Design of an Android Application for Symptoms Monitoring of Brain Cancer Patients

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ABSTRACT*:* For an Oncologist, it is necessary to monitor his patient's physiological parameters constantly because Brain tumor patients experience headache, weakness, vomiting and loss of awareness or a partial or total loss of consciousness, etc. The proposed system has the capability to monitor these parameters from multiple patient bodies. Here, a patient provides symptoms to the system in the form of questionnaire then the system detects the normality of the symptoms. If abnormal condition arises, our system issues an alarm and sends a notification via SMS/E-mail to the oncologist. Then Oncologist can provide proper assistance to the patient.

KEYWORDS: Oncologist, Questionnaire, Symptom monitoring, Decision Tree

I.   INTRODUCTION

Symptoms are common among patients receiving treatment of advanced cancers and often go undetected. Systematic collection of symptom information using questionnaires has been suggested as an approach to improve symptom control. Several web-based systems exist and have been shown to prompt clinicians to intensify symptom management, to improve symptom control, and to enhance patient-clinician communication, patient satisfaction, and well-being. Most patients are willing and able to self-report via the web, even close to the end of life.   The patients can undergo one of the following three types of treatment alone or in combination with others: Radiotherapy, Chemotherapy and Operation. These treatments have side effects like fatigue, hair loss, weight loss, pain, mouth and throat sores, diarrhea, blood disorders, etc. The proposed system has capability to monitor physiological parameters and predict if the patients' condition is aggravating based on symptoms given by patients. It will differentiate between side effects of treatment and cancer symptoms. If the system detects an abnormal condition, it issues an alarm to the patients' family and the doctor. Otherwise the system will give simple solutions. The system uses – algorithm to predict the patients' condition and thus it tells the difference between treatment output and observed output.

Brain Cancer :

Brain cancer is a disease of the brain in which cancer cells (malignant cells) arise in the brain tissue. Cancer cells grow to form a mass of cancer tissue (tumor) that interferes with brain functions such as muscle control, sensation, memory, and other normal body functions.
Tumors composed of cancer cells are called malignant tumors, and those composed of mainly noncancerous cells are called benign tumors.
Primary brain cancer develops from cells within the brain. Part of the central nervous system (CNS), the brain is the control center for vital functions of the body, including speech, movement, thoughts, feelings, memory, vision, hearing and more.

Symptoms of Brain Cancer:
- Headache
- Nausea
- Vomiting.

- Blurred vision.
- Balance problems.
- Personality or behavior changes
- Seizures: The onset of new seizures or convulsions can be the result of a tumor forming in the brain.
- Drowsiness or even coma.
- Vision changes: A tumor on or near the optical nerve could cause blurred or double vision. Other types of brain tumors may cause abnormal eye movements or changes in vision, depending on the size and location of the tumor.
- Loss of motor skill: A brain tumor can affect certain areas of the brain responsible for motor functions, like balance, coordination or movement. Weakness of facial muscles may result from a tumor within the cranial nerves.
- Speech problems: Some brain tumors can cause difficulty with speech.
- Cognitive problems: A brain tumor can impact cognitive abilities and result in memory problems, poor concentration, confusion, difficulty thinking clearly or processing information, and language difficulties.
- Weakness or numbness: Some brain tumors cause weakness on one side of the body or other paraneo plastic syndromes, like peripheral neuropathy (numbness or tingling in the hands and feet).

II. EXISTING SYSTEMS

1. Health Outcome

Health Outcome addresses the lack of treatment outcome data by capturing the voice of the patient. It's mission is to help people see treatment ratings and options for their condition, based on the aggregated experience of patients like them.
The advantage of this system is suggests appropriate treatment specific to the patient.

The disadvantage of this system is notifications and alarms are not issued if patients condition is deteriorating.

2. Iodine

Better information about thousands of drugs, built from clinical research and real-life experience from people like you. You can find top
side effects, reviews, tradeoffs, alternatives, cost, and quick tips.
The advantage of this system is information of all type medications and diseases is present. It also
rates drug based on responses given by users.
The disadvantage of this system is that notifications and alarms are not issued if patients condition is
deteriorating.

