Research Article

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American Journal of Computer Science and Engineering Survey

2021
Vol.9 No.4:8281

Major Privileged to Health Centers: E-Health Technology & Hospital Management Systems

Sanskar Srivastava*

Department of information technology, HMR institute of technology and management, Guru Gobind Singh Indraprastha University, delhi, india

***Corresponding to:** Sanskar S, Department of information technology, H MR institute of te chnology an d management, Gu ru Go bind Singh Indraprastha University, Delhi, India Tel: 9773560936, Email: sanskar2711@gmail.com

Received date: Apr 25, 2021; **Accepted date:** September 17, 2021; **Published date:** September27, 2021

Citation: Sanskar S (2021) Major Privileged to Health Centers: E-Health Technology & Hospital Management Systems. Am J Comput Sci Eng Surv Vol:9 No:4.

Abstract

Today web based technology offers many online services in majority of fields. Today it is possible to do majority of things online which help to reduce the amount of tasks, cost and efforts. The paper describes an idea of such a web based platform that makes medical/hospital procedures online using web, networking technology that is vital in the implementation of functionality of online medical management.

This will help in managing patients, managing schedules of doctors and will also become useful for maintaining the records of patients that can be accessed by the respective hospital. The major aim of this web technology would be storing, managing, communicating, analyzing as well as updating the patient details online. Thus by executing this web based technology using customized application programming we will be able to handle many tasks that are usually time consuming and inconvenient. It offers a simple common system which can be used by some special E-health application development in the future. It provides a worth guidelines on E-health web application for people self-care management.

Introduction

This hospital based web technology application system includes keeping a record of patients, organizing their details into the system, and also computerized billing. The software has the power to offer an enquiry facility to each patient as well as the staff automatically. It includes the search facility to determine the current status of different rooms available in the hospital. User can search about the doctor whether or not they are available and the details of a patient. The hospital management system can be employed using a username and password. It would be accessible either by an administrator or receptionist employed at the hospital. Only they can add data into the database. The data can be retrieved is easily. The interface is very user-friendly. The data is well protected for private use and fast processing. Hospital management system is meant for multispecialty hospitals, to overcome a wide range of hospitals administration processes. This web technology is useful to improve the management of hospitals in the area of clinical process analysis and activity-based costing. The application would enable you to develop your organization and improve effectiveness and quality of work.

Being a developing country, India has seen a tremendous growth of the health sector in the field of research as well as in the field of development of numerous large and small scales. However, hospital institutions still lacking in inter-structure facilities. Government of India has still aimed towards medical facilities by establishing hospital. Even today the basic working of various hospitals in India is still on paper as compared to hospitals in European countries where computers have been put in to assist the hospital personals their work thus making their work much faster and easy to perform. The concept of autonetics of administration and management of hospitals is has been implemented in India also but the count remains extremely low. Only few large hospitals like APPOLO and AIIMS in Delhi, ESCORTS in Chennai, have understood the importance of a proper hospital management technology and have automated their existing system. The application of information technology in health care is unceasingly evolving because the quality of patient in contemporary times seems to depend upon the timely acquisition and processing of clinical information to the patients.

Figure1: Predicted Global Digital Health Market 2020-2024

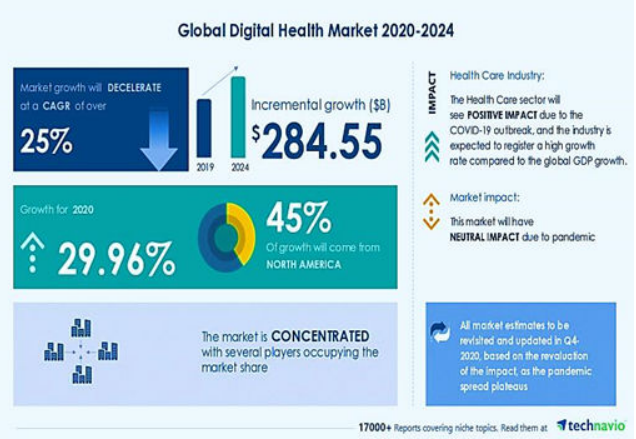
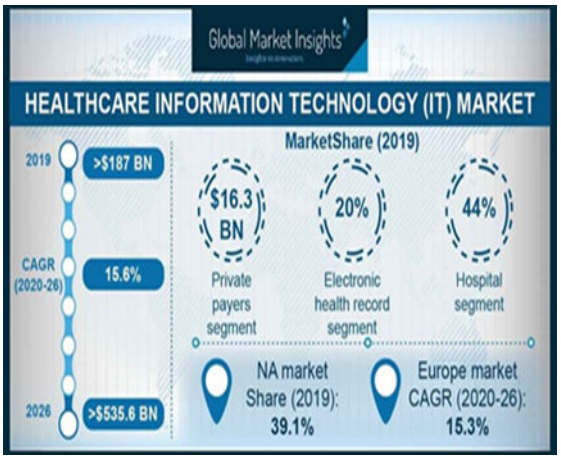


