Project Plan

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Abstract—Heart disease, a common chronic illness that affects millions of people in the United States, is the top ranking cause of death. With knowledge of health informatics, our group proposes to create an add-on application that extrapolates data from patients' EMRs and performs analysis. The application would contain a dashboard along with visualizations to help people in the healthcare field provide better treatment using Statin.

1 AREAS OF FOCUS

Our units of focus are health analytics and visualizations with a primary focus on health interoperability and tools. Our external mentor project is Internal Medicine Department Statin Tool, Application or Tool to be used in EMRs, so we will be focusing on a combination of healthcare technology, tools, and scripts, health analytics and visualizations, and healthcare domains.

2 BACKGROUND AND SIGNIFICANCE

Since the 1920s, heart disease has been the leading cause of death in the United States, resulting in approximately 655,000 deaths per year (Virani et al., 2020). From these deaths, the most common form of heart disease is known as coronary heart disease, which is mainly caused by cholesterol and other plaques-forming substances. Thus, a therapy or a treatment with lipid-lowering drugs is necessary for patients with a risk of heart disease.

High blood cholesterol is one of the key risk factors for heart disease. The 3-hydroxy-3-methylglutaryl coenzyme A reductase inhibitor, known as statin, has become a cornerstone of cardiovascular risk prevention for a wide range of patients, including hyperlipidemia patients. With an increased use of statins, national guidelines recommend the prescription of statins for a number of conditions, ranging from coronary artery disease to high cholesterol to diabetes (Rosenson et al., 2015). However, hypercholesterolemia itself is asymptomatic. Hence, only 55% or 43 million U.S. adults who could benefit from cholesterol medicine are taking the drugs (Mercado et al., 2015). As one study suggests, diabetic and

hypercholesterolemia patients with statins had lower death and stroke rates than the patients without statins (AbuRahma et al., 2015). Therefore, it is important to study and develop a communication mechanism that notifies providers for information on warranted statin.

3 PROBLEM

With asymptotic hyperlipidemia, patients with neglection of high body cholesterol level increase. The known standard total cholesterol level for adults is 200 milligrams per deciliter (mg/dL), yet 93 million U.S. adults over the age of 20 have total cholesterol levels higher than 200 mg/dL and 29 million adults having higher than 240 mg/dL (Virani et al., 2020). Furthermore, many adults who qualify for a statin treatment do not receive statins due to clinical information being overlooked by their providers.

4 SOLUTION

We created an EMR tool that extrapolates relevant data from a patient's electronic medical record and notifies the patient's provider when a statin is warranted. The EMR tool will help increase timely treatment with statins.

The tool is a proof-of-concept application that pulls from the existing SMART-on-FHIR sandbox and can eventually be scaled into an add-on to an existing HL7 fast healthcare interoperability (FHIR) v4-compliant electronic health record (EHR) system. The tool is a web-based single-page application (SPA) written in Bootstrap, a JavaScript framework. The website contains a form of a list of patients that can be selected. Once a patient has been selected, the website pulls the patient's relevant data with the FHIRClient and SMART-on-FHIR APIs and calculates the 10 year Heart Disease risk based on the Framingham 10 year Study. A dashboard will be shown of the 10 year ASVCD risk and the corresponding elements needed to calculate the risk. The tool also recommends statin treatments based on the risk level.

The calculation and data extraction was done on the backend using Django, a Python backend web framework, by extracting variables from the patient's profile, using LOINC codes. The sex, age, total cholesterol, hdl cholesterol, systolic blood pressure, smoking status, and blood pressure medication treatment status were grabbed with the FHIRClient and the Request python libraries. To calculate the risk score given the extracted attributes, we used code from the official framingham10yr python library (Videntity Systems, 2012). After calculating the risk, we determine the statin recommendations and send the information to the frontend using the Django framework. The application is currently deployed on Heroku.

The calculator code can be found here: https://github.com/videntity/python-framingham10yr

5 COMPLEXITY AND EFFORT

Based on the few things we mentioned above in the proposed solution, we will focus on a few aspects of the project to deliver the best results.

5.1 Data Security

As mentioned above, protecting patient's data would be our top priority; we need to be HIPAA compliant. We will create a secure user login and authentication system to make sure that only authorized users can access our application and view different analyses. We also aim to deploy our project to a safe and secured cloud environment to act as a second layer of protection of privacy. We can potentially "anonymize" the data during the testing phase and deployment to limit exposure to sensitive information. We will take advantage of existing up-to-date security systems and libraries to ensure maximum data security.

5.2 Dashboard

Our group plans to meet with our mentor soon to discuss the feasibility of what we proposed above and coordinate a regular meeting time on a bi-weekly/monthly basis. For our small group, we plan to meet on a weekly basis to discuss and distribute tasks, as well as update each other to keep everyone informed. Each sprint is also a checkpoint for us to ensure we are not behind the planned schedule.

6. FUTURE STEPS

We would potentially incorporate other libraries like Plotly to support creating the dashboard. The dashboard should contain different types of charts and basic tables to deliver direct messages of the patient's statistics, allowing people to visualize the data. If we have time, we can stretch our app and even include machine learning algorithms that could potentially make suggestions on how to treat patients effectively based on the existing statistics.

7 TEAM MEMBERS AND ROLES

We are a group of 5. Sami Belhareth will be the Database Administrator. Jinyoung Eum will be the Data Scientist. Yiqiong Xiao will be the QA Tester. Evan Mi will be the Backend Developer. Tony Zhang will be the Frontend Developer. These roles are not set in stone, as we will all be helping each other. We will not be limited by our roles.

8 REFERENCES

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