**AN INTERNET OF THINGS (IOT) BASED PATIENT MONITORING SYSTEM**

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## ABSTRACT

*The healthcare monitoring systems has emerged as one of the most vital system and became technology oriented from the past decade. Humans are facing a problem of unexpected death due to various illness which is because of lack of medical care to the patients at right time. The primary goal was to develop a reliable patient monitoring system using IoT so that the healthcare professionals can monitor their patients, who are either hospitalized or at home using an IoT based integrated healthcare system with the view of ensuring patients are cared for better.*

## INTRODUCTION

The increased use of mobile technologies and smart devices in the area of health has caused great impact on the world. Health experts are increasingly taking advantage of the benefits these technologies bring, thus generating a significant improvement in health care in clinical settings. Likewise, countless ordinary users are being served from the advantages of the M-Health (Mobile Health) applications and E-Health (health care supported by ICT) to improve, help and assist their health.

According to the constitutions of World Health Organization (WHO Report, 2010) the highest attainable standard of health is a fundamental right for an individual. As we are truly inspired by this, we attempt to propose an innovative system that puts forward a smart patient health tracking system that uses sensors to track patient vital parameters and uses internet to update the doctors so that they can help in case of any issues at the earliest preventing death rates.

Patient Health monitoring using IoT is a technology to enable monitoring of patients outside of conventional clinical settings (e.g. in the home), which may increase access to care and decrease healthcare delivery costs. This can significantly improve an individual's quality of life. It allows patients to maintain independence, prevent complications, and minimize personal costs. This system facilitates these goals by delivering care right to the home. In addition, patients and their family members feel comfort knowing that they are being monitored and will be supported if a problem arises (Jung & Chung, 2011)

### LITERATURE REVIEW

Jung & Chung (2011) Studied the Flexible and scalable patient’s health monitoring system in Low PAN. The main advantage of this enabling factor is the combination of some technologies and communications solution. The results of Internet of Things are synergetic activities gathered in various fields of knowledge like telecommunications, informatics and electronics.

Shin & Mao (2016) studied a cell phone-based health monitoring system with self-analysis which incorporates IoT a new paradigm that uses smart objects which are not only capable of collecting the information from the environment and interacting the physical world, but also to be interconnected with each other through internet to exchange data as well as information.

Gennaro & Tabilo (2011) had studied a Maintaining sensing coverage and connectivity in large sensor networks mainly includes the information about how to build or develop a new computational technology based on clinical decision support systems, information processing, wireless communication and also data mining kept in new premises in the field of personal health care.

Cristina (2011) studied Health care applications a solution based on the Internet of Things survey aims to present a detailed information about how radio frequency identification, multi-agent and Internet of Things technologies can be used to develop and improve people’s access to quality and health care services and to optimize the health care process.

Gennaro and Tabilo (2011) studied the Internet of Things (IoT): A vision, architectural elements, and future direction which proposes on demand positioning and tracking system. It is based on Global Positioning enabled devices and suitable for large environments. Smart phones between two terminals are used for making initial communication. The initial communication is performed by synchronization phase.

Cristina (2011) developed a system, which is capable of measuring different physiological parameters and are used to design a system for heart rate reconstruction for rate adaptive pacing.

Reza (2016) studied the strength of smart sensors which are developed from the combination of sensing materials along with combined circuitry for other biomedical applications.

Loren (2004), proposed a simple microwave technique to monitor the cardiac activity. This technique is dependent on changes in modulation envelope of amplitude modulated waves passing through the body. It explained the use of wireless micro sensors networks for medical monitoring and environmental sensing in their study found the design of Wi-Fi sensor network that is capable of monitoring patient’s chronic diseases at their home itself via a remote monitoring system. So, immerging of wireless sensor technology individual test like only blood pressure, heart rate, temperature etc. can be measured but this research project enables all this parameter together to be measured under single system, and also thus all can be worn by patient and processed data send toward internet through internet of things (IOT).