Figure2: Healthcare Information Technology Market



Motivation and Requirements of the Proposed System

The real motivation for this application is to make easy process of all the administration and management process like patient registration, billings, doctor's appointment, doctor's prescription etc. We have often seen that to find out the particular patient's history, the user has to go through various registers which results in wastage of time. By implementation of this system it will become easy to manage all such process thus saving time and money. So now by taking the motivation of this scenario which was regularly done in hospitals we are designing this system which can be benefitted for the patients and hospital staff. This system would make it possible for the hospitals to do work in fast and effective manner.

The major requirements of this system are as follows-:

- To implement this application we will require computers in each room of hospital for e.g. Entire wards of hospital must have a computer to update the details about patient, all the department like MRI, CT scan, X-ray rooms must have computer to store the reports on the system database and all these computer should be in network and it should have an updated browsers and internet connection in order to adapt to this new technology.
- Every patient should be registered, and every person who handles the patients in some or the other way should have login access to the system so that person can update about the patient relatively.
- The entire doctor should have a system with internet connection and connected with the other hospital computers.
- This web application can be developed by using object oriented programming languages from front end like .net, c#, HTML, CSS and some other like Java, Python, Djanjo which will provide the most recent technology in developing user friendly user interface so it is very easy for all the user to understand and use the system.

Research Methodology

The study is qualitative and descriptive in nature and most of the information is predicated on secondary sources of survey data. Such an approach is adopted within the study because the area of research is extremely broad and sources of information are also spread across multiple locations. In order to attain a conclusive idea of the larger picture on E- Hospital Management and Hospital information systems, analyzing the prevailing survey data and certain successful case studies of Hospital information system could provide a good end in finding the answers to the research question framed.

Task and Features of the Proposed Application

To carve out a comprehensive E Hospital management / Hospital information systems model, some of the various E – Hospital management system tasks are discussed and summarized in the context of the current study. The most important tasks in hospital information systems can be summarized as follows,

- Storage and monitoring of patient's health condition: Accurate and electronically stored medical records of patients (e.g. drug, allergies, last check-up) are easily provided. Visual and auditory warning systems are generated within the event of abnormal test results or other important data. Time intervals and testing periods for tests on patients are to be specified. Data Processing and analysis regarding statistical purposes and research oriented purposes.
- Management and Data Flow: Support automated patient data transfers between departments and institutions. Enable graphic or digitized diagnostic images from the hospital database based on the integrated retrieval system.Digital signatures, in to create internal orders electronically in a hassle-free manner.
- Financial Aspects: Well organized administration of finances. Use and effectively monitoring of medicines of the ordering process. Expected and actual treatment costs should be listed and reported.
  Automated representation of the requirements of the nursing staff.Status analysis of bed occupancy and overall performance within the hospital data system.
  In the public sector domain, a number of successful e -

hospital management solutions include that of the, e-Hospital solution by National Informatics Center, India (NIC, 2013). It is a kind of Hospital Management System that is a workflow based ICT solution for Hospitals specifically developed for the hospitals in Government Sectors.

It is a type of generic software which covers majority of the functional areas like patient care, laboratory services, work flow based document/data exchange, human resource and medical records management of a Hospital in a very convenient style. It is a patient-centric system instead of a series of add-ons to an economic system.

