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INFORMATION TECHNOLOGY ENABLED PROVIDER BASED DIAGNOSTIC AND THERAPEUTIC INNOVATIONS IN HEALTHCARE: A PROFILING STUDY

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ABSTRACT

Vast data is being created in the healthcare industry on account of the various operations in different segments like hospitals, diagnostics, medical devices, medical tourism etc. Thus it becomes pertinent to use information Technology extensively to capture and transfer data. Healthcare industry is increasingly adopting IT to automate its many processes like clinical decision making, clinical information flow, transaction, inventory keeping and maintaining records, thus obliterating many routine activities. Healthcare, in that way involves, prevention, management and the treatment of illness with the goal to provide efficient and effective services that lead to the preservation of physical well-being and mental health of humans and animals. In the present essay, information technology innovations have been identified and have been profiled.

KEYWORDS

healthcare innovation, information technology, healthcare technology.

INTRODUCTION

IT plays a core role in almost every healthcare area. Be it providing quality services to the patient at reduced cost, maintain patient history, adjudicating payer claims, providing referral and pre-certification services, case management, digital imaging of paper forms or generating electronic medical record for(EMRs) for speedy and accurate processing of information, IT is playing commendable role in the healthcare delivery. *Technology* presents in myriad number of forms which not only includes physical tool or product, but also as the knowledge and skills needed to operate a tool or as the application of a production process. Thus technology is defined as "science or knowledge applied to a definite purpose" and medical technology, in particular, includes all elements of medical practice that are knowledge-based, including hardware (e.g., equipment and facilities) and software (e.g., knowledge and skills). Medical technology is defined as the set of techniques, drugs, equipment, and procedures used by health-care professionals in delivering medical care to individuals and the systems within which such care is delivered" [OTA, 1976].

According to (Attaran 2003), "Information technology is defined as capabilities offered to organizations by computers, software applications, and telecommunications to deliver data, information, and knowledge to individuals and processes". Besides that, information technology can be defined as recently it is stated by Tan et al. (2009) as application of Information and Communication Technologies tools including computer network, software and hardware required for internet connection. Based on the reviews presented herewith, term information technology will cover wide range of information acquisition, processing and delivery through computer application in organizations. Thus information technology includes means to acquire, store, transmit and retrieve information and its infrastructure includes computer softwares, networks and hardwares. *Health technology* include technologies, used by individuals like doctors and other clinical personnel for the patient's care, rehabilitation or health promotion or those technologies used by the patients themselves for their care and rehabilitation. Not all technological processes and products are innovative. Thus it becomes imperative to define innovations. *Innovation* is defined as —"the intentional introduction and application within a role, group, or organization, of ideas, processes, products or procedures, new to the relevant unit of adoption, designed to significantly benefit the individual, the group, or wider society".**(West 1990).** And coming to the healthcare**,** *Healthcare innovation* can be defined as the introduction of a new concept, idea, service, process, or product aimed at improving treatment, diagnosis, education, outreach, prevention and research, and with the long term goals of improving quality, safety, outcomes, efficiency and costs*.* **(Vincent K Omachonu, Norman G Einspruch, 2010).** The innovations were sourced from journals such as PubMEd, Science Direct and Lancet. The process of search included manually typing terms such as "Innovation", "Innovations in the health care delivery", and "Innovations in health care technology", in the Google and Google Scholar Search Engine in the electronic keyboard.

1. MEDICAL DECISION-SUPPORT SYSTEMS (MDSS) are computer systems developed to help doctors or other clinical professionals in making decisions in clinical set-up**.** MDSS can help clinical professionals to acquire, store, consolidate and apply the medical knowledge. Accurate, effective, and reliable diagnoses and treatments by avoiding errors due to physicians' insufficient knowledge can be delivered with the assistance of MDSS. In addition, MDSS plays a major role in bringing down the healthcare costs by obviating the need for specialist consultation through specific and faster diagnosis and making the treatment delivered at the level of primary care physicians more effective and efficient.The medical diagnosis of an illness can be done from the patient's description and physical examination and confirmed through laboratory tests.