II. LITERATURE SURVEY

1. Smartly Elderly home Monitoring system with
an Android phone(2013)

Advantages:
1. It uses SHIMMER.
2. Android platform is used.
3. DSP signals can be Visualize.

Disadvantages:
1. Low power sensors are used.
2. Patient need to get admitted in system.

2. Health monitoring laboratories by interfacing physiological sensors to mobile android devices(2013)

Advantages:
1. SHEM is developed.
2. Wi-Fi is used for faster speed.
3. Uses android mobile

Disadvantages:
1. Mainly concentrates on Elder people.
2. Does not monitors Continuously.

3. Hospital healthcare monitoring system using wireless sensor networks(2013)
Advantages:
1. It monitors blood pressure, heart rate.
2. It also monitors fatal movement in pregnant women.
3. Raise alarm for abnormal condition.

Disadvantages:
1. Patient needs to get admitted in the hospital
2. WSN gets complicated.
3. When number of patients increases beyond certain limit.

4. Design and Implementation of a Wearable ECG
System International Journal of Smart Home(2013)
Advantages:
1. Smart phone and shirt is used.
2. Automatic emergency call system.

Disadvantages:
1. Concentrates on elder people.
2. Cost of ECG shirt is high.

5. Android ECG application development(2012)
Advantages:
1. It uses android platform
2. Monitors heart rate.

Disadvantages:
1. Cost is high.
2. It only monitors ECG

6. Mobile Healthcare System using NFC
Technology(2012)
Advantages:
1. Doctor does not refer the paper, but refer data from NFC.
2. User gets proper information from
3. NFC tag via EMR.

Disadvantages:
1. Security and Reliability is provided, no newest
2. development is provided i.e. latest technology
3. Various tags are used i.e. RFID, NFC,CCID etc.

7. Wireless health and the smart phone conundrum(2011)
Advantages:
1. Wireless health is measure.
2. Health is measure
3. on different platform via library.

Disadvantages:
1. Giving health tips according to the threshold values.
2. Bluetooth and Wi-Fi are not used.

8. Mobile Phone Sensors in Health Applications(2011)
Advantages:
1. Various sensors are used to read data fast and accurate.
2. Health is measure on mobile devices

Disadvantages:
1. Various sensors are used which cost a lot.
2. With Phone image quality is not accurate.

9. Android Based Health Monitoring System.(2015)
Advantages:
1. Develop an application to monitor heart beat and temperature of a user of the system.
2. Provide a list of hospitals of nearest locations.
3. Gves health tips according to the threshold values

Disadvantages:
1. Security and Reliability is provided, no latest technology used.
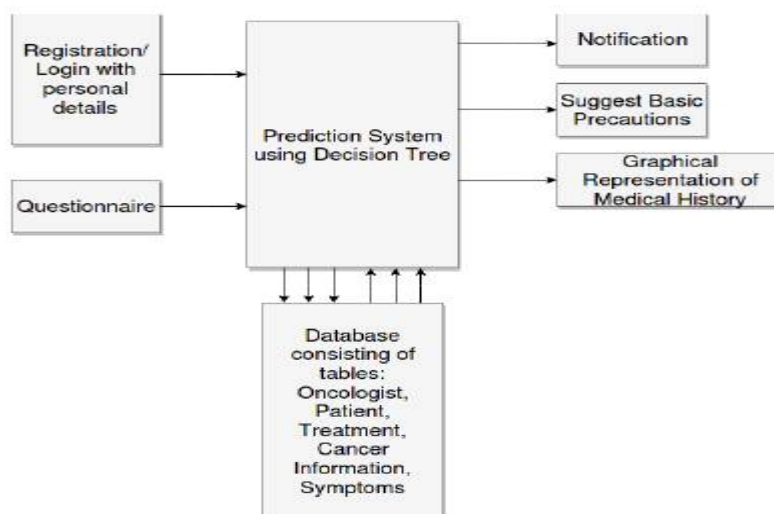
III. PROPOSED SYSTEM

A. Architecture Diagram

Fig. 1: Architecture of the Proposed System

B. Modules

1. Predict Patient Condition

The system should detect the condition of patient and thus tell if the
patients condition is aggravating. It will ask the patient to give symptoms and discomforts he is experiencing when he is provided with the questionnaire. The questionnaire also asks the user to specify the severity and frequency of the symptoms he is experiencing. The system uses
Decision tree algorithm to tell the condition. The system thus also tell the difference between side-effects of the treatments and cancer aggravating symptoms. It will refer the Treatments
Table, Symptoms table and the Cancer Info table to carry out this decision.

