Creation of e-health system
Aliyeva Aynaz

Abstract
Over time, the rapid development of technology has led to an increase in health care costs and the emergence of various diseases, including a decrease in highly qualified doctors, which in turn requires consideration of the use and application of health information technology. With the help of HIT, healthcare organizations can improve a number of different processes and ensure efficient and effective delivery of services. New technologies such as cloud computing (CC) provide powerful opportunities for online HIT services. This can be achieved through a cloud-based e-Health model that will not only meet the current and future needs of the healthcare industry, but also reduce costs. Despite its great potential, HIT, unlike the CC model, has not yet been openly and widely discussed. There is no clear framework defining most of the concepts and relationships between HIT and CC. In this regard, it is considered important to evaluate and compare the results of such strategies. This article covers the concept of eHealth Cloud, its various features and various challenges to succeed in eHealth Cloud, along with creating an eHealth environment. It is also important to pay attention to the different ways to solve security and privacy problems.
Keywords: health information technologies; cloud computing; e-health cloud; care; security; privacy

One of the important strategies in healthcare is to improve healthcare services and minimize operational costs, which poses the challenge of planning the use of the latest technologies for a number of healthcare organizations. One of the most pressing problems facing healthcare in modern times is the shortage of qualified healthcare professionals such as doctors, nurses and pharmacists and the rapid increase in demand for medical services. As diseases become increasingly complex, new advances in technology and research allow for better diagnosis and treatment. This has led to the increasingly complex and expensive logistics of managing some operations. Another issue is the increase in competition in the field of medicine. Currently, some health care organizations offer different types of services. These services aim to meet the needs of different disease levels.

HIT has also used the latest innovations in technology such as database systems, Cloud Computing (CC) systems to provide effective and reliable healthcare solutions. Healthcare providers have been able to shift the complex management and maintenance burden of HIT to the Cloud in order to simplify the operations of doctors and minimize operational and maintenance costs. CC has also created an opportunity to share some information with a number of authorities. Sharing patient data has several advantages for the development of medicine. However, strict rules regarding the sharing of this information and the protection of patient privacy should be developed and enforced. However, there are some drawbacks related to privacy and data sharing. One such drawback is the fact that users can easily and voluntarily disclose their private information even if they choose to remain anonymous. Another problem is the threat of web analytics performed by third parties, who use any information available online to create a user profile. Monitoring and recording of users' behavior and internet traffic by some organizations leads to violation of their privacy, and in such cases, privacy problems arise.

e-Health Cloud Opportunities

Current e-health systems have a number of existing limitations:

High cost required to implement HIT: The cost of HIT requires investments in software, hardware, technical infrastructure, IT professionals and training. This, in turn, results in significant costs for healthcare organizations. Thus, HIT requires dedicated teams and adequate funding to provide day-to-day management and maintenance.

Dispersion of HIT and insufficient sharing of medical information: Limitation of some parts of medical information in separate departmental systems, in different clinics has caused HIT to exist as separate small systems in different departments of the healthcare organization. This fragmentation of data makes it

difficult to keep it together and share it within an organization or between different healthcare providers.
Lack of regulations to ensure the protection of electronic medical records: currently there are no regulations covering the issues of patient protection and safety.

Lack of eHealth Cloud design and development standards: There are no standards that healthcare professionals can use to design and build their systems. These standards will define how data is acquired, stored, used and protected, as well as definitions of data types, forms and sometimes the frequency of data capture. Another problem with eHealth standardization is that standardization bodies produce multiple eHealth standards. Some of these are not interoperable or directly linked to each other at the organizational level.

Centralizing healthcare data in the cloud can lead to a number of risks:

Data security risks: one of the security measures is to prevent unauthorized users from accessing the patient's medical information. For example, some healthcare systems have the ability to log each login attempt with usernames and include the date, time, and patient contact.

Risk of data loss: To reduce the risk of data loss, changes in database management systems such as Oracle, Cache' and SQL have created some concepts by providing effective solutions.

Risk of systems unavailability: in an emergency, one of the main problems can be the loss of e-health service. However, advances in business continuity science have had a positive impact on systems reliability and availability.
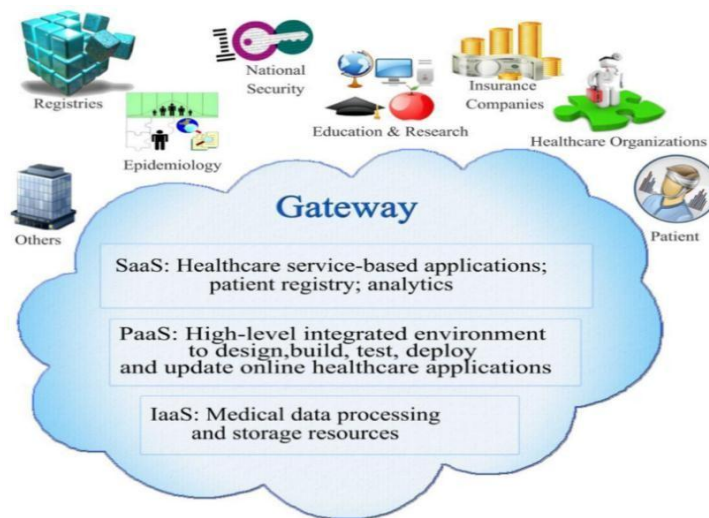

Figure 1. General architecture of the eHealth Cloud.

