iCure EHR Project Proposal

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Introduction

iCure is an Electronic Health Records software designed to be applicable in different scenarios. Features include electronic records of medical treatments, appointment scheduling, emergency calls, patient-doctor communication platforms and other supporting features all work together to provide both care for patients and efficiency for doctors.

Objectives

The goal that iCure is pursuing is not only to build up a software that keeps health records in a systematic way, but also to provide services utilizing the power of the data to create a user-friendly environment for patients and doctors. By saying this, we are going to implement functions for patients and doctors respectively during medical treatment processes. In addition to that, iCure will do to serve a platform for interactions between patients and doctors, which includes forums and chat rooms for medical consulting or personal treatment follow-ups. For patients, iCure focuses on enabling them to have medical care resources not just when they're at the hospital, but whenever they have concerns for their health. For medical care providers, the electronic records will help them to keep track of the medical history of each patient they treat, which will make the whole treatment process more efficient. And as a software driven by data, iCure will be able to provide tailored service for each user, which can refine the traditional medical treatment processes significantly.

Stakeholders

Customer: Legally Registered Health Care Providers (e.g.Hospital, Clinic…)

User: Everyone (mostly doctors and patients)

Others: Pharmaceutical Company, Popular Science Authors and so on

Value Proposition

- Sales of software

  Hospitals need to pay to use the electronic diagnostic system.

- Advertisements

  There can be advertisement positions in the website, especially in the forum section.

Functionalities

	Visitor Mode	Patient Mode	Doctor Mode
Priority 0	- Register or login - Search for hospital and doctors	- Log out - Profile - Search - Appointment	- Log out - Profile - Schedule - Appointment - Diagnosis
Priority 1	- Forum - Tutorial	- Chat room - Emergency Call - Forum - Rate a doctor - Reminder	- Chat Room & Status - Forum - Reminder
Priority 2		- Online pharmacy - Personal diagnosis history	- Log - Statistics

Highlight of this Project

- Easy Communications
    - Private chat rooms between patients and doctors
      Private one-to-one chat room makes online medical consulting possible. Patients no longer need to have a face-to-face appointment with doctors to get medical help. They can communicate their concerns and symptoms with doctors daily.

    - An online forum for all the patients and doctors
      Patients can post their questions and concerns on the forum. Doctors and other users can provide answers and support or post popular science articles on the forum. The forum saves time and resources for both patients and doctors and can help create a helpful community.

    - Emergency call system
      When the patient is in an emergency situation, this function can help the patient to get medical services in time. Our emergency call system will also inform the hospital and doctors to let them prepare ahead.

- Online Pharmacy
  Patients can buy various drugs and equipment with prescriptions in this online pharmacy. Also, after payment, it provides a home delivery service.

- Detailed Electronic Records
  - Personal profiles for patients and doctors
    Personal profiles for patients include personal info, contact info, insurance info, etc.
    Personal profiles for doctors include personal info, major field of study, ratings by other patients.
    Doctors can better treat patients with personal information.
    Patients can select their preferred doctors to make an appointment with.

  - Diagnosis
    After each appointment, detailed diagnosis would be saved in the system.
    Diagnosis includes patient's info, reason for visit, medical check details, etc.
    Doctors can refer to previous diagnosis to make judgements. Also, they can easily conclude trend information about causes of patients' illness.

Detailed Design

There are three different modes for users to visit our website: visitor mode, patient mode and doctor mode. We will introduce the functions of our system according to different modes.

Visitor Mode

- Register or login
  Priority 0.
  Users can login if they already have accounts, otherwise they can register for new ones.
  While creating a new account, user is required to choose their role as patient or doctor.

- Search for hospital and doctors
  Priority 0.
  This function allows users to search for hospital based on locations and further search for doctors based on departments. Without login, users can view the profile of hospitals and doctors. However, they cannot make appointments or chat with doctors.

- Forum
  Priority 1.
  Any user who visit the website can view the forum, which includes articles or questions posted by logged-in users and the following comments. But the user cannot post or comment anything as a visitor.

- Tutorial
  Priority 1.
  The tutorial function starts with providing the visitors with an introduction of our EHR system. Moreover, it also includes detailed steps which guide users to get familiar with all the functions of the system.

Patient Mode

- Log out
  Priority 0.
  This function let patient logout the system. Then the user will stay in a transition page for several seconds and will go back to the main page as a visitor.

- Profile
  Priority 0.
  Patients can create or edit their profiles, which include personal information such as name, gender, age, photo, etc. The profile will be saved and can be shared with doctors who the corresponding patient is assigned to.

- Search
  Priority 0.
  After narrowing down the scope of suitable doctors, the patient can directly make appointments on the search page or chat with the chosen doctor using the chat room function. The state of doctor will be shown.

- Appointment
  Priority 0.
  Under this function, a patient can make an appointment, view upcoming appointments and check history appointments. If making an appointment, the website will direct to searching for doctors. After making the appointment, patients can chat with the doctor privately using the chat room function.

- Chat room

Priority 1.
The chat room provides a platform for patients to privately communicate with the doctors. Patients can access the doctors by searching or checking their appointment history.

- Emergency call
  Priority 1.
  An emergency button is on each page of our website. Once the patient clicks the button, the system will automatically contact the emergency medical service and send out the patient's profile.

- Forum
  Priority 1.
  The patients can make new posts on the forum, such as sharing their experiences or asking questions, and add comments under existing forums.

- Rate a doctor
  Priority 1.
  After seeing the doctor, the patient can rate the doctor with a general score and comments. The ratings will be displayed to all users as part of the doctor's profile.

- Reminder
  Priority 1.
  The email reminders will be automatically sent to patients when they successfully made appointments, when the appointment is coming. The patients themselves or their appointed doctors can also set other reminder for them.