MDSS helps in diagnosis by providing a compendium of health problems to the clinicians or by generating background information about specific patients. It also provides instructions to proper drug consumption, reminders to patients to avail of preventive health services at specific time. One of the products in this domain is Isabel, a web-based system that has been interfaced with electronic patient/medical record. It has two component systems: Isabel Diagnosis Reminder System (IDRS) and Isabel Knowledge Mobilizing System (IKMS). In this system, a likely list of diseases and illness based on clinical features including signs, symptoms and appropriately confirmed by laboratory test results has been compiled electronically. IKMS has a dictionary of 10,000 diagnostic categories which help the doctors and physicians to do concepts search instead of keyword search in the in-built knowledge silos present in the system.

2. "MYCIN was developed in the early 1970s to diagnose certain antimicrobial infections and recommends drug treatment. It has several facilities such as information acquisition with due explanation, tutoring facilities and information building and enrichment facilities.

MYCIN is a medical diagnosis expert system that was developed to capture the expertise of a human expert on blood diseases. Physicians used it to diagnose and treat patients with infectious blood diseases caused by bacteria in the blood and meningitis (Shortliffe, 1976).

MYCIN reasons about data associated with a patient. It considers, for example, laboratory results of body fluid analyses, symptoms that the patient is displaying, and general characteristics of the patient, such as age and sex. MYCIN obtains this information by interacting with the physician. A MYCIN consultation proceeds in two phases. At first the most likely infectious organisms for the given set of clinical features is identified. Then one or more drugs are prescribed that should

control for all of the possible organisms. The prescribed antibiotics should get the patient cured of the particular disease. There should be no contraindication among the spectrum of prescribed antibiotics and should be appropriate for the specific patient.

MYCIN may ask for the results of a test that has not yet been completed. In this case the physician must answer UNKNOWN. This is proper because, when diagnosing infections, doctors rarely have the luxury of perusing a complete set of laboratory data. Rather, because early treatment is important, doctors have learned to work from partial information. MYCIN accommodates to this situation by accepting UNKNOWN as a response. Like a human specialist, MYCIN will reason with incomplete information.

STRENGTHS

1. It provides accurate and quick diagnosis
2. Its knowledge base was developing with the help of the best human practitioners, as a result it is extremely detailed and is very competent
3. It is comprehensive and considers every disease, present in it knowledge base
4. It does not forget or overlook any details, no matter how obvious the disease is

WEAKNESS

1. It is only available to diagnose infectious blood diseases
2. It does not follow up on previous decisions
3. Bases advice on the data available at that particular time
4. The User interface is only in English

3. "TELEMEDICINE is the integration of telecommunications technologies, information technologies, human-machine interface technology and medical care technologies for the purpose of enhancing health care delivery across space and time (Warner, 1997). It is an integrated system of healthcare delivery that employs telecommunications and computer technology as a substitute for face-to-face contact between provider and client" (Bashshur 1995)**.** Rusovick and Warner (1997) define telemedicine as any instance of medical care occurring via the Internet and using real-time video-teleconferencing equipment as well as more specialized medical diagnostic equipment. In general, telemedicine means the use of computer and communications technologies to augment the delivery of health-care services (Chellappa, 1995**).**

It includes for support systems for diagnosis teleconferences, transmission of high-resolution images and vital signs for long-distance diagnosis and robotic telesurgery.

The driving forces for Telemedicine advancement and adoption have been as follows: (1) communications infrastructure development with network development and increase bandwidth availability, and (2) decreasing cost of data transmission with scientific advancement in digitalization of medical and non-medical requirement.

The cost savings of telemedicine compared with traditional alternatives depend on transportation costs, volume, time sensitivity of care and the cost of the alternative is difficult to quantify with certain accuracy. However, there is an agreement that advances in digital medical applications and lower-cost information technologies are improving the financial prospects for telemedicine.

Telemedicine is used, in a broad sense, to refer to the transfer or exchange of
medical and healthcare information using ICT. *Tele-rehabilitation* refers specifically to the delivery of rehabilitation services via telemedicine methods and techniques. *Tele-care* refers to the specific instances where health or care services are provided to people in their homes or other supervised living settings.

Telemedicine is being widely recognized and adopted by the clinicians and the other health clients on account of rich research knowledge base with robust assembly of evidence on efficacy and effectiveness. Radiology, pathology, and other primarily image-driven diagnostic specialties have strongly embraced telemedicine as a way to deliver services faster, more efficiently, more accurately (for example, when advanced image processing techniques or algorithms are applied), and to a greater number of people. Healthcare and client care in particular is becoming more inclusive in nature by virtue of videoconferencing consults from larger specialty clinics to rural healthcare providers. Advancements in ICT coupled with the rapid development of software, sensors, robotics, digital medical records, and other equipment have helped telemedicine develop into a key component in the evolution of modern healthcare.

