Project Name:SMART MEDICAL PRESCRIPTION ASSISTANT

Introduction/Motivation:

Nowadays, it is a great concern for developing countries to build an online prescription service and medical data storage system. Patients visit several doctors throughout their lifetime, and health records get generated with every clinical meet. The paper-based records have limitations such as difficult to access, time-consuming to update, impossible to share and maintain for lifelong. Again the patients have to carry his previous medical history like prescriptions, laboratory test results before consulting any doctor.

A number of problems may arise to the patient who needs medical care regularly due to aging or chronic disease effect. Due to the health problem, per week people who are aged 65 years or above, 90% of them need to take one drug, 40% of them are five different drugs and 12% take ten or more drugs. So medicine taking is obligatory for older people.

In this case, there can be a major issues with drug potency prediction which might lead to medical complications like organ failure, exhaustion, over dependency over the drugs etc.

So this smart prescriber for drugs will assist the doctors to predict the accurate dosage of drugs for patients. .

Market Research / Literature Survey

Drug use is a complex process and there are many drug related challenges at various levels, involving doctors, pharmacists, nurses and patients. Medication misadventure can occur anywhere in the health care system and many errors are preventable and pharmacists have an active role in the appropriate use of drugs [1].

Few statistics were surveyed to study the impact of the use of drugs on death and health hazards. Three categories of errors were identified: Prescription based errors, Dosage errors by nurse and negligence of pharmacist. The details are put in Figures 1-3. Three categories of research analysis is made: (i) based on prescription errors (ii) Nursing errors and (iii) Pharmacist errors [2-4]. The reported incidence of prescribing errors in this review ranged from 7.1% to 68.2% [5].The reported incidence of nursing errors ranged from 19% to 34%. The reported incidence of pharmacist errors ranged from 2.29%to 25%of dispensing orders.When a patient's clinical problem is examined and medication record of patient, it tells about oldness of particular disease is diagnosed. Prescription is an order for medication issued by the identification of patient, it should be written clearly. Prescribing errors are classified into two types which are error of omission and error of commission which occurs in government hospitals and private hospitals respectively
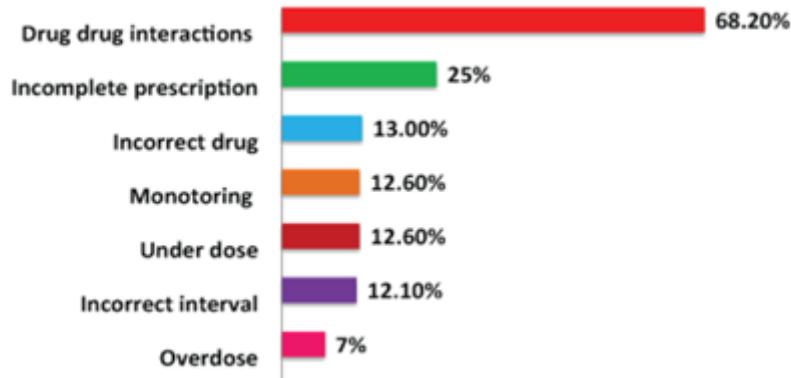
Figure 1: Highly reported prescribers errors in the literature
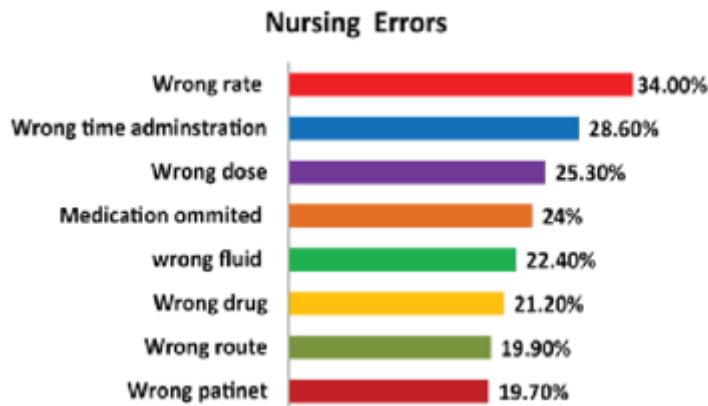
Figure 2: Highly reported nursing errors in the literature

Figure 3: Highly reported Pharmacist errors in the literature

Hardware requirements

1. Raspberry PI as IoT device

2. Pulse heartbeat 3554 sensor

3. MCP3008 ADC to convert analog values of sensor to digital

4. DS18b20 temperature sensor

5. Resistors, Breadboard, Jumper wires

6. WiFi based Internet dongle

7. Android Phone for testing

Software requirements

1. Python with sckit machine learning library.

2. Kotlin in Android Studio

3. Raspbian OS in IoT device.

4. 4) Google charting for Analytics.

Implementation

The smart prescriber system has 4 components as shown in Figure 4 and listed as follows:

1. A trained system for drug prescription.

2. Set of sensors for regular health updates of patient.

3. A server to store the patient data.

4. A system/mobile application as an interface to the doctors, pharmacists and patients.

When the patient arrives to the doctor suffering from some disease, the doctor first gets the diagnostic reports of the patient and further proceeds with the smart drug prescriber app to get assistance over the prescription of drugs. Sensors Basically we are using 3 sensors to get regular updates regarding the patient health, along with a daily surveillance over the vicissitude health status. Primarily the vigilance is done about the blood pressure and pulse rate using blood pressure sensor, amount of calories burnt on the daily workouts with the help of data obtained by combining inputs from accelerometer and heart rate monitoring sensors.

