MediTech : An Improvised E-healthcare Platform

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Abstract— **Web-based Meditech is an initiatively providing a platform to support the Electronic based-health facilities and telemedicine system which simplify and help to co-ordinate the effective home health care function of Hospitals, Clinics, or any Rehab centers. Meditech healthcare is designed as a platform to serve the patients the best e-healthcare available. In an attempt to provide smart healthcare MediTech has functionalities such as appointment booking, E_chat, predicting risk of diabetes, BMI calculator which gives value to e-health and telemedicine.**

Keywords—EHR, MediTech, E-health, Telemedicine, Web-based portal, Database etc.

I. Introduction

E-health systems can be used for prevention, diagnosis, treatment, monitoring, training, research, and management of health [1]. The aim with E-health is to provide better and faster health to patients while developing a system that will encourage interaction and communication between different point of access at different locations (provincial, regional, rural) for different types of health institutions (pharmacy, laboratories, hospital, family medicine clinic, emergency care etc...) [1]. E-health can host Healthcare information systems which provide a high-level support for electronic health records (EHR), archiving and communication systems [1]. E-health can incorporate Telemedicine systems to provide healthcare at a distance and improve access of rural communities to healthcare services [1]. E-health can also incorporate m-Health which can allow rapid collection and sharing of data, real-time monitoring, and self-management by patients through various mobile applications and wireless communication via SMS [1].

One major component of e-health is the EHR [1]. It represents essentially the database of all health encounters undergone by a patient [1]. The EHR will be updated and consulted by many physicians and health institutions with varying levels of access through an e-health platform.

EHR systems come with many challenges to their implementation. The most important ones are user compliance to the EHR system, privacy and security issues [2]. Users must obtain proper training in order to avoid resistance to a switch from a paper system to a digitized health record system [2]. The EHR system must also match and integrate easily into current healthcare facilities workflow [2]. Otherwise, the aimed customers will not be inclined to switch to an electronic health record system. This is why it is important to take in consideration the major requirements demanded by healthcare facilities, healthcare providers and patients.

Providing a platform that allows communication between different healthcare organizations and different healthcare specialists is essential in the Electronic Health Record systems. Many cloud computing models have proposed collaborative platforms to address this issue [2].

However, privacy and security concerns remain major risks in the implementation of such platforms. Several solutions that are encryption-based and others that are not have been explored in the literature [2]. These privacy and security concerns will be taken into consideration throughout the design of our Meditech platform.

II. Literature Review

In Europe, at least 23 e-Health platforms currently exist [4]. They were found to have different focus.

Some are centralized and provide a common point of access, like the EFA in Germany [4]. EFA is a communication platform establish for one type of user [4]. It enables doctors to share their patient's information across facilities and geographical boundaries [4]. They provide an organize electronic view or case file for each of their patients and have access to diagnosing imaging, other doctor's report amongst other services [4].

Others allow interaction between two sides: users that provide services and others that require the services [4]. One example of this is the Kanta platform in Finland [4]. One part of their platform has features for doctors like training and the other part has features for patients like informing them that they can control who accesses their data by giving their consent [4].

Some platforms allow management of the patient' EHR by their provider and others allow management of patient's data by the patient by organizing their Personal Health records [4].

Platforms have also been designed to provide many services in one platform, sometimes at a distance through Telemedicine, to allow data exchange, storage and new functionalities or applications to be developed within their existing platform [4].

Considering all of these different proposed functionalities, services and platforms that have been developed, we will attempt to design an improved e-Health platform called Meditech.

To design the Meditech platform, the following functional requirements were taken into consideration. Some of them were implemented for the scope of this project and others were considered as future work needed to complement and develop the proposed Meditech platform.

1. Platform must allow patients to request / book appointments with more a less urgency while keeping a log of associated symptoms and supporting photos entered by an AI preliminary diagnosis Module.
2. Platform must allow patients to make a request to see (in person or virtual e-consult) /talk/chat (text messages) with physician or nurse while providing an estimate wait-time.
3. Platform must provide a secure communication for virtual e-consultations.
4. Platform must notify patients of lab results status: if they have arrived and if they were reviewed by a physician
5. Platform must restrict access to lab results that have not been consulted, reviewed, and explained by a health professional (physician /nurse).
6. Platform must allow patients to request a download copy of their e-health records from their clinic.
7. Platform must keep a detailed log, accessible by patient, of all their consulted data by tracking user status/employer, date, time.
8. Platform must keep a log of patients concerns about their data being accessed suspiciously.
9. Platform must allow patients to enter their self-measured data (weight, BP, allergies etc.…)
10. Platform must keep a record of all patients measured data separate from health professionals measured data without ever erasing any logs. No modifications, only new logs can be added.
11. Platform must require authentication before patient data is accessed.
12. Platform must restrict access of patient's data to only authorized users (MD of patients and their nurses, referred MD)
13. Platform must keep a detailed log of all encounters between patients and physicians/nurses. Platform shows the type of encounter (in person visit, call, virtual e-visit) what was done, by whom (MD, nurse etc.), how and at which date and time.
14. Platform must provide an AI preliminary diagnosis feature that will prompt a more a less urgent feedback from the doctor/nurse.
15. Platform must request consent from patient when their physician attempts to share their info to other specialists.
16. Platform must keep a record of all previous current and pending prescriptions, immunizations, diagnostic imaging.

