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Diffusion and adaption of Healthcare Information Technology

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Abstract:

Healthcare Information Technology (HIT)is widely regarded as a key to improving the quality of healthcare and potentially reducing its cost. Healthcare Information technology can contribute significantly to quality improvements in healthcare institutions. Information Technology (IT) has the potential to improve the quality, safety, and efficiency of healthcare. There are challenges associated with implementing information technologies, but they are not insurmountable.However, adoption and benefits have not been uniformly distributed and reliability of success has been difficult. So, it is necessary to improve the quality. Suggestions are offered as to how managers can adopt information technology systems to improve the delivery of service to thehealthcare consumer/patients. Limitations of the paper and scope of further research are mentioned at the end to encourage further development in this section.

1. Introduction

The degree of use of IT in healthcare varies by health care setting. IT and the internet had a significant impact on consumers. Numerous websites have made health information available to patients, thereby strengthening their role in care decisions.Healthcare is undergoing a distinct movement along a logical trajectory from its historical focus on acute care to chronic care.
This revolution would move us away from a curative drug-based healthcare towards consulting/service-based healthcare with focus on lifestyleand adapting behaviour to prevent and

cut out the roots of any instance of illness.Now a days some technologies are emerging in healthcare such as Clinical Data Warehouse, Clinical Decision Support Systems (CDS), Data-mining Techniques, Online Analytical Processing (OLAP) and Online Transactional Processing (OLTP). The coming years are expected to witness greater deployment of tools such as telemedicine, teleradiology, hospital information systems (HIS)/hospital management information systems (HMIS), online or electronic medical records (EMR), etc.[1] These technologies are used to maintain and utilize patient data intelligently, based on the user's requirements. Information systems are used to educate patients about the latest developments in medical science through the internet and specially configured kiosks in hospitals and clinics.

2. Research Methodology

Basis secondary research on sources or repute and reliance, prominent cases on Healthcare Information Technology relevant to the current times have been chosen. Below mentioned are brief descriptions of the need of Information Technology and some cases on the recent development in the same. Final conclusions chart out the challenges that need to be addressed to improve the safety and implementation of healthcare IT.

3. Literature Review

An article by Julian Wienert [2]depicts the shortcomings in proper implementation of Healthcare Information Technology, Necessity of IT intervention in healthcare and Implementing Complex Health Information Technologies in High Reliability Health Care Organizations.

Article by Mary E. Reed, DrPH [3] has given quantitative portrayal of the broad scale of the ongoing clinically informed maintenance activity that are required to use and sustain a mature and up to date EHR. It tells us that mere adoption of EHR will not provide the long-term benefits but we have to work towards continuous implementation and adoption of the same.

This work by Nisakorn Phichitchaisopa1 and Thanakorn Naenna [4] explains factors affecting the adoption of healthcare information technology. It is done by a structured questionnaire developed and distributed to healthcare representatives in each province surveyed in Thailand.Data collected from 400 employees including physicians, nurses, and hospital staff members were tested the model using structural equation modelling technique.

An article by Lena Stephanie and Ravi S.Sharma [5] on digital health eco system is a review of field effort that have resulted in positive impact and transformation in the delivery of healthcare research fromthe period 1998–2018.This review tracks the evolution of digital health and the seminar development in the field – crucial to obtain a grasp of the key issue involving the delivery of healthcare 4.0

This article byJiunn-WoeiLian, David C.Yen and Yen-TingWang [6] is an exploratory study to understand the critical factors affecting the decision to adopt cloud computing in Taiwan hospital.This is done by integrating the TOE (Technology-Organization-Environment) framework and HOT-fit (Human-Organization-Technology fit) model to understand the issue.

Andrew Beam and Kohane (2018) in their article have tried to demystify the nuances and explain how big data and machine learning can create algorithms with performance at par with any medical professional.

Kuo et al (2017) in their research paper have introduced bitcoin cryptocurrency and blockchain technology. They have further tried to analyse the advantages, disadvantages, and application of blockchain technology for biomedical and healthcare professionals.

4. Challenges for IT in Healthcare

4.1. The challenge in the 21st century is a surplus of patient information. The human brain, even a physician's brain, cannot keep up with the exponential growth in medical knowledge that will occur in forthcoming years.

4.2. The ability of human to memorize things has remained flat, but the medical knowledge that needs to be assimilated is increasing geometrically. It is difficult for the human brain to memorize all the information at a given period of time. With the help of computer, we can store massive amount of data and can retrieve it when required. Rapid technology advancements and continuous increase in performance/price indexes have made information technology (IT) applicable at all levels in health care organizations and patient management.