Tele-rehabilitation employs live interactive videoconferencing which included mostly audio-visual interaction (e.g. neuropsychology, speech-language pathology, counseling, etc.) and in that way, the treatment does not suffer from lack of physical contact between the clients and the providers. Physicians were able to use high-quality video transmission to provide consultations, diagnostic assessments, delivery of treatment interventions, and distance learning and supervision via tele-rehabilitation when a high-speed connection was available. In other instances of tele-rehabilitation, slower analog public switched telephone network (PSTN) connections that were more limited in the speed of the videoconferencing they could provide were used. Yet despite lower quality video transmission, tele-rehabilitation was shown to be a feasible method for delivering a range of rehabilitation treatment and assessment interventions.

More number of tele-rehabilitation services are moving beyond basic videoconferencing to include the types of remote 'hands-on' interaction that was once viewed as being impossible. Multi-axial position and force sensors (the latest of which are small in size with wireless communication and low-power requirements) provide a tangible measure of physical performance and function of a remote client. Haptic and robotic technologies let therapists 'feel' a client and impart forces and motion. Environmental sensors, and other 'Smart Home' equipment, monitor a living space and collect information on a client's interaction with the environment. The data from these devices can be used as part of a remote monitoring application and transmitted in real-time (with or without a simultaneous videoconference) or be collected, processed, and analyzed using store-and-forward methods.

- **HUMAN FACTORS AND USER-CENTERED DESIGN IN TELE-REHABILITATION**

Involving users throughout each stage of the development process will result in release of products which are compliant with the design goals, completed on time, have lower development costs, and more usable for its target population. To work towards this goal, developers of tele-rehabilitation devices may wish to employ UCD techniques such as 'story-boarding' which involves conducting observational fieldwork, semi-structured interviews, and cultural probes, to develop 'personas' for each of the targeted users of a system. For example, in a tele-rehabilitation system for clients with stroke, the persona would identify physical and cognitive abilities, social environments, personal life goals and networking needs and then map that storyboard to a new or emerging technology. In this way the design is derived from both the clinical need and the future user's needs. Other valuable UCD methods that can be used include iterative paper prototyping (a method of having users test early iterations of a GUI through low-fidelity mock-ups), video acting, and workshop dissemination processes.

One such avenue for future exploration, from both a service-delivery and research perspective, is client self-care, defined as the practices undertaken by individuals towards maintaining health and managing illness. Home-based tele-care programs have the potential to promote self-care in numerous ways. Sensor-based systems could monitor performance and provide clients with feedback on their progress or display to them pre-established therapy and educational content (delivered by computer screen), all without the direct real-time involvement of a therapist. Clients would perhaps feel empowered to take an active role in their own rehabilitation, conducting self-care whenever they feel appropriate. Self-care, therefore, provides both the opportunity to receive treatment at the time and place of the client's choosing, and to achieve improved health outcomes through self-managed *additional* rehabilitation sessions.

The concept of self-management is closely linked to that of self-care. However, there are some distinctions in relation to rehabilitation, with clear key elements of the self-management concept that dictate a more dynamic process with the users. The elements within the self-management paradigm are goal identification, information acquisition, problem solving, decision-making, and self-reaction, which in rehabilitation terms, should result in changes in motor control and subsequent functional ability

4. "ARTIFICIAL INTELLIGENCE (AI) is a study to emulate human intelligence into computer technology." Specific conditions that require elaborate treatment plans could benefit from AI tools during therapy planning. By incorporating an AI system that can automatically formulate plans based on specific conditions would add certain value to the physicians as well as patients. (Wan Hussain Wan Ishak, Fadzilah Siraj)

5. "CASNET (Causal Associational NET works) was developed in early 1960s is a general tool for building expert system for the diagnosis and treatment of diseases. CASNET major application was the diagnosis and recommendation of treatment for glaucoma."

CASNET (Kuliwoki and Weiss, 1982) is a model for describing disease process developed at Rutgers University. CASNET was originally applied in consultation program for glaucoma diagnosis and therapy (CASNET/Glaucoma). It is a graph-based formalism that attempts to capture the notion of causality in diagnostic and therapeutic process. All the disorders and the relevant causative factors and possible consequences are presented as nodes in a network. Different scores can be calculated for the nodes, indicating the possibilities of causal pathways that would lead to the particular disorder. The belief in a disorder can be ruled out if every possible pathway to a suspected disorder can be ruled out (Szolovits, 1982). Therapy efficacy is modelled in the same manner as disease progression.

