duplicate and inaccurate records. Benefits of MPI includes up to date record any time anywhere to authorized personnel. It removes duplicate entries for a patient [12].

Remote Health Monitoring (RHM): RHM is very diverse and rapidly growing as health professionals as well as

patients wants to monitor the health from any place outside the hospitals [13] suggested a secure data accumulation approach (also privacy-preserving) based on bilinear ElGamal cryptosystem (a suite of cryptographic algorithms) for RHM systems to advanced data collection efficiency and data privacy. Security analysis validates that the proposed method maintains data authenticity, data confidentiality and data privacy.

Studies show that health organizations (hospitals & clinics) who implemented this technology are accomplished of providing more organized patient care from admittance to discharge and are able to increase patient safety and privacy.

5. Usability of Health Information Technology

A report was recently published in the US trade literature with a title "Death by 1000 clicks". Where HER went wrong. In this title author shown light on poor health IT usability and their impact on patients [14]. Health

Information Technology usability problems experienced by doctors, nurses, and other medical professionals, can create multiple negative effects to both patients and medics [15 – 18]. The ideal procedure to develop the health information technology is to test the usability as project plan. Usability testing is less costly if we test from very beginning. Otherwise it'll cost much due to change in designing and coding [19]. Usability has many descriptions and characteristics [20]. Usability involves navigation, familiarity, consistency, visual clarity, error prevention, feedback and flexibility & efficiency.

In other word usability means useful. It is more than a look and feel i.e. GUI (Graphical User Interface). It is also user cantered, learnability, efficiency and satisfaction. It is also to the knowledge. In principle, a system having good usability is easy to use and effective. It is spontaneous, forgiving of mistakes and allows users to accomplish essential tasks swiftly, efficiently and with a minimal effort [21].

Fig. 2: Why is usability so important? [21]

We need to improve the usability of health IT systems by providing more training in relations to patient's safety. Deeper understanding should be developed to the users of health IT systems. Users of health IT should meet the designers and developers of the system to avoid any misunderstanding. They must understand the health IT in

such a way that they can identify where and when usability gets created and breaks down [22]. Usability can be combination of Intuitive design, Ease of learning, Efficiency of use, Memorability, Error frequency and severity and Subjective satisfaction [23]. Phases of

usability testing includes planning, designing, testing and deploying.

There are several obstacles to address patient safety within health IT systems. Usability is the major factor in health IT. Lack of evaluation might cause the decrease in efficiency, satisfactions and effectiveness of health IT. There is an absence of obligatory reporting for "medical errors" associated to health IT systems. Due to the nature of rival merchant's health care providers might fear sharing inaccuracies directly related to the IT system because of concern of violations of clauses and vendors' intellectual property rights (IPR) signed by users and they worried to lose the contract or services from the consumers. Usability and additional human challenges with health IT might be continuous. It can be understood with the article by Atul Gawande illustrated in a New Yorker entitled "Why doctors hate their computers?" Reason behind is that they think that they are putting unnecessary time and effort for technology instead technology should work for them to perform their duties [24].

Usability problems of health information technology (Health IT) may cause threats to safety of patients as well as medical professionals, it can produce frustration and burnout which is not good for the system, health professionals and higher managements.

6. Challenges in Using Health Information Technology

As a result of the pandemic, the healthcare industry has encountered new IT challenges, as well as deepened existing ones, leading many large companies to develop medtech solutions and vertical-specific applications. In spite of challenges, technology has been able to aid healthcare providers successfully. Whether they are insurers, or other participants to create a cohesive patient care experience. Few major IT challenges in using health IT can be given as:

Data management and integration: A persistent technology challenge in healthcare is the ability to integrate different types of data from various sources. Patient's file may contain data from many sources and in many forms. Clinics and hospitals are digitizing their work processes.

Seamless billing processes: It is possible for billing processes to be confusing and inefficient, resulting in frustration for patients and partners. Software solutions offer simplified account and invoice management, financial forecasting, and automation capabilities that are time-saving.

Compliance: There are a number of regulatory changes that are constantly occurring in the field of billing, equipment maintenance, and software updates. Health care providers must navigate a legal tangle of landmines in order to adhere to compliance measures to safeguard their patients' information.

Security and privacy: To prevent identity theft, fraud, and misdiagnosis, compliance standards generally focus on data security and privacy. In January 2022, there were 50 healthcare data breaches affecting 500 or more patient records, according to HIPAA Journal's Data Breach report [26]. 38.9% more data breaches occurred last month as compared to January 2022 [26].

Telehealth infrastructure: Healthcare IT infrastructure and security are under enormous strain to support services like telehealth as a form of remote immediate care. It becomes more difficult to ensure patient security and compliance as patient data moves from third-party applications to personal devices, such as telehealth communication portals.

Equitable access: Although healthcare IT has improved greatly, a digital divide still exists, especially in the US, where some demographics are not able to take advantage of health technology to the same degree as others.

7. Conclusions

Health information technology is being implemented on a large scale. Recent progress and widespread adoption of HIT offer prospects for tools that support cognition through data visualization, not only quantity of data load but also rational support through pre-processing of information, and improve decision making through dashboards and other alert systems [25]. Although this paper provides some insight into some fundamental topics, architectures, platforms, security requirements, and challenges, it does not provide a deep understanding of some fundamental topics. In addition to the technologies discussed in this review, other technologies, such as IoT, big data, and augmented reality, could be investigated further. Finally, policies and regulations are also very important in the healthcare and should be carefully examined in future researches.

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