17. Platform must notify doctors in real-time when pharmacy received a Rx renewal request from patient.
18. Platform must keep a record of all immunizations, those who need to be updated, those who are missing.
19. Platform must notify doctors in real-time when a laboratory has released lab results or diagnostic imaging

For non-functional requirements, we have established that the platform should be secure, user-friendly, have optimal network speed and be reliable.

III. Proposed Architecture

The proposed design framework of Web-based Meditech Portal depicts how internal function are organized and helps to provide the best e- healthcare for the hospital *Figure1* depicts the high-level architectural view of Meditech, and major components include:
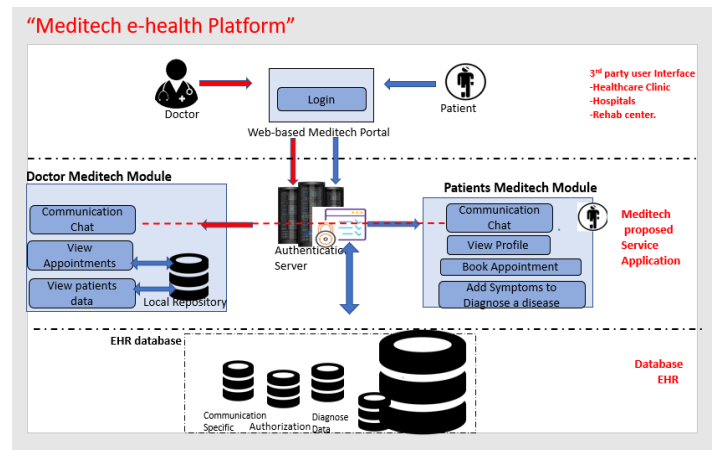
A. Web portal

This is User-Interface level for any Hospital, clinic or 3rd party who accepts Meditech as a e-healthcare platform. This is a default Web browser configured to execute E-health platform where a user tries to login into the system to experience the best health care provided by Meditech Portal.

B. Meditech Proposed Services application

1) Doctors Meditech Module

This Module specifies a webpage for the Doctors registered with Meditech E-health platform. It has various functionalities such as Viewing the appointments, communicating with client for serious case discussions.

2) Patients Meditech Module

This module specifies a webpage that allows Meditech E-health Platform's Patient user to access their profile and medical records. They login using a secure authenticator to access the profile, Schedule an Appointment, Diagnose disease etc.

3) Authentication Server

The login credentials are then verified by an Authentication Server for establishing a Secure connection between doctor and client for chat feature. This Authenticator also provides a security to the database access and retrieval functions. Only Authorized user can access the portals.

C. Database Layer

The Database is the main repository that has Meditech Patient's E-Health Record. The database can be accessed only by an authorized Meditech user to retrieve of do any management commands. It also contains specific database for specific functionalities to increase the retrieval speed and provide faster and better service.

IV. MEDITECH FUNCTIONALITIES

This section explains all the necessary functionalities of MediTech to provide an improvised e-health & telemedicine services for the healthcare arena. They are as follows:

1. Ease-of-use

The Web-based Meditech is developed using a user-friendly interface portal for everyone using e-heath care.

2. Secured Channel

Web-base Meditech introduces a feature of communication with the doctor using a secure network channel and a network Authenticator.

3. Scheduling an Appointment

The users of Meditech can book an appointment to visit doctor in a very convenient way using the portal at your home vicinity. The doctors of Meditech can view these appointments and can send an acknowledgment with decided time and location.

4. Diagnose a disease

Meditech is also capable of predicting a disease and provide medication using dataset of EHR (Electronic Health Record) and mention the allergy or side-effect due to the medication prescribed.

5. Chat Feature

The chat feature of Meditech makes it possible to have a quick response from the doctor regarding serious issue of the case and get an instant health , thus providing the best healthcare available.