As shown in Figure 1, the e-health Cloud not only provides IT services to the patient, but also helps to increase the efficiency of the operation. Typically, Cloud storage consists of several parts: eHealth Cloud internally (private Cloud), externally (public Cloud), or a combination of both (hybrid Cloud). The main purpose of the eHealth Cloud layers is to create a platform that provides pre-built software tools for specialized HIT providers and software designers. Electronic Health Cloud consists of Gateway and Service-based applications:

Gateway: This component manages access to the Cloud; auditing the EHR (Electronic Health Record) for compliance with privacy and medical data sharing regulations; Consolidation and integration of EHR data into a new Cloud-based EHR; can be assigned to perform a number of important tasks, such as selecting and de-identifying an EHR to share with the public Cloud.

Service-Based Applications: services such as national security and epidemiology, registries, Web Portal,

Image Archiving and Communication Systems; all of which are provided as services that are easily managed through CC operational settings.

Software as a Service: Provides Cloud-based software solutions through which consumers such as healthcare providers or financial and insurance brokers gain access to the software capabilities of the cloud. Platform as a Service: Extends core infrastructure with a Highly integrated environment to design, build, test, deploy and update online healthcare applications.

Infrastructure as a service: physical processing and storage resources.

E-health Cloud has the potential to support collaboration between different healthcare sectors. For this purpose, it combines healthcare programs and integrates their various data sources. By doing so, distributed healthcare providers and hospitals will be able to network to more efficiently coordinate and distribute data. The resulting network will be more flexible and scalable for the integration and exchange of services and data, which will help reduce costs and increase efficiency. The centralized collection and storage of patient data in the E-Health Cloud has several advantages:

Better patient care: having a single patient medical record – which contains patient information from all patient encounters across all operators. Such records will allow healthcare providers to provide the most appropriate treatments by looking comprehensively at the patient's data.

Reduced costs: the ability to create an environment where common costs are shared between participants using the capabilities of CC. Small and medium-sized healthcare providers can use advanced IT infrastructures and services to support healthcare operations without incurring high operational costs. Another aspect of cost reduction is making medical records globally accessible, so there is no cost involved in sharing patient information around the world.

Resource shortage problem: Addressing shortages in terms of IT infrastructures and healthcare professionals. This is considered more important for some areas that lack primary health care facilities, such as remote rural communities. Cloud healthcare providers have access to remote healthcare services and data in such areas. It also allows various healthcare professionals to offer their services remotely, thereby saving time and effort and reducing the need for professionals to be present everywhere.

Better quality: storing medical data in the cloud will make it easier to provide relevant institutions, such as the Ministry of Health, with information about patient safety and the quality of care provided. One of two options will be available here, either to merge existing data or to provide online access for direct data entry.

Research support: e-Health Cloud offers an integrated platform to host the massive data warehouse of millions of patients accessed. This integrated platform can be used to develop data mining models to discover new medical facts and improve drugs, treatments and healthcare services, as well as to conduct medical research.

Supporting national security: The eHealth Cloud can enhance the monitoring of the spread of infectious diseases and/or other diseases. The cloud can serve as an early warning system for monitoring the spread of any dangerous infectious disease, and can also be used to identify areas of infection, patterns of spread, and hopefully the causes of outbreaks.

Supporting strategic planning: decision makers can use e-Health Cloud data for health care planning and budgeting. It can also be integrated with other Cloud services to help predict future healthcare needs. It will help plan the needs of doctors, medical laboratories and equipment, operating rooms, patient beds and other medical facilities.

Support for financial transactions: The ability to streamline financial transactions as the cloud can act as a broker between healthcare providers and healthcare payers. Billing, settlements and approval processes can be automated and integrated between both parties.

Facilitation of clinical trials: stored data allows the Cloud owner to collaborate with pharmaceutical companies and medical research institutes for clinical trials of new drugs. Since the data is collected in an

integrated manner, it is easy to detect the presence of cases of specific patients.

Facilitating the development of registries: shared data will enable the development of specialized registries for specific disease types, such as cancer and diabetes registries.

Security and Privacy Issues in the E-Health Cloud

Security and privacy in e-health and other domains are generally the same issues raised when Cloud customers want to move their data and applications to the Cloud. Protecting the security and privacy of patient records in the eHealth Cloud is of absolute importance and involves various requirements. First, the creation and storage of any type of cloud-based e-health record must protect the authenticity, integrity, and confidentiality of the content. After that, all healthcare data must be stored in a secure storage location with secure access mechanisms and secure transmission. Finally, the acquisition and sharing of health information must ensure comprehensive source verification, confidentiality and audit capabilities. Thus, common security and privacy issues in e-Health Cloud include:

Privacy: ensuring that health information is not accessed by unauthorized persons.

Integrity: ensuring the accuracy and consistency of health information.

Authentication: ensuring that users are who they claim to be.

Access control: ensuring that users only have access to healthcare information that they are authorized to access based on their authentication and access levels.

Non-repudiation: ensuring that the communicating party cannot deny sending or receiving information.

Privacy: ensuring that patients have the right to control what health information is collected about them, how it is used, who uses it, who keeps it and for what purpose it is used.

Auditing: ensuring the security of healthcare data and the overall eHealth Cloud system by recording and monitoring all users and data access activities

The eHealth Cloud represents a technology that provides unique opportunities for many health care providers to ease many challenges such as rising costs of health care delivery, data sharing, and shortage of health care workers. However, the benefits are offset by reliability, privacy, and security issues, in addition to a number of technical issues that must be addressed before healthcare providers can fully adopt and trust the eHealth Cloud. E-health offers a number of benefits that can transform the provision, acquisition and management of accessibility in healthcare. As technology continues to advance and regulatory frameworks improve, the potential for eHealth to revolutionize the healthcare industry remains high, providing a brighter and more accessible future for patients worldwide.

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