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A COMPREHENSIVE SURVEY ON SMART HEALTHCARE MONITORING OF PATIENTS USING IOT

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Abstract: *This paper focuses on the review of IoT based Smart Healthcare System. The most rapidly growing healthcare segments is Telehealth and Remote Patient Monitoring (RPM). The Smart e-Health monitoring of a patient or an elderly person with the help of the sensors makes it easy and helpful in assisting them. The emerging Smart e-Health Monitoring tries to provide a risk-free environment. The main objective of the proposed system is to transmit the patient`s health parameters through Wi-Fi to the doctor`s website and to an Android app. Diagnosing and monitoring of the health of patients who are under observation, bed-ridden and who need special care are the underlying aspects of this system. The major components of Remote Patient Monitoring (RPM) are wearable devices that allow healthcare professionals to monitor, diagnose and analyse the patient`s condition without requiring them to be physically present at the doctor's office. When correctly utilized, these wearable devices enable us to monitor patient vitals and symptoms remotely. RPM can be used effectively as an early warning system for medical issues that could lead to readmission (or worse) if left untreated.*

Keywords: IoT, smart healthcare system, RPM, wearable devices, monitoring.

1. INTRODUCTION:

Things have changed due to the Internet as it plays a major role in education, medical science, entertainment, industrial field, e-commerce, social networking, etc. The concept of extending Internet connectivity beyond conventional computing platforms led to the emergence of the Internet of Things (IoT). The term IoT was foremost proposed by Kevin Ashton in 1982. Internet of Things is a concept connecting anyone, anywhere, anytime, anyplace any service. The internet of things is a system of computing devices, digital devices, objects, animals or people which are interrelated and provided with unique identifiers (UIDs). It provides the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. IoT is the network of devices such as smart homes or home automation that contain electronics, software, sensors, actuators, and connectivity which allows these things to connect, interact and exchange data. For an advanced study [1] –[5] can be referred. Health care and Medical care is one of the important applications of IoT [6]. IoT`s potential gives rise to many applications such as remote health monitoring, fitness programs, active and assisted living, chronic diseases and elderly care. IoT in health care reduces the risk of the untimely death of a patient being monitored. Further, the data being updated in the cloud can be used in the case studies and analysis of diseases that are new. The entire concept of IoT stands on sensors, module, a smartphone, wireless network and a cloud which enable the users to collect the data and communicate and access the data. This type of IoT based health monitoring helps patients who are unable to visit their doctor regularly. Through this technology, patients can be monitored and managed continuously. New trends in IoT health care gave scope to the evolution of wearable devices. When this IoT using Arduino R3 as its interface which monitoring system is used by nurses or caretakers, the patient need not stay in the hospital but can reside at his residence. In case of emergency, these devices remotely alert the health condition of the patient to the respective doctor and his caretaker.

2. LITERATURE SURVEY:

S.M. Riazul et al. [7] presents Smart Healthcare and IoT policies and principles. This paper also lists various wearable devices and explains the functional framework of a health information service model. A detailed view of the applications of IoT Healthcare has been demonstrated.

Bhoomika.B.K.et al. [8] suggested secured smart healthcare for patients using PIC18F46K22 microcontroller as a module, which picks up the data through sensors such as temperature sensor for measuring temperature, pulse oximeter sensor for measuring a person`s oxygen saturation and transmits wirelessly. The sensors are connected to the patient`s body, a piezoelectric buzzer is connected which alerts in case of emergency. The data is secured by encrypting by AES-128.

Soumya Kanti Datta et al. [9] employs a Machine-to-Machine Measurement (M3) framework which will be utilized to generate a high level of abstraction from the data being collected from the sensors. The functional architecture considers Generation subsystem (data generation, processing, and storage), Actuation subsystem (consumer and actuation).

Amira Meharouech et al. [10] presents a survey of Body-to-Body Network which consists of several Wireless Body Area Networks communicating with its neighbor. WBANs works on the principle of IEEE 802.15.6 standard. BBN is a mesh network that transmits data within a small geographical area. This paper put forth challenges and issues raised while transmitting the data.

Ms. V.Anupriya et al. [11] defines a design on Smart e-Health monitoring, which uses Radio Frequency Identification module and has a unique RFID for every patient. This system consists of smart devices, sensors, and cloud storage. The sensors pick up the patient`s details, transmits them to the doctor and the caretaker. The health parameters are stored in the cloud and can be used for further analysis. Privacy is maintained by the RFID, details are updated after every medication.

Meria M George et al [12] proposed a patient monitoring system collects the temperature, ECG, Heartbeat. The health conditions can be viewed through an Android application which is installed in the doctor`s smartphone and the care taker`s smartphone. Healthcare professional can monitor the patient`s health parameters remotely from any location.