2. View medical history

The system will show the graphical representation of different symptoms the patient experienced till now, their severity and frequency also. It will also show the treatments that patient has taken. It will also show the medications taken and suggested to patient.

3. Reminders

The system will notify the patient regularly about the medications and doctor visits
.

4. Suggest Immediate Measures

If it's only the side-effects the patient is experiencing then it will give simple measures to overcome them.

5. Notify The Doctor

If the system detects abnormal condition then it notifies the doctor and the patients' family about it in the form of SMS or email. Then the doctor can further decide the course of treatment.

C. Database

Below are mentioned all tables, their corresponding attributes and a small description of each:

1. Table Name: Oncologist

Attributes: Id, Full Name, user Name, Email Id, Password, Contact No.

Description: It holds all the general information of all the Service Provider. Primary key of this table is Service Provider Id.

2. Table Name: Patient

Attributes: Id, Full Name, user Name, Email Id, Password, Contact No., Age, Gender, Cancer Grade and Location of tumours, Treatments and their dates and durations, Medications

Description: It holds all the general information of all the Customer. Primary key of this table is Data User Id.

3. Table Name: Cancer Information

Attributes: C Id, C Name, location, age, gender

Description: It holds all the general information of all the Cancer. Primary
key of this table is Cancer User Id.

4. Table Name: Symptoms

Attributes: S Id, S Name, Severity, Frequency

Description: It holds all the general information of all the Symptoms. Primary key of this table is Symptom Id.

5. Table Name: Treatment

Attributes: Type, medications, Duration, side-effects, No. of times

Description: It holds all the general information of all the Treatment.

V. ALGORITHMS

Decision Tree

Decision tree is a binary structure where each node best splits the data to classify a response variable. Tree starts with a Root which is the first node and ends with the final nodes which are known as leaves of the tree. A decision tree is a decision support tool that uses a tree-like graph or model of decisions and their possible consequences, including chance event outcomes, resource costs, and utility. A decision tree can be built from a set of training objects with the divide and conquer principle. Few of the commonly used algorithms to build a decision tree are ID3, C4.5, CART

Advantages:

1. Suitable for handling both categorical and quantitative values

2. Universal for solving both classification and regression problems

3. Capable of handling missing values in attributes and filling them in with the most probable value

4. High-performing with regard to searching down a built tree, because the tree traversal algorithm is efficient even for massive data sets

Disadvantage:

1. Poor processing of incomplete, noisy data

2. Can produce only one decision tree for a problem(when the same train-ing set is used)

3. The problem of not finding a decision tree in such a way that the ac-curacy of classification for the most important decisions is maximized.

Algorithm:

1. Calculate entropy of the target.

2. The dataset is then split on the different attributes. The entropy for each branch is calculated. Then it is added proportionally, to get total entropy for the split. The resulting entropy is subtracted from the entropy before the split. The result is the Information Gain, or decrease
 in entropy.

3. Choose attribute with the largest information gain as the decision node, divide the dataset by its branches and repeat the same process on every branch. A branch with entropy of 0 is a leaf node. A branch with entropy more than 0 needs further splitting.

4. The ID3 algorithm is run recursively on the non-leaf branches, until all data is classified.

VI.   CONCLUSION

The proposed system is an effective symptom monitoring application which will be used by both doctors and patients. With the help of Decision trees which are a reliable and effective decision making technique that provide high classification accuracy with a simple representation of gathered knowledge, normality of the patient will determined. Symptoms due to side-effects of a treatment and due to patients condition aggravating will also be differentiated. The medical history of patients will be represented in graphical format for easy understanding by the viewers. The Application will prove to be useful for the patients for further care and treatment.

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