4.3. It is difficult for physicians to keep up with the rapidly changing state of medical knowledge and to understand what these changes mean for the treatment of specific patients. In such situation IT based decision support system could help doctors to learn about new treatments.

4.4. Low reach / inaccessibility as well as insufficiency (where available) of quality care to the most economically backward areas.

4.5. Fragmentation of isolated bits of patient and medical know-how across entities in the ecosystem.

4.6. Lack of a one-point complete patient record.

4.7. High Cost / Low Productivity due to bottom-up re-creation of diagnosis/analysis for every instance. [5]

Moreover, despite the long-term gains in efficiencies and costs that can be achieved, the initial high capital investments may act as impediments for organizations looking to invest in advanced technology products/ services. Further, lack of in-house IT expertise, lack of standards, reluctance/resistance of staff, inadequate support from the IT vendors, etc are some of the bottlenecks that will have to be effectively dealt with in this direction.

5. Technological Advancements [7]

5.1. The electronic health records**:** An electronic health record (EHR) is a digital version of a patient's paper chart. EHRs are real-time, patient-centered records that make information available instantly and securely to authorized users. While an EHR does contain the medical and treatment histories of patients, an EHR system is built to go beyond standard clinical data collected in a provider's office and can be inclusive of a broader view of a patient's care. EHRs are a vital part of health IT and can contain a patient's medical history, diagnoses, medications, treatment plans, immunization dates, allergies, radiology images, and laboratory and test results. Allow access to evidence-based tools that providers can use to make decisions about a patient's care. Automate and streamline provider workflow. One of the key features of an EHR is that health information can be created and managed by authorized providers in a digital format capable of being shared with other providers across more than one health care organization. [6]

5.2. mHealth**:** Mobile health is freeing healthcare devices of wires and cords and enabling physicians and patients alike to check on healthcare processes on-the-go. Smartphones and tablets allow healthcare providers to access and send information more freely. Physicians and service providers can use mHealth tools for orders, documentation and simply to reach more information when with patients, Mr. Sturman says. However, mHealth is not only about wireless connectivity. It has also become a tool that allows

patients to become active players in their treatment by connecting communication with biometrics, says Gopal Chopra, MD, CEO of PINGMD, and associate professor at Duke University Fuqua School of Business in Durham, N.C.

5.3. Telemedicine for cost effective healthcare: The increasing dependence on digital platforms is enabling location-independent healthcare. There is a dire need to bridge the massive urban rural gap that exists in India, out of which a sizeable chunk of rural population is deprived of the basic healthcare facilities. Shortage of healthcare professionals in rural areas is the reason that the telemedicine trend is being propagated by government and healthcare companies. Video interaction through instant messaging apps on mobile devices empowers patients from remote areas to connect with medical staff over the Internet with ease. Virtual care and self-monitoring devices are gaining popularity in the telemedicine space.

5.4. Portal technology**:** Patient portals are healthcare-related online applications that allow patients to interact and communicate with their healthcare providers, such as physicians and hospitals. Typically, portal services are available on the Internet at all hours of the day and night. Some patient portal applications exist as stand-alone web sites and sell their services to healthcare providers. Other portal applications are integrated into the existing web site of a healthcare provider. Still others are modules added onto an existing electronic medical record (EMR) system. What all of these services share is the ability of patients to interact with their medical information via the Internet. Currently, the lines between an EMR, a personal health record, and a patient portal are blurring. For example, Intuit Health and Microsoft HealthVault describe themselves as personal health records (PHRs), but they can interface with EMRs and communicate through the Continuity of Care Record standard, displaying patient data on the Internet so it can be viewed through a patient portal.

5.5. Self-service kiosks**:** Also, sometimes known as an interactive kiosk, a self-service kiosk is essentially a screen device at a fixed point, but unlike a standard tablet kiosk, a self-service tablet kiosk is one that someone uses themselves. The self-service kiosk definition is a small, self-standing structure, used to display information or facilitate an action. It could be a point of sale (PoS) self-service touch screen kiosk check-out, like those used in supermarkets up and down the country, an information point in a tourist attraction, or a kiosk in an airport that allows people to check-in without joining a counter queue. The self-service kiosk meaning will be different for everyone, depending on your specific planned application. Self-service kiosks do not just come in a standard supermarket check-out set-up but are available in many different forms and styles. Depending on what they are going to be used for, a self-service kiosk design could consist of a huge portrait-style touch screen, such as the McDonalds self-service kiosks where you place an order in one of their restaurants. Or large square self-service kiosks are available that are ideal for informational applications, such as in tourist

attractions, museums or libraries. Also, small businesses frequently make use of mini-kiosks and tablet stands for customers ordering/buying and making payments**.**