Sapna Tyagi et al. [13] characterized the job of IoT in social insurance liberation and the mechanical perspectives that make it a reality and inspect the chances. This framework fabricates a system among all substances (specialists, patients, Labs, Pharmacists, Nurses) taking an interest in wellbeing care that not just points of confinement to the elements under one umbrella yet, in addition, spreads across the nation elements. Endeavored to actualize the ideas of IoT where these substances would be legitimately conveying to the cloud.

S. Sivagami et al. [14] characterized a proposition for shrewd clinic framework (SHS), which depends on various, yet complimentary, advances, explicitly RFID, WSN and shrewd portable, interoperating with one another through a Compelled (CoAP)/IPv6 over low power remote individual zone organize (6LoWPAN)/illustrative state exchange (REST) arrange framework.

Ming Li et al. [15] proposed a novel patient-driven structure and a suite of systems for information get to control with the PHR put away in semi confided in servers all together to accomplish fine-grained and versatile information get to control for PHR's by influence characteristic-based encryption (ABE) methods so as to scramble each patient's PHR document. Made spotlight on various information proprietor situation and has separated the client in the PHR framework into numerous security key the board which progressively lessens the key administration between the clients and the proprietors. A high level of patient security is ensured all the while by abusing multiauthority ABE that empowers dynamic adjustment of access strategies or record properties, bolsters productive on-request client/quality renouncement and break-glass access under crisis situations.

Robert Matthews et al. [16] determined a portrayal, what's more, assessment of a remote form of a framework dependent on these inventive ECG sensors. Built up another class of smaller than expected, ultra-low commotion, wearable, and ultra-low power remote capacitive sensor hub called Eco that does not require direct contiguity to the skin, and has identical execution to best quality level ECG terminals.

Rita Paradiso et al. [17] proposed a framework based on a material wearable interface which is actualized by incorporating sensors, terminals, and associations in texture structure, inventive flag handling systems, and present-day media transmission frameworks. The framework demonstrates the attainability of a framework dependent on texture detecting components. Intended to screen people influenced via cardiovascular maladies, specifically amid the renewal stage. The framework can likewise help proficient staffs who are exposed to extensive physical and mental pressure, natural and expert wellbeing dangers.

Yi Mao et al. [18] proposed an early cautioning framework (EWS) intended to distinguish or to follow the indications of clinical weakening and give early cautioning to genuine clinical occasions. Likewise presented a bucketing procedure that distinguishes and catches the adjustments in the fundamental signs. In the meantime, figured out how to deal with the missing information so that the visitors who don't have every one of the parameters can, in any case, be arranged. Led a pilot plausibility to think about by utilizing an amalgamation of calculated relapse, pail bootstrap totalling for tending to overfit, and exploratory under testing for tending to class awkwardness. Likewise appeared that this mix can essentially improve the expectation precision for all execution measurements, over other significant strategies.

Danilo De Donno et al. [19] proposed A tale, IoT-mindful, sharp-witted engineering for programmed observing and following of patients, faculty and biomedical gadgets inside the emergency clinics and nursing associations. Remaining consistent with the IoT vision, they proposed a Smart-Health-System (SHS) which depended on various, yet correlative, advancements, explicitly RFID, WSN, and savvy versatile innovations.

Kasim M. Al-Aubidy et al [20] The fundamental goal of this exploration is the structure and acknowledgment of ongoing checking and disturbing framework for patient

wellbeing, particularly for patients experiencing infections amid their typical life. The proposed framework has an installed microcontroller associated with a lot of restorative sensors (identified with the patient case) and a remote correspondence module (Bluetooth). Every patient is considered as a hub in a remote sensor system and associated with a focal hub introduced at the restorative focus through a web association. The implanted microcontroller checks if the patient wellbeing status is going great or not by examining the filtered medicinal signs. On the off chance that the examination results are irregular, the inserted unit utilizes the patient's telephone to transmit these signs legitimately to the restorative focus. For this situation, the specialist will send therapeutic counsel to the Punit Gupta et al [21] the structure and execution of IOT-based wellbeing checking framework for crisis medicinal administrations which can show gathering, combination, and interoperation of IoT information adaptable which can offer help to crisis medicinal administrations like Intensive Care Units (ICU), utilizing an INTEL GALILEO 2ND age improvement board. The proposed model empowers clients to improve wellbeing related dangers and lessen human services costs by gathering, recording, examining and sharing substantial information streams progressively what's more, productively.

Mohamed Adel Serhani et al. [22] proposed an outline work to gather patient's information continuously, so as to perform proper nonintrusive observing and propose restorative and additionally way of life commitment, at whatever point required. The structure totally depends on administration situated design (SOA) and the cloud which permits the consistent combination of versatile advancements and administrations to easily gather the crucial information of the patient's wearable biosensor gadgets. The information is put away in the cloud which and made accessible that can be gotten to by the doctors or potentially by some other approved substance.

