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Healthcare Assistance to COVID-19 Patients Using the Internet of Things (IoT)

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Abstract

The IoT can lead to disruptive healthcare innovation. Research articles on IoT in healthcare and COVID-19 pandemics are thus researched in order to discover the potential of this technology. This literature-based research may help professionals to explore solutions to associated issues and battle the COVID-19 epidemic. Using a process diagram, IoT's significant accomplishments were briefly evaluated. Then seven critical IoT technologies that look useful in healthcare during the COVID-19 Pandemic are identified and illustrated. Finally, in the COVID-19 Pandemic, potential fundamental IoT applications were identified for the medical industry with a short explanation. The present predicament has opened up a fresh avenue to creativity in our everyday lives. The Internet of Things is an up-and-coming technology that enhances and gives better solutions in the medical area, such as appropriate medical record-keeping, sample, device integration, and cause of sickness. IoT's sensor-based technology gives a remarkable ability to lower the danger of intervention in challenging circumstances and is helpful for the pandemic type COVID-19. In the sphere of medicine, IoT's emphasis is on helping to treat diverse COVID-19 situations accurately. It facilitates the work of the surgeon by reducing risks and enhancing overall performance. Using this technology, physicians may readily identify changes in the COVID-190 s vital parameters. These information-based services provide new prospects for healthcare as they advance towards the ideal technique for an information system to adapt world-class outcomes by improving hospital treatment systems. Medical students may now be better taught and led in the future for the identification of sickness. Proper use of IoT may assist handle several medical difficulties such as speed, affordability, and complexity appropriately. It may simply be adapted to track patients' calorific intake and therapy with COVID-19 asthma, diabetes, and arthritis. In COVID-19 pandemic days, this digitally managed health management system may enhance the overall healthcare performance.

Introduction

The use of the Internet of Things (IoT) can bring many benefits to physicians, patients, and the general public. Because the accuracy of measurement and speed of operation of intelligent systems and computers is thousands of times higher than humans. Applying technology to medicine can greatly help reduce treatment costs and mortality rates.

The Internet of Things (IoT) is revolutionizing the collection, processing, and evaluation of information across many business ecosystems. These days, IoT-based technologies and sensors can be found almost everywhere to collect, monitor, and improve the regular life of health care and redefine how health care facilities and systems are.

The Internet of Things (IoT) enables physical devices to connect to the Internet, and information may be

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delivered or received over the Internet. The idea of the Internet of Things has evolved into several technologies such as sensors, machine learning, real-time testing, and embedded systems. It deals with the concept of smart hospital and other fixed or wireless equipment. Intelligent devices may collect and exchange data on a daily basis to achieve essential activities. Intelligent centers, transportation, electronics, entertainment systems, families and related healthcare reach out to IoT applications. Various sensors, medical equipment, artificial intelligence, diagnostic equipment and sophisticated imaging are at the heart of the IoT application. These tools increase production and quality of life in old and new jobs and communities.

The Internet of Things connects all computer, mechanical, and digital technologies to transmit data over the Internet without any human-to-human contact. During the COVID-19 epidemic, this technology flourished in health monitoring. In the current environment, many people lose their lives due to incorrect and untimely health information. This technology uses sensors to instantly detect health problems [2]. All patient information from COVID-19 is stored in the cloud, which may contribute to more accurate activity. This technology may record a person's regular activities and warn them about health problems. There is an essential prerequisite for the right equipment to perform a successful treatment. The Internet of Things is capable of performing effective procedures as well as analyzing postoperative progress. Therefore, the use of the Internet of Things helps to improve patient care during the COVID-19 epidemic. Effective IoT monitoring works well and saves lives from many issues such as diabetes, heart failure, asthma, high blood pressure and more. Smart medical devices are connected via a smartphone in order to transmit the necessary health data to the doctor without any hassle. They also receive information about oxygen, blood pressure, weight, blood sugar levels and so on. A reliable digital information system is a major medical problem during the COVID-19 epidemic that is quickly resolved by the Internet of Things [3]. Unfortunately, there are barriers to researching technology, its benefits, and related critical applications to meet performance-enhancing needs. However, due to its vast capacity, it can solve many problems with new information during the COVID19 epidemic.

2. IoT integration in the field of medicine

The IoT is able to provide quality solutions with the help of modern technologies. In the medical field, this becomes a new reality of a major idea that provides the most incredible services to COVID-19 patients and performs precise operations. During the current epidemic, complex situations are easily managed and digitally controlled [4]. The Internet of Things poses new challenges in creating effective support systems for physicians, surgeons and patients in the medical field. The various stages of the process are carefully identified for the efficient deployment of the Internet of Things. The IoT process diagram in the health institution is shown in Figure 1.

3. The role of the Internet of Things in health care management

IoT-enabled technologies have enabled remote monitoring in the health sector, provided the potential for safe and healthy patient care, and empowered physicians to provide exceptional treatments. It has also increased patient participation and satisfaction by facilitating and efficient contact with physicians. In addition, remote health monitoring helps reduce hospitalization time and readmission. The IoT also significantly reduces costs and improves the therapeutic effects of health care [5]. The Internet of Things is transforming the healthcare business without any ambiguity by changing the scope of devices and connecting people to solutions. The Internet of Things offers healthcare applications that benefit patients, families, doctors, hospitals, and insurance businesses.