6. SETH an expert system for the management on acute drug poisoning (Droy *et al.,* 1993)

The SETH's knowledge is comprised of terms, objects, requests, rules and descriptive terms. The consultation model consists of findings, hypotheses and decision rules. Findings are requested from the end-user. Hypotheses are conclusions that may be inferred by the system; they include treatment and monitoring recommendations and intermediate hypotheses, representing relevant aggregations of observations useful for organizing the reasoning. Rules are used to link findings to hypotheses. The typical expression of a rule is an IF. THEN statement, where the IF clause contains the pattern and the THEN clause contains the action.

The data base contains information on drugs, toxicological classes, potential clinical findings, advice on treatment and monitoring according to severity of poisoning. After each update in the data base, these informations are transferred to corresponding objects in the knowledge base. Currently, the data base contains the 1153 most toxic or most frequently ingested French drugs from 78 different toxicological classes. Our cognitive analysis was transposed in the knowledge base. The SETH expert system simulates the expert reasoning, taking into account for each toxicological class delay, signs and dose. SETH describes a level graph, where each level represents a step of the reasoning. The first level contains initial conclusions on delay, dose and signs. These three initial conclusions generate a final conclusion, which represents the second level of the graph. This final conclusion defines for each class accurate monitoring and treatment advice, taking into account drug interactions. All the conclusions are done at the toxicological class level. SETH checks if the patient had ingested drugs from the same class.

Inferencing is used to compute initial conclusions with respect to delay, clinical manifestations and doses, to give global conclusions regarding each ingested class, and to take into account interactions between classes or drugs and treat specific problems.

SETH ALSO CONTAINS A CASE DATABASE: All data imputed by an end-user, (PCC's resident), such as names of drugs, or generated by SETH such as the conclusions about the intoxication, are stored in the case database.

Identification of drugs according to 56 clinical manifestations is also available in a different module in the case of an intoxication with unknown drugs. The end-user inputs the clinical signs and SETH is giving the list of toxicological classes which can explain all the signs. We designed an imputability model to hierarchy this list of toxicological classes. This model takes into account the prevalence of each toxicological class in adult and child poisoning and a predictive score given by the expert of each sign for each class.

7. FUZZY LOGIC is another branch of artificial intelligence techniques. It deals with uncertainty in knowledge that simulates human reasoning in incomplete or fuzzy data. Meng (1996) applied fuzzy relational inference in medical diagnosis. It was used within the medical knowledge based system, which is referred to as **Clinaid**. It deals with diagnostic activity, treatment recommendations and patient's administration.

8. CLINICAL DECISION SUPPORT SYSTEMS: They facilitate clinical and administrative decision-making by means of interactive dialogues. These include clinical diagnosis, individual monitoring applications, facility and institution management applications and "virtual health libraries". They are computerized protocols for patient management, both for diagnosis and treatment, including electronic prescription and requests for laboratory tests. These may be rule-based systems, cognitive and simulation (Bayesian) systems, or tree-decision systems that could include active patient participation.

ADVANTAGES

Physician adherence to standardized therapeutic plans, cost reduction, and easier standardization and regulation of requests for secondary and tertiary health care and for examinations thus reducing variability between services.

LIMITATIONS

Low adhesion rates among health-care professionals, the great variety of systems available which hindered evaluation of their validity and reproducibility, and difficulties in standardization and integration with other applications. The main drawbacks of such systems include the lack of consensual standardization for a number of conditions, the probably negative effect on the physician–patient relationship (for example, the perception that computers take over the physician's role), the difficulty in addressing complex conditions, the profusion of different systems with different formats, and the need for training and support.

9. COMPUTERIZED PHYSICIAN ORDER ENTRY (CPOE) SYSTEM-A reduction in drug interactions, as well as unnecessary repetition of tests and repetitive tasks that may already have been performed but not recorded or available in the paper-record system(Davenport 2007; Walker etal. 2005). Classic study of inpatient medication errors found that approximately 90% occurred at either the ordering or transcribing stage. These errors had a variety of causes, including poor handwriting, ambiguous abbreviations, or simple lack of knowledge on the part of the ordering clinician. A CPOE system can prevent errors at the ordering and transcribing stages by (at a minimum) ensuring standardized, legible, and complete orders.