Table 1. NIC, India - E – Hospital Management Solution Special Features

S.No	Features
1	ISO / IEC 9126 Certified
2	Based on HDF(HL7 Development Framework)
3	Unicode based Indian Multilingual Support
4	Vocabulary- ICD-9, LOINC etc.
5	Comprehensive Reporting on various customizable parameters
6	Comprehensive Role based Access control and Security
7	Data Security and Privacy
8	Audit logging of transactions
10	Powerful Search facility and tracking of patient history
11	Touch Screen Kiosk interface
12	Available on Linux and Windows platform

Proposed Approach

At present traditional Hospital Management system in any hospital is time consuming and long-lasting process. Patients goes to hospital and they need to undergo have various process for treatment. Apart from this the patients goes to billing counter and then the patients need to wait there in queue where the billing is generated manually by receptionist, this process is very time consuming and lengthy also. To overcome such pitfalls we have to design a Hospital Management System. The advancements in technology and internet speed made services like Telemedicine a dream come true for today's patient care needs. Telemedicine can be cited as the provision of medical services from a distance. According to Belgium Federal Public Service – FPS report (2002), top quality of knowledge storage, data speed, data exchange and networking for Hospital information systems (HIS) is compulsory for efficient performance of Hospital Information Systems (HIS). Especially information storage requirements of departments like radiology are very stimulating. Also the developing technology and varied solutions in the hospital management domain necessitated for the development of common protocols and standards at global level. The methodology of project contains four modules Admin module, Doctor module, Sister module, Employee module. If the patient enters into hospital first, they need to register their name at reception counter. According to their problem they will take appointment of particular specialist. The name of all the patients will display on the alphanumeric display screen which is placed outside of the entire department. For display the name of patients, the system use queue technique to display the name one by one.

In this the employee first register and login in employee module and after that registers the name of patients and give initial treatment to patients if there is any emergency then they send patients to specialist consistent with their problem otherwise they generate bill with prescription. In emergency condition patients could also be admitted to ward or ICU that process handle by sister for that sister has got to register and login with username and password. In this module there's a searching facility to understand the present status of every room consistent with that bed is allotted to particular patients. This module also manages medication of patients consistent with doctor's prescription. It also manipulates proper diet of patients. In doctor module doctor has to register and login .This module also contains specification of doctor in which doctors can update patients report. On the other hand admin module contain admin registration and admin login. It also contains user creation, manage information and user deletion.

Figure-3: Workflow diagram of the e-health application

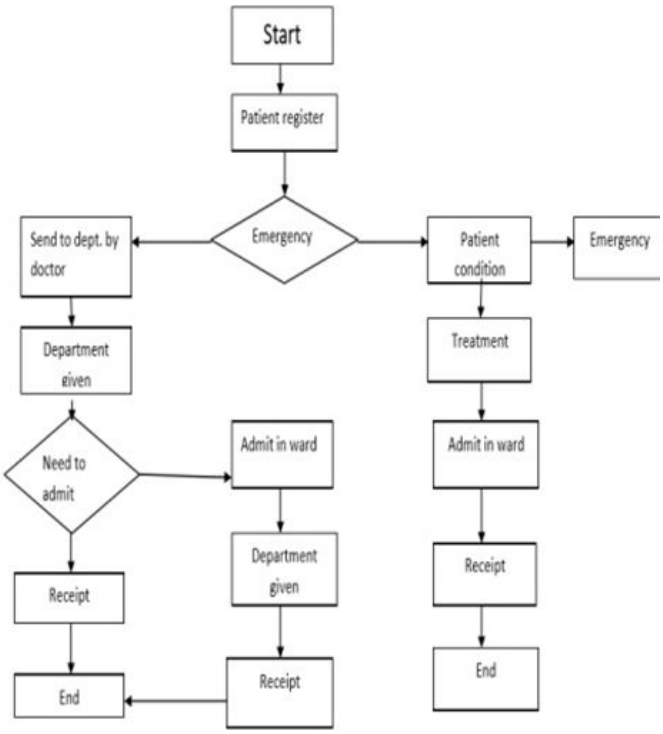
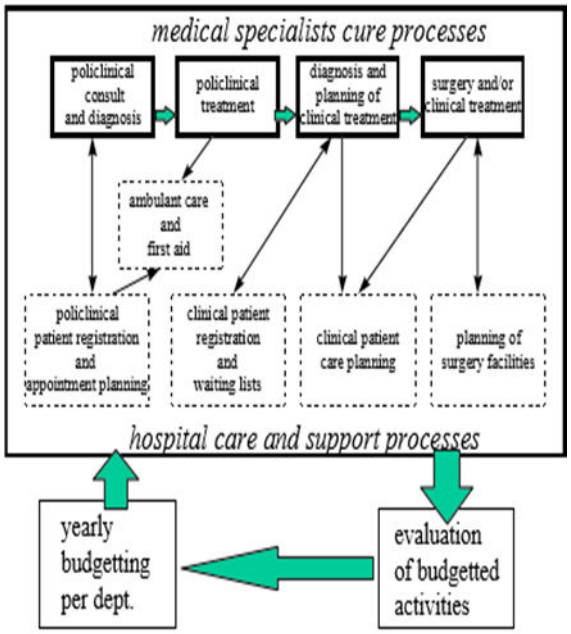