Alexandru Archip et al. [23] characterized the means taken to structure and construct a minimal effort checking framework model. The framework centres around remote patient observing in emergency clinic wards, following an ICU release. The framework offers portable help so as to encourage quicker and better restorative in crisis cases and has been created utilizing low-power devoted sensor exhibits for EKG, SpO2, temperature, and movement.

3. PROPOSED SYSTEM:

The proposed framework utilizes each of the abilities of the Internet of Things by associating keen gadgets or things with people to give them the best human services. It makes out all the right components from every technique so we can have an ideal formula for yielding the best wellbeing administrations, which prompts the limited blunder free form of the current frameworks. The new framework, IoT Health framework which will screen the states of an individual utilizing different sensors, for example, pulse sensor, temperature sensor, circulatory strain sensor, and so on. Sensors can be changed over to into whenever wearable gadgets if the client needs to utilize it constantly. Presently the framework will send the gathered information to the brilliant things; which exchanged to the framework server through IoT organize utilizing IoT entryway. Figure 1 explains how the transmission takes place.

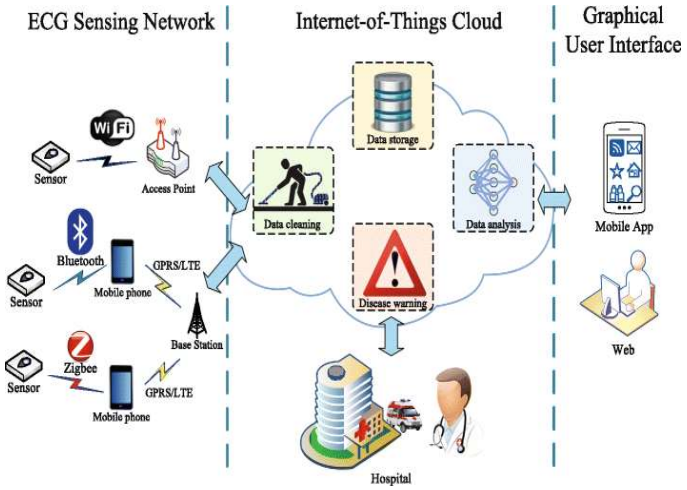

Fig 1. Patient monitoring using IoT

Next framework investigates these qualities and foresees the opportunity of happening the sicknesses. In the event that the patient is surely in basic consideration, the framework naturally alerts the clinic and specialists with the goal that the patient can get quick administrations, (for example, rescue vehicle, help of specialists, and so on) at the earliest opportunity. Therefore, patients with heart ailments, maturity issues can utilize the framework as a programmed emergency clinic framework. Indeed, even it may help in the recognition of shot of having sicknesses ahead of time.

4. CONCLUSION:

The internet of things, assemble gadgets and share data with one another, influencing it conceivable to gather, to break down/procedure and store information all the more precisely. Along these lines, IoT can likewise be used for patient observing and gives administrations to the patients. The IoT based human services framework will give benefits in an opportune way and may spare the lives of millions. In this paper, we attempt to compare the current strategies for guaranteeing the fitness of patients. It ranges from wrist-worn gadgets to IoT social insurance frameworks. With the headway of IoT empowered medicinal service frameworks, we will have an upheaval in human services that changes society as

once did by industry insurgency. Additionally, these need to ensure the protection and personal satisfaction of each individual.

REFERENCES

[1] Jan Höller, Vlasios Tsiatsis, Catherine Mulligan, Stamatis Karnouskos, Stefan Avesand, and David Boyle, From Machine-to-Machine to the Internet of Things,The Netherlands Elsevier, published in 2014.

[2] G. Kortuem, F. Kawsar, D. Fitton, and V. Sundramoorthy, ``Smart objects as building blocks for the Internet of Things,'' IEEE Internet Comput., published in vol. 14, no. 1, pp. 44_51, Jan./Feb. 2010.

[3] K. Romer, B. Ostermaier, F. Mattern, M. Fahrmair, and W. Kellerer, ``Real-time search for real-world entities: A survey,'' Proc. IEEE, published in vol. 98, no. 11, pp. 1887_1902, Nov. 2010.

[4] D. Guinard, V. Trifa, and E. Wilde, ``A resource-oriented architecture for the Web of Things ", IEEE, pp. 1_8, published in Nov./Dec. 2010,

[5] Lu Tan and Neng Wang, ``Future Internet: The Internet of Things,'' in Proc. 3rd Int. Conf. Adv. Comput. Theory Eng. (ICACTE), published in vol. 5. Aug. 2010, pp. V5-376_V5-380.