- Online Pharmacy
  Priority 2.
  Patients can search for medicine by name or keywords and add to shopping cart for purchase.

- Personal diagnosis history
  Priority 2.
  The patients' own diagnosis history records will be stored as a library for viewing. The records can be sorted based on creating date or filtered by doctors who created them.

Doctor Mode

- Log out

Priority 0.
This function let patient logout the system. Then the user will stay in a transition page for several seconds and will go back to the main page as a visitor.

- Profile
  Priority 0.
  Doctors can create or edit their profiles, which include personal information such as name, gender, age, photo, title, resume, etc. The profile will be saved and can be shared with patients during searching.

- Schedule
  Priority 0.
  We will set a consistent schedule for each doctor and the doctor can adjust his schedule when an emergency occurs. The schedule will be shared with patients when they make appointments.

- Appointment
  Priority 0.
  The doctor can check current appointments and can review history appointments he attended.

- Diagnosis
  Priority 0.
  The doctor can create and edit diagnosis for patients during one appointment, which includes filling information table, answering questions on procedures and writing prescriptions.

- Chat room and status
  Priority 1.
  The doctor receives texts from patients. Some of these patients have appointments with the doctor while others send messages to the doctor through search page. Also, the doctor can change his status in the chat box.

- Forum
  Priority 1.
  The doctor can make new posts in the forum. And the doctor can also comment under others' post.

- Reminder

Priority 1.
The doctor can set a reminder for himself to remind of something special in the future. Also, the doctor can set a reminder for his patients to take medicine. If the doctor has a reminder expiring that day, he will receive emails from the website.

- Log
  Priority 2.
  The log function serves as a library that stores the information of patients that the doctor has had an appointment with. The doctor can also look up all diagnosis history for his patient.

- Statistics
  Priority 2.
  We want to provide a function that can save information from patients' diagnosis for further study.

Industry Comparison

We choose two similar EHR systems to compare with:

- **WeDoctor(微医)**

  The first EHR system is WeDoctor (微医), a Chinese online hospital system partly supported by government. It provides a wide variety services, mainly including three highlights. First, it puts an emphasis on efficient communications between patients and doctors, and also between different patients. It has an online appointment registration system, which enables patients to conveniently make an appointment online without waiting for a long time at the hospital. It has a private chat room system between patients and their doctors in charge, which makes online medical consulting possible. It also has a large online forum, which enables patients to post their symptoms and get help from doctors all over the country and other patients. Second, it builds a very convenient online pharmacy where patients can buy various drugs and equipment with prescriptions. Also, after payment, it provides a home delivery service. Third, since this system is partly supported by government, it can be used in more than 2700 public hospitals in about 30 provinces, which covers most of public hospitals in China. Therefore, even if a patient chooses other hospitals after one appointment, his or her new doctor-in-charge can still see the patient's previous medical information.
  However, it has a huge flaw. Even doctors can see one patient's appointment history, they cannot see or create the patient's detailed diagnosis on WeDoctor. Also, this system

lacks every patient's detailed personal profile, including age, gender, height, weight, medical history, etc. Therefore, doctors cannot refer to this system to get useful information about their patients, which limits WeDoctor to a mere communication platform and a way to make appointments conveniently, but not a complete electronic health record system. On the contrary, in our system, we create complete personal profiles for every patient, and doctors can save their detailed diagnosis in the system so that patients themselves and other doctors can refer to them in the future appointments. Besides, even if we are unable to embed nationwide hospital network into our system due to the small size of our project, our system does incorporate most of WeDoctor's features, including online appointment registration, private chat rooms, an online forum and online pharmacy.

- **AdvancedMD**

  The second EHR system is AdvancedMD, an integrated medical software for independent practices. Features include practice management, electronic health records, patient engagement, telemedicine, rooming, reputation management, financial analytics and business intelligence reporting that all work together to automate practice workflow. Its highlight is that it provides a very complete personal profile for every patient, including their personal info (name, age, gender, etc.), contact info (cell phone number, email, address, etc.), insurance info, medical history, etc. Also, it maintains a detailed diagnosis in every appointment, including time, location, doctor-in-charge, the patient's reason for visit, medical examination details, etc. In all, AdvancedMD has a well-built database system and records every detail of medical treatment.

  However, AdvancedMD provides no means of communication between patients and doctors. There is no private chat room or online forum in this system. All the information in the system is gained by face-to-face appointment and manually recorded. On the contrary, our system provides private chat rooms between patients and doctors, an online forum for sharing medical information and an emergency call system. These services make communications between patients and doctors easier and cheaper and thus making our system more than a mere electronic record.

Project Members

	Project Manager	Front-end & UI	Back-end	Test
Wenxin Feng		√		√
Wujie Duan		√	√	
Xinyi Wang	√		√	
Zhuoer Wang			√	√

Risk

Risk	Probability	Impact	Action
Loss of a team member	**10%**	**Catastrophic**	**Always communicate with other team members. Once the risk occurs, we should reassign tasks or even change the functions of our system as soon as possible.**
Behind schedule	**70%**	**Critical**	**Remove unnecessary functions with low priority. Then reschedule the project.**
System crash	**20%**	**Marginal**	**Frequently commit and push code on github.**
Technology limitations	**50%**	**Critical**	**Simplify those functions which require advanced technology.**
Data leak	**30%**	**Critical**	**Improve the safety level of login/logout using salt in JS; prevent database injection attack using input sanitization; prevent others from predicting data by setting a threshold of data change**

Tools and Resources

Front-end

JavaScript with Vue or Angular or React

Back-end

NodeJS or Java Spring

Database

MySQL or MongoDB

Version Control

Github

Automation Test

Selenium