Figure-4: Core processes involved in the system



Important Modules Involved In Trending Pharmacy Applications

- Patient Registration and Appointment Scheduling Module - The Registration module is a combined patient management system, that also captures complete and relevant patient information. The system automates the patient administration functions to process better and efficient patient care process.
- Outpatient Management Module- The Outpatient management module serves as an entry point to schedule an appointment with the Hospital Resident Doctor or Consultant Doctor for Medical Consultations or diagnosis. This module also supports doctors to take better and timely consultation decisions by providing faster access to comprehensive patient information.
- Patient Billing & Insurance Module-The Patient Billing module handles different types of billing for long-term care. This module facilitates cashier and billing operations for various categories of patients like Outpatient, Inpatient and Referral and It also provides automatic posting of charges correlated with different amenity like bed charges, lab tests conducted, medicines issued, consultant's fee, food, beverage and telephone charges etc. This module provides for credit partly billing and may be seamlessly integrated with the Financial Accounting Module.
- Services Module - The service module generally provides a way for effectively managing all the services available within the hospital and therefore the charges for each of these services are securely entered and handled.
- User Manager Module (security workflow) - The User Manager module mostly deals with security through controlling the access to the data available within the application. Any user related to a user group can access only those screens that the user group has rights. It also deals with the System Related Activity like User Monitor, Creating User Group Master, User Master and considers the User Group Lookup of employee database, Maintenance of company documents; User defined error message and Generating Daily Statistical Summary.

Some Other Optional Modules Involved In Pharmacy Application

- Pharmacy Module - Pharmacy module handles the automation of general workflow and administration management process of a pharmacy.
- Laboratory Data System - The Laboratory module automates the investigation request and also the processes involved in delivering the results to the concerned department/doctor of the hospital.
- Electronic Medical Record (EMR) - The EMR Module may be a fully integrated knowledge repository which caters to Medical and clinical records of patients within the hospital.
- The dietary module -in the hospital management system software is designed to help the hospital kitchen in providing meals and medicines to inpatients according to the instructions of the dietician.
- House Keeping Module - Housekeeping in hospital is defined by the provision for a clean, comfortable and safe environment within the hospital for patients and general public.
- Emergency Management - Emergency module in the hospital management system software allows quick registration of patients by the capture of key and very specific registration details like demographic information, keeping in mind the critically of this function.
- Financial Accounting Module - The Financial Accounting Module handles Cash/Bank, Receipt/Payments, Journal Voucher and Ledger etc. Books like Cashbook, Bankbook and Ledger book are often generated.
- MIS Dashboard - The dashboard presented within the hospital management system software maybe a summary of key parameters values covering all areas of the hospital that are generally monitored by the top management on a regular basis.

Identification Of Three Types Of Hospital Management

	Capacity management	functional management	network management (process management)
services to customers	broad specialists	sub specialists	networked specialists
success factors	availability and reliability	correct diagnosis and treatment	quality of life and well being
knowledge owners	medical specialists	medical sub-specialists	networks of medical professionals
knowledge sources	clinical training and experience	scientific approach, academic training and journals	knowledge networks, electronic networks
management orientation	control and financial reporting	(internal) functional management	(external) process management and marketing
co-ordination mechanisms	top down, centralised	decentralised clusters	standardisation and communication

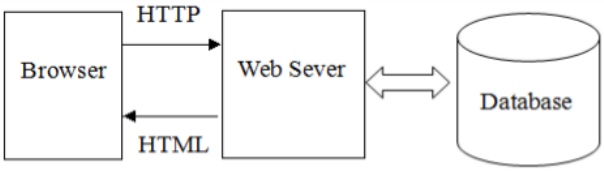
System Architecture Design

The entire E-health application frame structure uses the B/S (Browser/Server) architecture which the mainstream web architecture model. The web browser is the most vital application of the client. This model simplify the client's task and

put the core a part of the system functions to the server to largely simplify the system development, maintenance and use. Only just install a Browser on the client such as Internet Explorer, server install the database such as SQL server, the browser data interaction can be realized with the database by the web server. This greatly reduces the client computer loads and also reduces system maintenance and upgrade cost and effort, thus reducing the overall cost of ownership.