5.6. Remote monitoring tools**:** Remote monitoring is the electronic transmission of health care data either entered directly by a patient (or his/her caregiver) or through a medical device to a clinician's Electronic Health Record (EHR) or a Patient's Personal Health Record (PHR). The ability for a clinician to monitor patient information about diagnostic, medication tracking, and activities of daily living (ADL) measurements, captured remotely is a key enabler for the management of chronic health problems and management of new conditions. Remote monitoring could include physiologic measurements (e.g., weight, blood pressure, heart rate and rhythm, pulse oximetry, glucose), diagnostic measurements, medication trackingdevice information (e.g., medication pumps, infusion devices, electronic pillboxes), and activities of daily living measurements (e.g., ADL biosensors, pedometers, sleep actigraphy etc).

5.7. Sensors and wearable technology**:** Wearable devices and sensors are a way to keep a constant monitor on vitals, in a hospital and outside of a healthcare environment. In a hospital, doctors can use wearables that measure vitals, without the patient being restricted to a bed, but can also use items such as the SensiVest. This vest is used to prevent recurrent heart failure by measuring the level of fluid in a patient's lungs and sends the information to a doctor's computer, allowing the doctor to change the medication if the level of fluid raises. One example of how wearables are used outside of a hospital environment is created by Kenzen, manufacturers of a wearable smart patch that analyses the electrolytes, metabolites, small molecules, and proteins in sweat. These can then indicate through a smartphone app if the body's glucose levels are too high or if someone is dehydrated.

5.8. Personal Health Record**:** PHR is an electronic application through which individuals can maintain and manage their health information in a private, secure, and confidential environment. The most salient feature of PHR, and the one that distinguishes it from the EMR and EHR, is that information it contains is under the control of individual. The individual is distinctively the guardian of information stored who can decide what volume of information to include, how it is maintained and ordered, and who to read them or "check them out." It is necessary to decide standards and policy to determine how individuals can delete or modify information in a PHR that originated from an EHR and how these modifications are communicated to other providers with whom the data in the PHR are shared. Significant sources may include health care providers, medical devices, individuals, health insurers, research institutes etc.

6. Conclusion:

The healthcare industry is increasingly influenced using information technology in various forms from record maintenance to patient monitoring, communication, and treatments. They can enable healthcare professionals to confidently access, interpret and apply organizational knowledge, patient care procedures, best practices and other skills in a manner that improves patient satisfaction, achieves positive clinical outcomes, and maximizes cost savings for the organization. HIT is viewed by healthcare professionals to promote professional ethos and commitment and to strengthen their perception of self-efficacy.With the help of IT, it is possible to transform health care and improve patient safety by better leveraging information technology to improve the efficiency, accuracy, and effectiveness of health care system. Implementing and supporting IT applications require skills, hence physicians must make significant changes to both office and physician workflow and take time away to learn how to use IT. Health care administrators and planners should take a long-term view because the benefits will not be immediately tangible. In India today healthcare is inefficient, error-prone, and of variable quality. Hospitals are slowly moving towards clinical information systems, which helps them to lower their cost, to raise the quality and to improve their cash flow.

7. Limitations and scope of future studies:

Despite the cost-effectiveness, the high installation and maintenance costs of these solutions are hampering the growth of the market. Furthermore, the uneven regulatory environment in developed and developing countries is hindering the growth of the market. The dearth of skilled IT professionals in the healthcare sector is also keeping the market from realizing its utmost potential.

The global healthcare IT market is brimming with opportunities as health information technology has revolutionized patient care and healthcare services across the world.The scientific community is attempting to better understand the complex interactions between people, processes, environment, and technologies as they endeavour to safely develop, implement, and maintain the new digital infrastructure.There is a massive demand for software solutions such as hospital information systems, ambulatory care management systems, electronic health and medical record systems, and patient management systems from clinics and hospitals to deliver better patient care.

Information technology has the potential to substantially improve healthcare by bringing decision support to the point of care, by providing vital links and by allowing routine quality measurement to become reality. Healthcare IT market is fastest growing where the hospitals across the country are leveraging the power of IT to provide the best of healthcare services. Health IT may be especially beneficial for inner-city and rural populations and other medically underserved areas. It is necessary that latest IT technologies in healthcare centre that are available in urban population to be made available to rural areas of India. Rural users can access information by connecting block headquarters to fibre optic network, using wireless technology

to achieve last mile connectivity. Achieving this potential will be challenging task, but it is possible.[8]

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