**Introduction**

Nowadays, Heart-related diseases are on the rise. Cardiac arrest is quoted as the major contributor to the sudden and unexpected death rate in the modern stress filled lifestyle around the globe. A system that warns the person about the onset of the disease earlier automatically will be a boon to the society. This is achievable by deploying advances in wireless technology to the existing patient monitoring system.

* This project proposes the development of a module that provides mobility to the doctor and the patient, by adopting a simple and popular technique, detecting the abnormalities in the bio signal of the patient in advance and sending an SMS alert to the doctor through Global System for Mobile (GSM) thereby taking suitable precautionary measures thus reducing the critical level of the patient.
* Worldwide surveys conducted by World Health Organization (WHO) have confirmed that the heart-related diseases are on the rise. Many of the cardiac-related problems are attributed to the modern lifestyles, food habits, obesity, smoking, tobacco chewing and lack of physical exercises etc.
* The post-operative patients can develop complications once they are discharged from the hospital. In some patients, the cardiac problems may reoccur, when they start doing their routine work. Hence the ECG of such patients needs to be monitored for some time after their treatment. This helps in diagnosing the improper functioning of the heart and take precautions.
* Some of these lives can often be saved if acute care and cardiac surgery is provided within the so-called golden hour. So, the need for advice on first-hand medical attention and promotion of good health by patient monitoring and follow-up becomes inevitable.
* Hence, patients who are at risk require that their cardiac health to be monitored frequently whether they are indoors or outdoors so that emergency treatment is possible. Telemedicine is widely considered to be part of the inevitable future of the modern practice of medicine.

**Purpose of the study**

* Design a Remote Patient Health Monitoring System (RPHMS) which has heartbeat detection system, a fall detection system, temperature detection system, a humidity detection system, a toxic gas and air quality detection system and SPO2 detection system.
* A doctor or health specialist can use the system to monitor remotely of all vital health parameters of the patient or person of interest.
* An attempt at designing a remote healthcare system made with locally available components:

1. The fall detector, temperature, humidity, pressure, toxic gas, air quality control, SPO2 modules comprise of an accelerometer, wireless transmitter and microcontroller. The data collected was transmitted wirelessly to a receiver module.
2. ECG consists of a non-invasive infrared finger detector, Liquid Crystal Display (LCD), a designed circuit for cardiac signal detection and microcontroller. The detected analog signal was then digitized to give a digital value that was read on the LCD.
3. A simple cloud server where hosted with a database for all the vital data to be accessed remotely whenever required.

**Objective of the study**

* Here the main objective is to design a Remote Patient Health Monitoring System to diagnose the health condition of the patients. Giving care and health assistance to the bedridden patients at critical stages with advanced medical facilities have become one of the major problems in the modern hectic world.
* In hospitals where many patients whose physical conditions must be monitored frequently as a part of a diagnostic procedure, the need for a cost-effective and fast responding alert mechanism is inevitable.
* Proper implementation of such systems can provide timely warnings to the medical staffs and doctors and their service can be activated in case of medical emergencies.
* Present-day systems use sensors that are hardwired to a PC next to the bed. 5 The use of sensors detects the conditions of the patient and the data is collected and transferred using a microcontroller.
* Doctors and nurses need to visit the patient frequently to examine his/her current condition. In addition to this, use of multiple microcontroller based intelligent system provides high-level applicability in hospitals where many patients must be frequently monitored.

1. For this, we use the idea of network technology with wireless applicability, providing each patient a unique ID by which the doctor can easily identify the patient and his/her status of health parameters.
2. Using the proposed system, data can be sent wirelessly to the Patient Monitoring System, allowing continuous monitoring of the patient. Contributing accuracy in measurements and providing security in proper alert mechanism give this system a higher level of customer satisfaction and low-cost implementation in hospitals.
3. Thus, the patient can engage in his daily activities in a comfortable atmosphere where distractions of hardwired sensors are not present.

* Physiological monitoring hardware can be easily implemented using simple interfaces of the sensors with a Microcontroller and can effectively be used for healthcare monitoring. This will allow development of such low-cost devices based on natural human-computer interfaces.
* The system we proposed here is efficient in monitoring the different physical parameters of many number bedridden patients and then in alerting the concerned medical authorities if these parameters bounce above its predefined critical values.
* Thus, remote monitoring and control refer to a field of industrial automation that is entering a new era with the development of wireless sensing devices.

**Perspective of the project**



**Sensors and Modules**

Proposed system consists of following sensors and modules

1. Arduino Micro Controller

2. ECG

3. GSM/GPRS Module

4. Temperature sensor

5. Pressure sensor

6. Body Movement Sensor

7. Humidity Sensor

8. Air Quality sensor

**Requirement Analysis**

* **Functional Requirements**

**R.1:Login Page**

Application must have a module for login using unique credentials of a patient for the doctor to monitor patient’s vital data.

**R.1.1:User**

*Input*: Patient name,id and password

*Output*: Patient status and latest reports

**R.1.2:Doctor**

*Input*:Doctor name, id ,field and password

*Output*: List of patients including patient name, patient ID, basic prognosis. Ability to click on each patient to view detailed reports and old parameters

**R.2:Location Tracking**

Application must have track location option with which doctor or guardian can track location of the patient.Hardware must have a GPRS module to fetch location coordinates which can be used to track location of patient

**R.2.1:Patient location**

*Input:* Live coordinates

*Output:* Patient location on Google maps

**R.2.2:Current location**

*Input:*

*Output:*.

**R.3:Messaging Service**

Hardware must have GSM module which send’s SMS alert messages to doctor and guardians upon any emergencies. And application must send email alerts upon any emergencies.

*Input:* Alarming parameters

*Output:* Message to guardian

* **Non-Functional Requirements**

Non-functional requirements are not directly related to the functional behavior of the system.

• Web application must be user friendly, simple and interactive.

• The user interface is designed in such way that novice users with little knowledge of web, should be able to access this application.

• Users are required to have some knowledge regarding google maps.

* **Software Specifications**

• Operating System: Windows 7 or higher

• Platform: IoT Cloud

• IDE: Arduino 1.8.4

• Database: Oracle SQL

• Technologies used: C, SQL, HTML, CSS, Java

* **Hardware Specifications**

• Microcontroller: Arduino Uno Board

• Sensors: Temperature (LM35), Toxic gas (MQ9), GSM Module, GPRS Module, ECG, Humidity, Air Quality, Pressure