[6] Z. Pang, ``Technologies and architectures of the Internet-of-Things (IoT) for health and well-being,'' M.S. thesis, Dept. Electron. Comput. Syst., KTH-Roy. Inst. Technol., Stockholm, Sweden, published in Jan. 2013.,

[7] S.M Raizul Islam, Daehan Kwak, MD. H Kabir, Mahmud Hossain and K.S. Kwag " The Internet of Things for Health Care: A Comprehensive Survey" IEEE Access, vol. 3, pp. 678-708, April 2015.

[8] Bhoomika.B.K "Secured Smart Healthcare Monitoring System Based on IOT", IJRITCC pp 4958-4961 published in July 2015.

[9] Soumya Kanti Datta, Christian Bonnet, Amelie Gyrard, Rui Pedro Ferreria da Costa,Karima Boudaoud "Applying Internet of Things for Personalized healthcare in Smart Homes" IEEE pp 164-169 published in 2015 24th Wireless and optical Communication Conference (WOCC).

[10] Amira Mehroueh, Jocelyne Elias, Ahmed Mehaoua "Future Body-to body Networks for Ubiquitous Healthcare: A Survey, Taxonomy and Challenges", 2015 2nd International Symposium on Future Information and Communication Technologies for Ubiquitous HealthCare (Ubi-HealthTech) Published in 2015.

[11] Ms.V.Anupriya, K.Karthikey Raja, M.Mohammed Noufal and M.M.Praveen kumar "Smart e-Health Monitoring and Maintenance Using Cloud" IJREST vol 3, 2016.

[12] Meria M George,Nimmy Mary Cyriac, Sobin Mathew, Tess Antony " Patient Health Monitoring System using IOT Android" Journal for Research, vol 2, 2016.

[13] Sapna Tyagi, Amit Agrawal, Piyush Maheswari "A Conceptual framework for IoT-based Health care System using Cloud Computing" Sixth International Conference Cloud System and Big Data Engineering, July 2016, pp. 503-507.

[14]S.Sivagami, D. Revathy and L. Nithyabharathi "SMART HEALTH CARE SYSTEM IMPLEMENTED USING IoT" International Journal of Contemporary Research in Computer Science and Technology, vol. 2, Issue 3, March 2016.

[15] Ming Li, Shucheng Yu, Yao Zheng, Kui Ren, and Wenjing Lou "Scalable and secure sharing of personal health records in on cloud computing using attributebased encryption" IEEE Transactions Parallel Distributed System, vol. 24, no. 1, pp. 131-143, Jan. 2013.

[16] Robert Matthews, Chulsung Park, Pai H. Chou, Ying Bai and Andrew Hibbs "An Ultra-Wearable, Wireless, Low Power ECG Monitoring System" Biomedical Circuitsand Systems Conference, BioCAS 2006, IEEE, pp. 241- 244, ov.2006.

[17] Rita Paradiso, Giannicola Loriga, and Nicola Taccini "A Wearable Health Care System Based on Knitted Integrated Sensors" IEEE Transactions Information Technology In Biomedicine, vol. 9, no. 3, pp. 337-344, September 2005.

[18] Yi Mao, Yixin Chen, Gregory Hackmann, Minmin Chen, Chenyang Lu, Marin Kollef, and Thomas C.Bailey "Medical data mining for early deterioration warning in general hospital wards" IEEE 11th International Conference on Data Mining Workshops (ICDMW), Dec 2011, pp. 1042-1049.

[19] Danilo de donno and Luca Palano "An Iot-Aware Architecture for Smart Health care System" IEEE Internet of Things Journal, vol. 2, Issue 6, pp. 515-526, January 2015.

[20] Kasim M. Al-Aubidy, Ahmad M. Derbas & Abdullah W. Al-Mutairi, "Real-Time Patient Health Monitoring and Alarming Using Wireless-Sensor-Network", 2016 13th International Multi-Conference on Systems, Signals and Devices, 978-1-5090-1291/16/$31.

[21] Punit Gupta, Deepika Agrawal, Jasmeet Chhabra, Pulkit Kumar Dhir, "IoT based Smart HealthCare Kit", 2016 International Conference on Computational Techniques in Information and Communication Technologies (ICCTICT).

[22] Abdelghani Benharref and Mohamed Adel Serhani "Novel Cloud and SOA-Based Framework for E-Health Monitoring Using Wireless Biosensors" IEEE Journal of Biomedical and Health Informatics, vol. 18, No. 1, pp.46-55, JANUARY 2014.

[23] Alexandru Archip, Nicolae Botezatu, Elena Serban,PaulCorneliu Herghelegiu and Andrei Zal "An IoT *Based System for Remote Patient Monitoring" Senenteenth International Carpathian Control Conference, June 2016, pp. 1-6.*