

Electronic Medical Records Applications

Introduction

The significance of medical records in healthcare has been recognized for a long time. Comprehensive and detailed records of patients will not only facilitate doctors' work but also help the patients to obtain a clearer knowledge of themselves. While the society is transforming into a digital era, the transfer of the medical records from paper-based to computer or cloud-based is inevitable. As a result, a concept of electronic medical records has emerged. The definition of electronic medical records is the storage of all healthcare data and information in electronic format with the associated information processing and knowledge support tools [1]. This paper reviews the current state of commercial EMR mobile applications and necessary technologies required to construct EMR applications such as dictionary maintenance and supporting tools development.

Commercial EMR Applications

There has not been a universal medical record system in the market today. However, healthcare providers employ several major EMR systems to maintain intimate connections between each other and with patients. One of the most commonly used EMR mobile apps worldwide is OpenEMR. It was originally developed by Synitech in 2000 and later became an open-source project. Like most of the similar applications in the market today, OpenEMR is free for both doctors and patients. It makes profit mostly by advertisements within its application[2]. With OpenEMR installed in their smartphones, healthcare providers are able to view patient information and medical record, create electronic prescriptions and schedule patients. On the patient portal, patients can view their prescriptions, result reports and current treatments as well as contact their doctors. Meanwhile, OpenEMR also supports an electronic billing system meaning that all transactions can be completed online.

Another example of EMR application is NextGen EMR/EHR System. Developed by NextGen Healthcare, it features a more complex version of EMR, called Electronic Health Record, or EHR. EHR includes everything medical records contain while having more information such as patients' previous test results, insurance information, or medication lists [3]. Moreover, Based on its information stored, NexGen System is able to briefly analyze patients' record and suggest patient to take related actions. Another key point of EHR is sharing, meaning that switching between doctors does not require the patient to generate new medical records [4]. As a result, NextGen's product requires cloud-based servers in order to

make retrieval of information by different healthcare providers in time. The cost of NextGen product is 599.99 dollars for service providers.

Technology Beneath EMR System

Database

A requisite component of the EMR system is a database, or dictionary that stores the patients' medical record. Based-on its application, such database can be either in local machines or in cloud-based servers. While all data and observations are stored in the database, such information should be encoded for security purposes and to facilitate data entries [5].

Prior to its construction, database designers should carefully consider the selectivity of data input and how information stored is related. Such discussion requires modelling the database with relational database schema or enhanced entity relational data models. Programming languages used during development can be query languages such as MySQL or server-side programming language such as PHP.

Support tools

Contrary to what many people believe, EMR system is not merely a database. It is the supporting tools that make the EMR system whole. Common functions of EMR system include electronic prescriptions, basic diagnostic of symptoms, communication between users and treatment reminders. These tools are called computerized clinical decision support tools [6]. Because they require direct interactions with users, these ancillary components are implemented in the form of user interfaces. In order to connect these tools to the core database, an application program interface, or API, is necessary. Such interface enables users to input, modify and retrieve data from the database thorough the application.

Building Blocks for Implementation

The building blocks for a complete EMR application include the construction of back-end database and development of accessing tools and related API. Because the construction of database server from scratch is uneconomical and time-consuming, it is preferred to employ the database to cloud services such as Amazon AWS and Google Firebase. In terms of supporting tools, front-end programming languages such as html and JavaScript can be chosen for web services while Swift and Android Studio are suitable tools for mobile applications. Furthermore, the application program interface can be created with existing frameworks such as RESTful API since they provide simplicity and lightweight.

Reference

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