B/S structure biggest advantages is that you can do few operating without installing any special software in any place as long as there is a computer with internet connectivity. The client almost needs no maintenance. In case of above advantages of the B/S model, the entire application will apply it as prior introduced that the MWAIIS and database has been selected as the server and data storage.

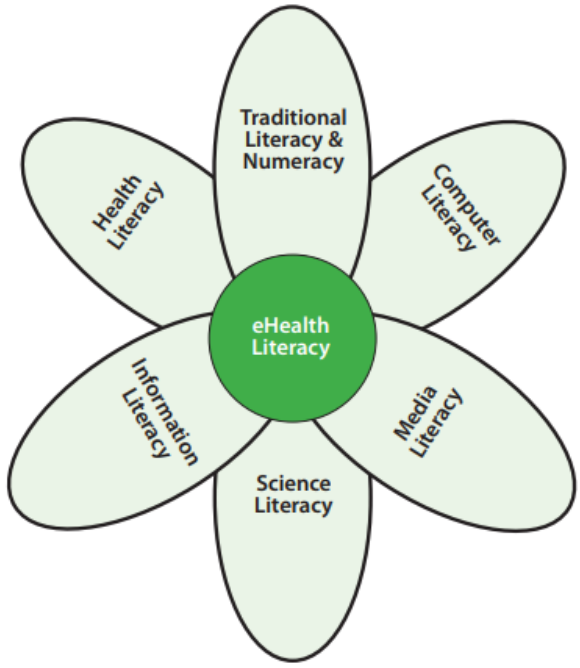
System Architecture Design



Consumer E-Health Literacy

In order to optimize an online experience, a consumer should have the skills to find, appraise and use relevant information. Although the first 'digital divide' involving access to Internet linked computers has eased for many (but not all) communities, a second more insidious divide might still result from inequalities in search skills. The concept of "e-health literacy" has been characterized as a combination of six separate relevant literacies31 (Figure 1): health; computer; traditional (basic literacy and numeracy); science; media, and information. Similarly, Nutbeam's classic definition incorporates the notions of functional, critical and interactive health literacies that have been applied by the author of this review to the online health environment32. Critical literacy challenges in finding relevant online health information, for example, might include information overload and knowing whom to trust33. A recent study has concluded that the general population does not have the Internet skills necessary to maximize their use of online information, and that this may be a particular concern for young users, who are assumed to have more expertise than other age groups34. Ironically, an example of highly developed consumer e-health literacy might be reflected in the Drug buyer's site (www.drugbuyers.com)*. The nature of this site was described by Boyer and Wines (2008) in an account of drug enforcement efforts to restrict online availability of controlled analgesics without prescription30. This web community of individuals gathered intelligence on sources of prescription analgesics, including observation of overseas sites and access to "understanding and compassionate doctors". It claimed that some doctors and some online pharmacy owners were also message board participants.

Figure 1 – The eHealth literacy 'Lily' model (Norman & Skinner, 2006[31])



Regulation of E-Pharmacies

There are good examples of national standards to safeguard consumers. The General Pharmaceutical Council in UK has an Internet pharmacy registration procedure, during which a green cross electronic logo is issued to qualifying pharmacies with a unique registration number of 22. The US National Association of Boards of Pharmacy run the 'Verified Internet Pharmacy Practice Sites' (VIPPs) programme23, where VIPP-accredited pharmacies can be sought online by consumers and are similarly identified by a logo easily. Few would argue that it is all too easy to fake such accreditation marks, if a rogue outlet so wished. The bigger question, however, is whether consumers recognize - and act upon - the information provided by the presence or absence of such logos. If not, then there is little motivation to even try and circumvent the regulatory system. Tony Delamothe, web editor of the BMJ, mused upon these very issues in 200024. He noted that one of the potentially harmful developments had been a proliferation of web content quality measures that had not been validated and could thus do more harm than good. He also noted the arguably greater impact of the market on rogue practice following the crash in share value of drkoop.com which had intermingled information and advertising. Commentary and research reporting actual or potential illicit use abound, and often conclude with a call for national and international enforcement co-operation25-29. Whilst there is concern that enforcement of regulation on the Internet is difficult, there are recent studies that show some regulatory effectiveness. Boyer and Wines, for example, undertook a study of online opioid purchase without prescription and concluded that the 2005 'CYBERx' operation by the US Drug Enforcement Agency had resulted in 'striking decreases' in availability30.

Future Scope of E-Pharmacies

Since the framework and prototype have been implemented in the project with in limited time, there are few ways that we thought can be further improved and implemented in the future work.