6. BMI calculator

Body Mass Index (BMI) is a simple calculation used to predict fitness by using weight and height. A person with BMI of 25.0 and more is considered overweight, while a healthy BMI ranges from (18.25 to 24.9) Meditech has an inbuilt BMI calculator to keep you healthy and fit.

7. AI Tools: Diabetic Type2 Risk prediction:

Meditech has an AI feature of predicting the risk of having diabetic type2 in near future. This is just a risk prediction and does not confirm the diagnosis of diabetics. This feature is risk prediction based on following algorithm and some research papers.

Meditech uses certain questionary for predicting risk of diabetics such as age, gender, family hereditary considerations, blood-pressure related issues, cholesterol intakes (H/L), physical inactivity and the BMI range.

The prediction results in 3 different case with low, high, and medium risk of diabetics type2 risk. For a better e-health tools, you can further save the results and download a copy with your sections, your result and date created. Thus, a doctor will be aware of your health all time and can predict the disease even before the lab results.

V. TOOLS AND TECHNOLOGY USED
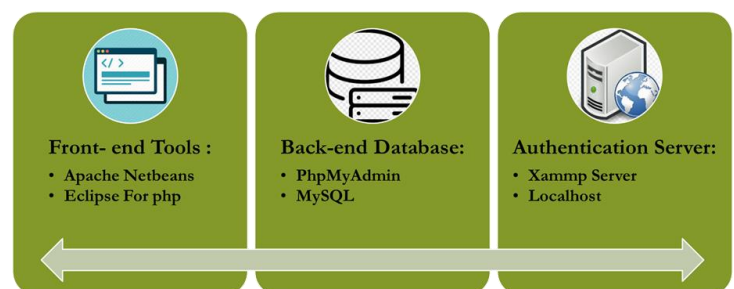
A. Font-End Development Tools

This paper uses the product development which can not only able to integrate with the existing technology but also it will be beneficial for the developers as the tools used are widely accepted among web-developer thus avoiding any dependencies. Hence the use of Apache NetBeans and Eclipse.

i. Eclipse: It is a well know tool and being used in variety of project and also web developer is highly familiar with this tool, hence the recommendation of tool.
Eclipse for Web Developer is recommended, Eclipse for Web Developer is being used to develop Java script for our prototype.

ii. IDE: It's a Apache NetBeans, just like eclipse, NetBeans IDE is famous for its use in web development, we have used net beans primarily to develop PHP and HTML5.

B. Database Tools

i. PhpMyAdmin is a free software tool written in PHP that is intended to handle the administration of a MySQL or MariaDB database server. You can use phpMyAdmin to perform most administration tasks, including creating a database, running queries, and adding user accounts.

ii. Once phpMyAdmin is installed point your browser to ***http://localhost/phpmyadmin*** to start using it.

C. Server Tools :

i. XAMPP is an abbreviation for cross-platform, Apache, MySQL, PHP and Perl, and it allows you to build WordPress site offline, on a local web server on your computer. This simple and lightweight solution works on Windows, Linux, and Mac – hence the "cross-platform" part.

ii. Its a free and open-source cross-platform web server solution stack package developed by Apache Friends, consisting mainly of the Apache HTTP Server, MariaDB database, and interpreters for scripts written in the PHP and Perl programming languages.

iii. Its most widely compatible with : Apache , MySQL PHP + PEAR, OpenSSL, phpMyAdmin, XAMPP Control Panel, SQLite, Tomcat

VI. SIMULATIONS AND DEMO

This section includes implementations and working of MediTech web-based portal for patients and doctors of Hospital.

Fig. 1-User interface of MediTech

Fig 1. Shows the user interface of Meditech Portal, only authorized users are given access to the MediTech System. Furthermore, there are 2 sections: Doctors' module & Patients module.