Trained system A system is trained with the help of supervised learning algorithms and data obtained from the physician community regarding range of dosage values of drugs for a disease with particular attribute values as seen over the lab reports. The system will be trained with supervised learning which uses algorithms like linear regression, gradient descent, stochastic descent etc. And is being tested verified with validation techniques like K-cross validation technique. This trained system will get the input from the doctor and do the required computation as predefined in the algorithm
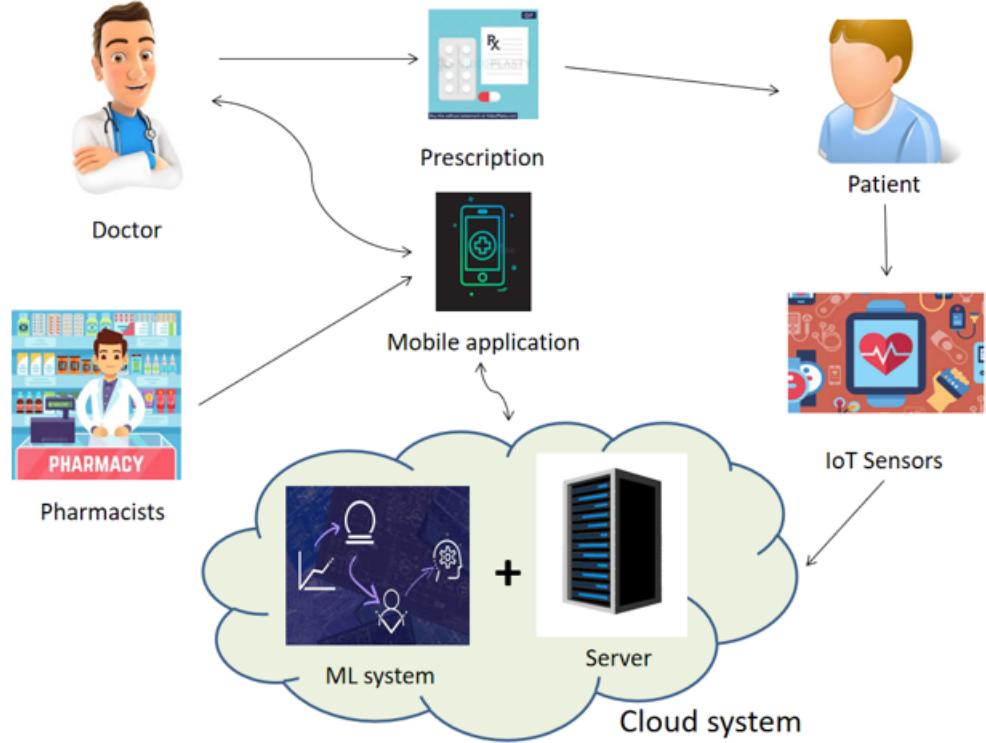
Figure 4: System Architecture

and gives assistance to the physician on what drug need to be given as remedy and what need to be the drug potency.

Server For storing confidential data of the patients we are maintaining a server. For this storage purpose we are making use of Google's mobile application development platform Firebase which is a cloud-hosted NoSQL database that enables data to be stored and synced between users in real time. This makes the data available anytime and anywhere. Also the data is well secured. We are storing the data entered by the doctor during the treatment of the patient like current status of the disease, currently prescribed drug and it's dosage, suggestions given to the patient for the betterment of health based on the regular diet and daily workout followed and also the regular updates from the health monitoring sensors are being stored in the server.

System/Mobile Application To access all these services we are going build an application which acts as an interface to doctors, patients and also to the pharmacists. This makes the system more transparent, easily accessible. Application will be developed using languages like kotlin , swift etc. The application consists of interfaces for login/sign in option and also to display the test result of the particular patient calculated in trained machine.

Feasibility

The prior research carried out motivates the need of a smart system for the assistance to the physician community who are less experienced or who wishes to have a second opinion for their verdicts regarding treatment to a disease suffering patient. A convenient application yet providing a great performance with maximum accuracy is to be developed. The development of this smart prescriber needs components like IoT device, sensors, and appropriate machine learning library in Python and a GUI based Android App for end users. The system is designed for the ease of life of elderly people by providing a simple and regular way to take care of their health.

References

[1] Van Harten WH, Manen JV (2009) The Occurrence of Medication Errors and the Occurrence of Risk Factors for Medication Errors in State Hospitals in Ghana: Patient?s Safety Improvement in Focus. Healthcare Management 1-74

[2] Buck ML, Hofer KN, McCarthy MW (2008) Medication rates in Infants and Children, Improving Pediatric Medication Safety Part 1.Paediatr Pharm 14: 1-5.

[3] Revikumar KG,Miglani BD (2012) A Text Book of Pharmacy Practice. Career Publications, 191-232. .

[4] Cisneros R (2012) Medication Errors. Leon Shargel, etal., Comprehensive Pharmacy Review, 7thedn, Lippincott Williams and Wilkins, 499-506.

[5] Smith KE, Enright SM (2005)Providing a Framework for ensuring Medication Use Safety.Chapter 102, Remington, The Science and Practice of Pharmacy, 21st edition, Volume 2, Lippincott Williams and Wilkins, 1840-1880.

[6] Ridley SA, Booth SA,Thomson CM (2004) Prescription Errors in UK Critical Care Units. Anaesthesia 59:1193-1200.

[7] Mandal K, Fraser SG (2005) The Incidence of Prescribing Errors in an Eye Hospital. BMC Ophthalmology 5: 1471-2414.

[8] "Aging and Drugs - Older People's Health Issues - MSD Manual Consumer Version", MSD Manual Consumer Version, 2018. [Online]. Available: https://www.msdmanuals.com/home/olderpeople%E2%80%99s-health-issues/aging-and-drugs/aging-and-drugs.