First of all, personal data storage will be main risk for privacy security, especially the password encryption in the cloud database. Some kinds of encryption methods such as RSA and DES, etc. can be applied to improve the data security level. In addition, communication between client and server need encryption for avoiding the sniffing.

Secondly, this prototype is just a simple application to show how the framework is applied, so the responsive web design mainly focus to the mainstream handheld device (iPhone and iPad) in the market. Few other type system of the mobile such as the Android will be added to well-adapt.

Thirdly, considering the difficulty in remembering many website username and password, the account combining with some existing account of website and software such as MSN, Facebook, etc. is necessary as it will reduce the user's burden.

Lastly, since the MS cloud database has been opted as the development part of the model, so the data transfer will be further researched and implemented in case if the owner of the website want to change the database vender. Huge amount of data transfer will be a serious problem in the future if this situation will happen.

The purpose of all these works aims to provide user a great experience and easy user interaction. Technology changes the life, so learning new technique constantly is quite necessary and crucial.

Under the e-pharmacies format, patients will fill out their prescriptions online and get medicines delivered at their doorsteps. The global e-pharmacy market, estimated at $69.7 billion in 2019, is expected to grow 17 per cent y-o-y to $244 billion in 2027. India's share in the global market is however comparatively small. At $9.3 billion in 2019, it is expected to increase at a CAGR of 18 per cent to $18 billion by 2023.

In developed countries such as the USA and Europe, e-pharmacy is a flourishing very fast and is the part of the more structured medical services market. Medicines are prescribed by physicians and tracked through barcoding to ensure systematic and proper supply.

Barriers to E-Health

- Operational Barriers-This area of worry relate to the interoperability of systems which e-Health aims to provide. First, a system is to be created with an interface allowing existing computer system to interact with new computer, which e-Health will introduce. Second, there must be a common standard electronic language to cross communicate between various healthcare organizations about the medical data, like patient records and hospital internal record. There must be formal agreement on what the optimum method for communication of such data between organizations.
- Cost/Benefits Barriers-As the name suggest it is the barrier associated to the cost in implementing e-Health solutions, whether it is feasible in-terms of capital wise i.e. do the benefit of e-Health outweighs the value required to implement E-health. From the technical side, the implementation of E-health solutions is clearly beneficial as compared to earlier methods like the paper-based record keeping systems but from the healthcare organization side these benefits might not outweigh the value of implementing e-Health solutions. The cost of implementing e-Health solutions could be tens of thousands of dollars and this does not even involve the requirement of hiring teams of IT professionals to support and maintain the software throughout its life cycle.

Perceived benefits and risks of purchasing medicines online

Benefits/Advantages	Risks/Disadvantages
• Lower prices • Privacy / Anonymity • Convenience (e.g. housebound patients) • Medical Information • Available 24 hours a day, 7 days a week • Added value through functionality like personal medication profiles • Price comparison possible through online mediators • Regulated medicines available without prescription • Not limited by traditional pharmacy supplies	• Unlicensed dispensing • Counterfeit drugs • Lack of protection of personal and financial information • Lack of pharmacy information (e.g. address) • Additional fees (e.g. shipping fee, account set-up fee) • Prices can change quickly • Inadequate safeguards to personal health • Sale of medicines that are dangerous if taken without medical supervision • Pharmacist not always immediately available online • Fears about the integrity of the medicines supplied • Damage through inadequate storage or delivery precautions • Fears about the qualification of the prescriber • Bypassing the health professional-patient relationship • Limited participation by third-party payers

Conclusion

By implementing this web based application the web site and customized application on the tablet the management of the patients are going to be considerably easier, efficient and fewer time consuming. It will be easy for the doctors and patient to access the records and reports because the history and reports are already present within the system, therefore the patient will not need to carry all the reports and large x-rays and MRI films etc. The patient details are already present within the database while registration so there's no got to fill a form during emergency cases. The doctors can check details of the patients on their system, can provide prescription on a click which will be sent to the pharmacist this will reduce a huge amount of time as the pharmacist knows which medicines to be kept ready before hand, the communications among the doctor and patient is enhanced because the patient can get the maximum amount help online. It will help to scale back many manual efforts, time taken and capital . Therefore in the area of health delivery, hospitals can benefit a lot from the use and supportive role that web based system will enhance.

- Stock inventory management/ Administration
- Drug Administration
- Staff administration/ Management
- Patient's Administration

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