

Cloud-based EHR in Medical Practices

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Abstract: Cloud computing is an environment which is created for users to access some software which is running on some other hardware and Electronic Health Record (EHR) which is used by physicians in medical practices. EHR as its name indicates it enables hospitals/Clinics to store and retrieve detailed health information of a patient in a centralized system which used by health care providers or by patients also. EHR helps in communicating all centralized records of a patient to any health care provider in a secure and confidential manner. The purpose of this paper is to focus on EHR functionalities with its modules with practice management used on a Cloud-Based server from which any user can have access from anywhere as this is an On-Line application which only require a gadget and internet which runs through a web browser.

Keywords: Cloud-Computing, Electronic Health Records (EHR), Health Care, Medical Practices, Security.

Introduction

A cloud computing is an environment created in a user's machine from an on-line application stored on the cloud and run through a web browser. In simple, Cloud computing is using the internet to access someone software running on someone else's hardware in someone else's data center. Cloud Computing is germinating its benefit to industrial sectors especially in medical scenarios. In Cloud Computing, IT-related capabilities and resources are provided as services, via the distributed computing on-demand. From a service point of view, cloud computing includes 3 archetypal models: software, platform, and infrastructure.

- Software as a Service (SaaS)-End Users e.g. Facebook
- Infrastructure as a Service (IaaS)-Application Developers e.g. NTT Communications
- Platform as a Service (PaaS) - Network Architects e.g. Azure

“An Electronic Health Record (EHR) is a medical record or any other information relating to the past, present or future physical and mental health, or condition of a patient which resides in computers which capture, transmit, receive, store, retrieve, link, and manipulate multimedia data for the primary purpose of providing health care and health-related services.” EHR systems basically fall into two categories: cloud-based or client-server. In a cloud-based system, a practice's data stored on external servers and can be accessed via the web, requiring only a computer with an Internet connection. Client-server systems store data in house, requiring a server, hardware and software be installed in the physician's office. The use of cloud-based electronic health records is spreading, especially among small physician practices.



Fig. 1 : Cloud Based EHR.

Need of an EHR

EHR is a convenience for us to replace conventional paper records that we used in medical practices into electronic records. EHR provides us many facilities that are not quickly possible through paper based system like

- Health Information Exchange (HIE) - HIEs work on the principle of a network – they grow stronger as more participants join as it begins sharing of a patient health history, medication history, lab results, family and social history and vital statistics with his specialists, emergency care providers, and so on. This sharing of information helps ensure that a patient gets the best quality of care, because all of his providers will be in sync.

- Clinical decision support (CDS) – CDS system is one that assists the provider in making decisions with regard to patient care. Some functionalities of a CDS system include providing the latest information about a drug, cross-referencing a patient allergy to a medication, and alerts for drug interactions and other potential patient alerts that are flagged like Vitals are not in normal range. With the continuous growth of medical knowledge, each of these functionalities provides a means for care to be delivered in a much safer and more efficient manner.
- Computerized physician order entry (CPOE) – CPOE is a system that allows ordering of tests, medications, and treatments for patient care using computers and also involves efficient electronic communication of the orders because nursing and pharmacy staffs do not need to seek clarification or to solicit missing information from illegible or incomplete orders
- E-Prescribing -Instead of handling a patient, a prescription on a piece of paper that can be lost, misread or stolen, his provider will send an accurate, error-free and understandable electronic prescription directly from the point of care to the pharmacy – adding to the quality of patient safety and care.
- Predictive analytics - Software continuously searches the information, a patient's caregiver enters into his EHR, and alerts them when any of thousands of possible changes in his condition happen simultaneously – such as an increase in temperature or low blood pressure, combined with various lab and radiology results
- Security - Storage and transmission of information are the two areas someone might try to gain access or intercept someone's private records. The healthcare industry has similar encryption and authentication methods to govern data security, on top of Health Insurance Portability and Accountability Act (HIPAA) to dictate roles-based rules around access to records.

Cloud Based EHR System vs. Paper-based Systems

Paper-based records require a significant amount of storage space compared to digital records. When paper records are stored in different locations, collating them to a single location for review by a health care provider is time consuming and complicated, whereas the process can be simplified with electronic records.

Check out this table to compare a paper-based system with EHR:

Table 1: Paper Based System vs. EHR System

Paper-Based System	EHR System
Paper charts can be easily misplaced	Paper charts can be easily misplaced
Appointment reminders have to be sent manually	Automatic appointment reminders are sent from the EHR
Identification of patient characteristics is often difficult and time-consuming.	Patient characteristics are fully searchable and linked to patient history
Manual filing of insurance cards	Insurance cards are scanned and instantly put into the system
Time must be taken to pull charts and refile.	Charts are updated and e-filed instantly
Waste valuable time as office staff has to transfer records by fax or mail. Because records aren't stored in a centralized system and also difficult to put together complete history	With EHR exchanging information is faster because office staff can skip the retrieval and faxing process and transfer records electronically. It provides a complete information about a patient
Doctor's access to medical records is limited by location and office hours	EHR provides 24/7 access to patient records and lab records from any location with internet access.
Human error can occur in clinical information	Reduced risks due to human errors

Major Modules associated with an EHR

EHR in medical practices must contain some important modules which are required for both physicians as well as for patients which help them in saving or retrieving some medical details.