**ADVANTAGES**

1. **Allows sending data from patients to health professionals in real time.**The main benefit of remote patient monitoring or homecare telehealth, is that it allows a patient to use a mobile medical device to perform routine tests and send test results to a doctor in real-time without the necessity of visiting a medical institution. This advantage is of great importance for people with long-term illnesses, who have to communicate with healthcare professionals more often. Homecare telehealth enables easy and quick communication between physicians and patients suffering from sleep disorder, mental, cardiovascular, respiratory and other diseases. Doctors can counsel sick people online with no need to wait for the appointment date.
2. **Improves patients’ lifestyle.**Incorporating RPM in chronic disease management can significantly improve a person's quality of life. Thanks to RPM, chronically ill people can spend more time at home with their families rather than at hospitals. A monitoring device is also able to inform patients about critical deterioration of health when they need to apply for emergency help as soon as possible.
3. **Makes healthcare more available.**RPM allows doctors to reach out to potential patients. While many people can’t stand going to clinics or, for certain reasons, can’t afford visiting a doctor, RPM will bring free consultation with a physician right to their homes. This is how medical establishments can gain more visitors without overcrowding facilities.
4. **Saves money.**Patients can save considerably thanks to RPM. With home telehealth, it’s not necessary to go to a clinic for prescription or ask your physician about tests results. Besides, due to the decreasing number of unnecessary hospital visits, medical institutions become less crowded and can faster admit patients who need an emergency help. For instance, The specialists from the Oxford University Institute of Biomedical Engineering developed an app that allows patients to avoid unnecessary in-person visits. In the facility where the system was tested, the number of doctor appointments [has dropped by 25 percent](http://www.hospitalemrandehr.com/tag/remote-patient-monitoring/).

**DISADVANTAGES**

1. **Is not accessible for everyone.**RPM requires good broadband connectivity, which is hard to achieve for small healthcare institutions and rural hospitals. On the other hand, it’s important to take into account that not everyone owns a smartphone, and elderly people often face difficulties in using modern gadgets, such as mobile phones.
2. **Patients and doctors' skepticism**. RPM appears to be the least effective patient engagement initiative according to [NEJM Catalyst Insights Council survey](http://catalyst.nejm.org/patient-engagement-report-improved-engagement-leads-better-outcomes-better-tools-needed/). The researchers explain these statistics by the fact that the use of wearables is still not available for everybody. By the way, doctors that were taking part in the survey haven’t noticed any improvements in chronic disease management. In addition, healthcare professionals based on their experience expressed doubt that the technology alone is likely to change behavior of higher-risk patients. Doctors are also concerned about the difficulties they can face handling received data. Some patients are afraid that their private health data can be obtained by third parties and used for dubious purposes.
3. **The need of additional** [**custom healthcare software**](https://ocsico.com/solutions/healthcare-software-development/)**.** After the data have been collected, IT departments have to redirect it from RPM devices to electronic medical record systems (EMRs) by the means of multiple third-party applications.
4. **Doubtful reliability.** Popular fitness wearables tracking physical activity appeared to have large variations of accuracy with error margins [up to 25 percent](http://journals.plos.org/plosmedicine/article?id=10.1371/journal.pmed.1001953#pmed.1001953.ref041). The reliability of RPM data is called into question as well. For instance, a review in JAMA Dermatology showed that smartphone apps for melanoma detection have a [30 percent failure rate](http://journals.plos.org/plosmedicine/article?id=10.1371/journal.pmed.1001953#pmed.1001953.ref043). The lack of reliability is the most serious problem that needs to be fixed before devices and applications could be used by healthcare providers.

**CONCLUSION**

The proposed system of patient health monitoring can be highly used in emergency situations as it can be daily monitored, recorded and stored as a database. In future the IOT device can be combined with the cloud computing so that the database can be shared in all the hospitals for the intensive care and treatment

**RECOMMENDATION**

Remote patient monitoring is of great help not only for patients but for healthcare professionals as well. However, RPM is still not available for all sick people depending on their location and remote access capabilities. Besides, doctors have to pay effort in order to engage patients and motivate them to use RPM. And finally, the main drawback of this technology is the unproved accuracy of devices. As long as the possibility of imprecision exists, the effectiveness of RPM will remain uncertain to many.

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