A. Patient MediTech Module

The patient module, a patient is provided with a list of features he can use for a better healthcare such as,
- ✓ View Patients profile,
- ✓ Consent management form,
- ✓ Book an Appointment,
- ✓ BMI calculator.
- ✓ Diabetics Type 2 risk predictions,
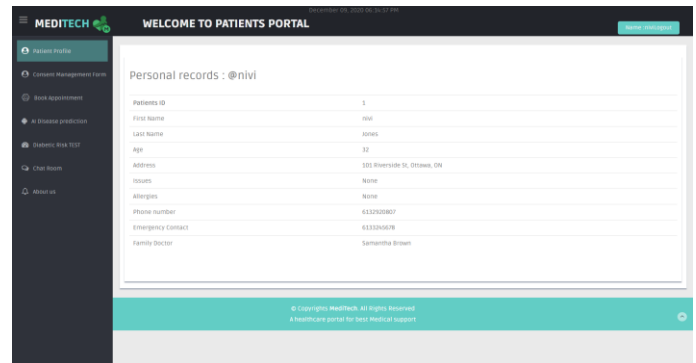- ✓ Chat room,
- ✓ About us.
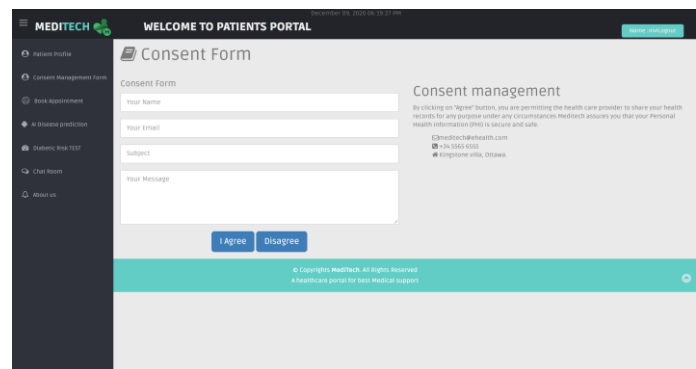

Fig. 2-Patients profile
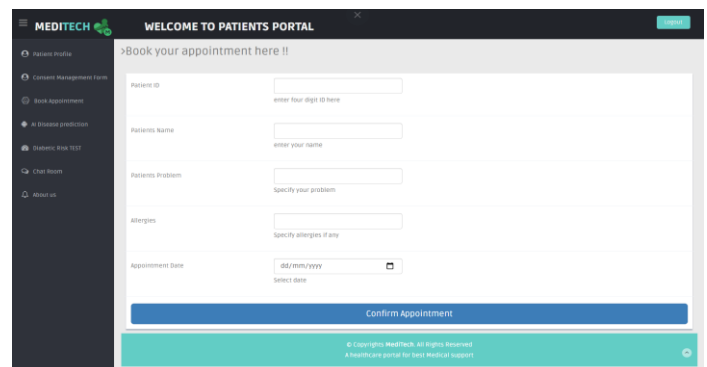

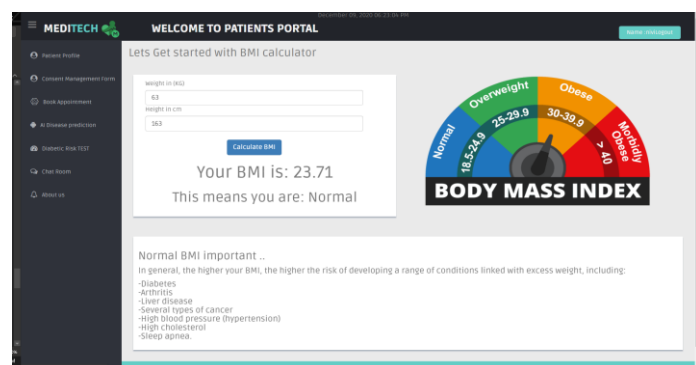*Fig. 3-Consent Management policy*

Fig. 4-Book an Appointment

Fig. 5-BMI Calulation

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Fig. 6-Diabetic Risk Prediction-User Questionary

Fig. 7-Diabetics Prediction Risk & Save Report

Fig. 8-Chat room

Fig. 9-About Us

B. Doctors MediTech Module

The Doctors module is provided with a list of features he can use for a better healthcare such as,

- ✓ View Doctors profile,
- ✓ View Appointments,
- ✓ Patients History
- ✓ Chat room,
- ✓ About us.

Fig. 10-Doctors Profile page

Fig. 11-View Appointments

Fig. 12-Doctors Chat Room

VII. CONCLUSION

In this fast-moving world of automation, MediTech proves to be the best healthcare portal for any individuals and doctors to know their patients better and treat them in best way. It automates many of the process in healthcare such as viewing our personal digital records which has an overview of healthcare and all previous medical records. The MediTech portal further thrives an individual to maintain a healthy and fit lifestyle by continuously monitoring BMI ranges and keeping track of them.

MediTech also offers a best AI diabetics risk prediction with a feature of saving those records to keep a track of patient's history and predict upcoming disease and treat before it gets more serious and harmful. Also, this project can be found in GitHub link: *https://github.com/ashwini1025/MediTech* To run and install please follow the guidelines in readme file.

With this paper, our goal is to make the healthcare mobile and accessible to more and more people, and the more people use it the more robust it becomes. With the widely accessible internet platform, this application can help people monitor their health even in remote areas.

VIII. REFRENCES

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