CPOE systems are generally paired with some form of clinical decision support system (CDSS), which can help prevent errors at the medication ordering and dispensing stages and can improve safety of other types of orders as well. A typical CDSS suggests default values for drug doses, routes of administration, and frequency and may offer more sophisticated drug safety features, such as checking for drug allergies or drug–drug or even drug–laboratory (e.g., warning a clinician before ordering a nephrotoxic medication in a patient with elevated creatinine) interactions. The most sophisticated CDSSs prevent not only errors of commission (e.g., ordering a drug in excessive doses or a drug to which the patient has a known allergy), but also of omission (e.g., failing to order prophylaxis against deep venous thrombosis in a patient who underwent joint replacement surgery). CDSSs are also increasingly being deployed to address overuse for example, a systematic review of CPOE for radiologic studies found that CDSS can improve adherence to guidelines for diagnostic imaging and reduce overall test usage.

ADVANTAGES OF CPOE

CPOE offers numerous advantages over traditional paper-based order-writing systems. Examples of these advantages include: averting problems with handwriting, similar drug names, drug interactions, and specification errors; integration with electronic medical records, clinical decision support systems, and adverse drug event reporting systems; faster transmission to the laboratory, pharmacy, or radiology department; ability to recommend alternative tests or treatments that may be safer or lower cost; and potential economic savings.

10. E-Prescribing: Stringent monitoring of generic medications so as to minimize costs, provides prescriptions electronically to pharmacies if preferred by patient, checks for drug interactions and poly-pharmacy issues, alerts providers as to when a repeat prescription is due, alerts to allergies, provides a drug reference guide, provides patients with details of their medications and side effects if required as an additional resource (BSR 2008)

E-prescribing has allowed prescribers to electronically send patient's prescription information to pharmacy computers. This process has decreased prescribing and medication errors and has resulted in fewer call-backs from pharmacies to physicians for clarification. Electronically sending and receiving prescriptions has streamlined the clinical practice workflow, and patient satisfaction and compliance have increased. Additionally, connecting physician and pharmacy systems has reduced paperwork and the associated mistakes that may occur from reliance on handwritten notes. This has produced time and cost savings for all parties involved.

E-prescribing systems can be incorporated into electronic health record (EHR) systems or can be stand-alone systems in the ambulatory care setting. HER systems include patient information such as clinical notes, laboratory orders and results, and clinical decision support (CDS) functions that stand-alone systems do not provide. When e-prescribing is part of an EHR system, providers are able to access all patient information, not just prescription information.

11. Personal Digital Assistants- Personal digital assistants (PDAs) are generic devices commonly used in both personal and professional spheres of society, due to their affordability and portability. The usage of PDAs to receive results and get information quickly and reliably, look at EMRs, request blood products or supplies as well as collaborating with colleagues who may need support (BSR 2008)**.**

12. Picture Archiving and Communication System(PACS)- A picture archiving and communication system (PACS) is a computerised means of replacing the roles of conventional radiological film: images are acquired, stored, transmitted, and displayed digitally. Teams can collaborate on patients who are not located geographically together, seeking specialist advice and input when necessary and supporting both patients and care providers in the rural and remote areas of the world (BSR 2008)

ADVANTAGES OF PACS

Once an image has been acquired onto PACS it cannot be lost, stolen, or misfiled. (Many hospitals report that 20% of films are missing when required, creating a serious practical problem.) Thus, images are always available after a PACS has been installed, so no patient appointment is cancelled, no clinical decision deferred, no images are repeated because they are missing, and no time is wasted by doctors or other healthcare workers looking for missing films. All images are available day and night for viewing anywhere in the hospital (and outside the hospital if there is a tele-radiology facility).

The numerous PACS terminals throughout the hospital allow simultaneous multi-location viewing of the same image, if desired, whereas conventional film can only physically exist in one place at any one time. This means, for example, that a doctor in the accident and emergency department can discuss a patient's images with the radiologist, with both clinicians viewing the images yet neither having left their department. Similarly, by the time a patient has returned to the outpatient department after being sent for an urgent radiological examination, the images will be available on PACS for viewing by the referring doctor.