- Registration - The first one and very important module to be implemented while working on EHR is registration. This module require registration for a practice which includes registration of physicians, front desks or nurses working in a hospital and registration of patients who are coming in a hospital for their treatments

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- **Management:** The second one is setting that includes the process of changing some required information for practice/physician etc. It helps in providing some rights to a staff member, e.g. a front desk can have the access of making appointments or registering a patient records etc. It terms as Role-Based Access as there are many different kinds of personnel who will have access to the patient health record, from the patients themselves to the technicians responsible for the management of the provider's servers.
- **Dashboard:** This module keeps track of daily activities of a logged in user like: daily administrative duties, patients check-in, etc.
- **Billing:** This module related to billing/payment for those done in encounter of a patient.

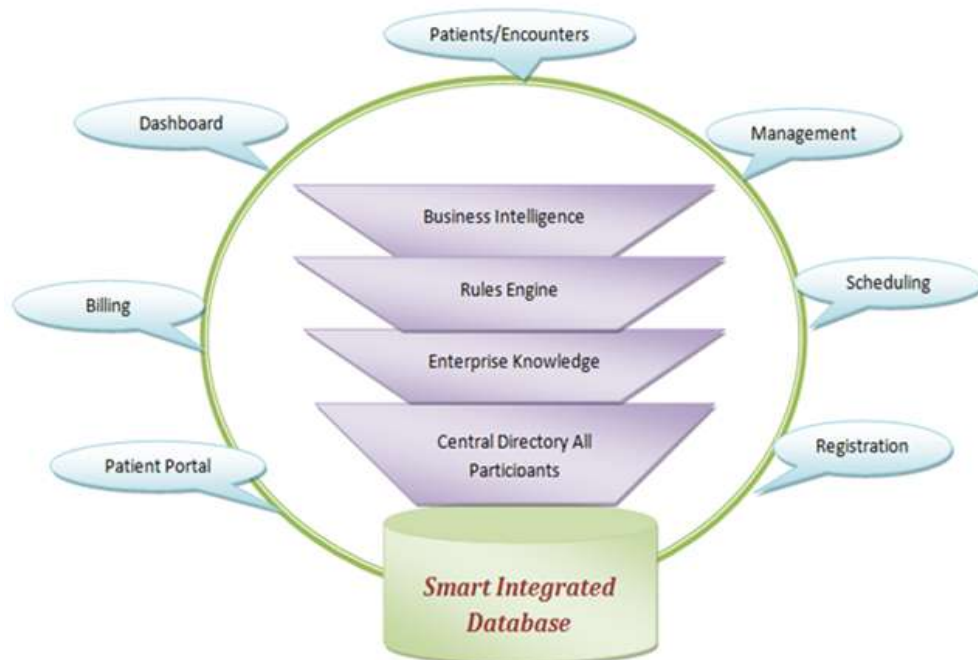


Fig. 2 EHR Major Modules

- **Scheduling:** This module is implemented for creating and monitoring the appointments of a patient and physician who is going to examine that appointment. This contains all the appointment records of physician.
- **Patients/Encounters:** This module is responsible for handling the encounter of a patient which includes some medical information like Chief Complaint/ History of Present Illness (CC/HPI), Review of System (ROS), Physical Examination (PE), Assessments, allergies, and medical Histories etc. of a patient.
- **Patient Portal:** A patient portal in EHR is a web browser for a patient which a patient can access and able to retrieve his details given in EHR. A patient love to making or registering for their appointments after office hours. By looking at their calendar, a patient can easily know about his/her appointment status.
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Benefits of Cloud-Based EHR

As we know all software and clinical data stored, shared and updated in the cloud, providing medical practice with many benefits. Some benefits are:

- **Reliability:** Cloud based EHR software runs on the web instead of the computer; we don't need any physical servers and can function efficiently from a small space. And also no need to keep upgrading your hardware/software.
- **Cost Effectiveness:** As there is no cost associated with EHR implementation, so its saves our money. Practices just need to pay a monthly fee, no additional cost for set up or licensing fees, maintenance, updates.
- **Reduced IT Requirements:** As in Cloud Based EHR there is no requirement of installations, configurations, testing, updating hardware/Software, so requirement of IT experts is reduced.

- Superior accessibility and collaboration: EHR users enjoy the relatively new luxury of access to their data from wherever they want, whenever they want. Users can securely log on to their system with just a gadget and the internet connection. With this, you can remain connected to your staff and patients even long after you have left the office.



Fig. 3 Benefits of Cloud-Based EHR

- Flexibility: Medical practices can expand without bothering much with the IT support. A cloud-based EHR system eases the process of adding users, physicians, locations, templates, etc. The flexibility of a cloud-based EHR system helps companies to reach great heights without actually emptying their pockets.
- Security concerns: As Security and privacy of data are the most important ones. Cloud-based EHR systems achieve HIPAA compliance through data centers with bank-level security and high-level encryption methods that render data unreadable and ensures that the data stored cannot be used or accessed by any unauthorized user. There are many ideas behind the data security in cloud based EHR. Data Encryption is one of them which helps in keeping the information secured and controlled by encryption. One more idea is to keep track of the logs of the people that have had access to the system

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Conclusion

Implementing EHR in cloud based system provides practitioners some advantages like accessibility and availability as it can be used anywhere on any device via internet, flexibility, reliability where user has the confidence that no system crash can affect their EHR, Cost effectiveness i.e. no need of purchasing costly servers, but it also comes with some consideration for HIPAA compliance where privacy and confidentiality of patient data are essential. As Cloud is a popular platform I believe that with proper implementation EHR on cloud is one of the best options for medical practitioners. EHR adoption must be considered one of many approaches that diversify our focus on quality improvement and cost reduction.

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