The PACS database ensures that all images are automatically grouped into the correct examination, are chronologically ordered, correctly orientated and labelled, and can be easily retrieved using a variety of criteria (for example, name, hospital number, date, referring clinician, etc). All imaging studies of a patient are immediately available on the PACS which encourages review of examinations with preceding studies and inter-modality comparisons. Although difficult to prove, this would clearly be expected to be clinically beneficial.

Working with soft copy images on monitors allows the full gamut of computer tools to be used to manipulate and post-process the images. Alteration of the contrast width and level allows soft tissue and bony structures to be well seen on a single exposure. For example, it often permits the left lower lobe to be assessed behind the left cardiac silhouette, whereas this information is not available on a relatively under exposed hard copy chest radiograph (fig 2). There is thus an increase in the amount of information which can be extracted from an image, which is particularly noticeable for plain radiography. This is also partly the result of the photo-stimulable phosphor plate acquisition device generally used for acquiring these images in a digital format. These phosphor plates have a greater dynamic range than the conventional screen–film combination which leads to improved simultaneous visualisation of structures of widely differing radiodensity, and also permits a lower exposure dose to be used in many cases (fig 3)

PACS does allow some direct economic savings from the lack of expenditure on film, film packets, film processing chemicals, salary savings from darkroom technicians, and film filing clerks, and the redeployment of space previously used for film storage. Cost savings are, however, not as great as predicted, because although dark room technicians are no longer needed, they are replaced by fewer, higher paid information technology managers and other computer personnel. The aim when introducing a PACS is to be at least cost neutral with respect to conventional radiology. If economic savings are made, this is a bonus. The real advantage of a hospital wide PACS is the huge increase in efficiency of data management it provides.

13. Mobile based Primary Health Care Management System CDAC, Electronics City, Bangalore has initiated the development of **"Mobile based Primary Health Care Management System"** for deployment in the PHCs for betterment of management of Primary Health Care specifically in the rural and urban slums of India. The system will capture of complete information related to an individual patient treated by a PHC. The Software components under development are Patient Database management, Interaction between doctor and a patient, capture of Medical data acquisition- such as ECG, images of heart & lung, eye etc and Scheduling management. The project involves development of the following:

(a) A Web based Information system for Management of Primary health care.
(b) SMS interface for integrating SMS messages from the patients using 2nd Generation mobile systems (GSM/CDMA) with the Information system.
(c) WAP Gateway for Web access Applications using WML for integrating GPRS/3G/4GMobile devices of Doctors and Nurses with the Web server.
(d) Development of Localization Support to National and other Indian languages in mobiles by providing interface for translation.

HIGHLIGHTS

Health Information system in which each family has an up-to-date family folder is a valuable tool for maintaining, analyzing and interpreting the enormous data The **Mobile based Primary health Care Management System** will seek to achieve:

(a) Increased quality of primary healthcare (PHC) services.
(b) Increased efficiency of service care with an adequate referral and remote consultation system.
(c) Improved epidemiological surveillance and control.
(d) Better pregnancy case registration and management.
(e) Reduction of maternal and peri-natal mortality and morbidity.

14. Blue Cross Blue Shield of Massachusetts is a founding member of the eRx Collaborative, in conjunction with **Tufts Health Plan** and **Neighborhood Health Plan**. Since 2003, the eRx Collaborative has offered e-prescribing to Massachusetts prescribers through two vendors, Zix Corporation and DrFirst. Prescribers participating in the program use hand-held devices loaded with e-prescribing software. The system checks for drug-drug and drug allergy interactions; identifies generic alternatives to brand name drugs; checks health plan formularies for coverage information; and offers a comprehensive prescription drug reference guide. E-prescribing makes it possible to reduce the potential for medical errors caused by illegible handwriting; reduce adverse reactions to medication; increase use of generic drugs; and speed the process of ordering and renewing prescriptions

CONCLUSION

It is concluded that vast data is being created in the healthcare industry on account of the various operations in different segments like hospitals, diagnostics, medical devices, medical tourism etc. Thus it becomes pertinent to use information Technology extensively to capture and transfer data. Healthcare industry is increasingly adopting IT to automate its many processes like clinical decision making, clinical information flow, transaction, inventory keeping and maintaining records, thus obliterating many routine activities. Healthcare, in that way involves, prevention, management and the treatment of illness with the goal to provide efficient and effective services that lead to the preservation of physical well-being and mental health of humans and animals. In the present essay, information technology innovations have been identified and have been profiled.

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