3-1 IoT application for the patient

Devices such as fitness belts and other wireless devices such as blood pressure and heart control, glucometers, etc. are available to patients. These devices are used to remind you of calorie counts, activity restrictions, appointments, blood pressure changes, and more.

The Internet of Things has changed the lives of people, especially the elderly, through ongoing health monitoring. The Internet of Things has had a significant impact on people and families. If a person's regular activities are interrupted, the alarm system sends signals to family and health care providers to call for immediate attention during critical hours. [6]

3-2 IoT application for doctor

Physicians can monitor patients' health more effectively using wearable devices and other home monitoring technologies embedded in the Internet of Things. Anyone can monitor patients' adherence to treatment regimens or any acute need for medical care. The Internet of Things helps healthcare professionals pay more attention to patients and actively engage with and engage with patients. The data collected from IoT devices help physicians to identify the optimal treatment method for the patient and achieve the desired results.

3-3 IoT in medical institutions / hospitals

In addition to health monitoring, there are several other areas where IoT devices are very useful in hospitals. IoT sensor signaling devices are used to track medical equipment such as wheelchairs, defibrillators, nebulizers, oxygen pumps and other surveillance equipment in a real situation. The deployment of medical personnel is also evaluated in real time at various sites. For hospitalized patients, the spread of infection is a major concern. In order to prevent infection of patients, IoT-enabled health monitoring devices help. IoT devices also support asset management such as inventory control and environmental monitoring such as refrigerator temperature and humidity and temperature control [7].

3-4 IoT for health insurance companies

Health insurance with smart devices connected to the Internet of Things has different perspectives. Insurance companies use data collected through health monitoring systems for their underwriting processes and claims operations. This data helps them identify fraud charges and discover possible subscriptions. In the underwriting, pricing, claims management, and risk assessment process, IoT devices provide transparency between insurers and customers. In all operational processes, in the light of data-driven IoT judgments, consumers will have sufficient insight into the underlying thinking of each process choice and outcome. Insurers offer incentives to their customers to use and share IoT medical data. For example, customers encourage IoT devices to monitor normal activities and follow treatment and health care plans. This helps insurers to drastically reduce losses. IoT devices also allow insurance companies to evaluate claims with the data they collect [8].

4. Existing health care monitoring system

Early Predictions system is available to diagnose various diseases. However, they have not been sufficient in achieving a high level of accuracy, which occurs due to the wrong choice of machine learning models. The data set used was very limited. Even if the models were built, they were not available with a user interface and were not user-friendly. A normal person has difficulty accessing it. Some existing systems can only show symptoms of disease. They do not have the ability to analyze and generate reports on a person's health issues [9]. Only a limited number of health issues have been

considered due to which proper awareness has not been created among the people. Health-related diagnoses are available but are very costly, make the e-health system less accessible to rural people, and require a period of hard work to maintain their health monitoring system. In addition, researchers propose various protocols in the field of healthcare [13-18] and vehicle communications [19-25] to protect the information exchanged between different devices to devices. Some researchers offer a variety of techniques for privacy [26-30] and IoT-based applications [31-35].

4.1 IoT integration in health monitoring during COVID-19

4-1-1. Remote health monitoring

IoT devices are used to check heart rate, blood pressure and blood sugar, patients with pacemakers or diabetes are at home while the doctor is aware of the patient's problems. If the data indicate that a person is in crisis, they may be rushed to hospital, but otherwise monitored by IoT systems for home safety [10]. Because senior health centers carried COVID-19, physicians had difficulty finding strategies to treat the chronically ill and the elderly without endangering others. The health care agency noted that funds and facilities should be used for remote monitoring and virtual visits to reduce the risk of transmitting the virus.

4-2. Remote consultation

The infectious nature of the virus prompted doctors to use video chat to determine if the patient was infected without the virus. Communication using technology and internal constraints is a great alternative to the widespread influx of acute viral prescriptions seen in hospitals and nursing homes. After digital diagnostics, many types of IoT devices are used to monitor health data. Compared to conventional thermometers, the advent of smart thermometers by Kinsa can gather vital information for exchange with health professionals and follow trends in improving community protection.

4-3 Digital detection

Many types of IoT devices are used to monitor health data after digital diagnosis. Compared to conventional thermometers, the advent of smart thermometers by Kinsa can gather vital information for exchange with health professionals and follow trends in improving community protection.

4-4. Robot help (automatic devices)

IoT robots are more common. It is used to disinfect equipment, clean hospitals and provide medicine, which gives health professionals more time to treat their patients. China, for example, was the first country to use Danish company UVD robots to clean its health facilities during a crisis. These robots use the Internet of Things to help disinfect treatment areas in nursing homes and clean rooms.

4-5 tracking

IoT-enabled smart thermometers control the transmission of disease from their devices by increasing fever. This aggregated data helps monitor where an epidemic may occur among people in their area. These thermometers are a better option for creating a distinct profile for each user in the home collection and distributing deleted and anonymous data. [11].

4-6 Vaccine chain monitoring

In poorer countries, providing the necessary immunization services during COVID-19 has been problematic. Mobile and IoT technologies can optimize the vaccine supply chain. Virus chain recorders transmit accurate information from status records via cellular data networks via IoT sensors placed on the vaccine. For example, IoT-enabled mobile technology, eVIN, developed by UNDP and the Government of India, provides real-time logistics management across the virus chain.

4-7 UAVs providing health care

IoT-equipped drones have been shown to play a vital role in the population of developing countries for testing, EPIs, drugs and other essential health supplies. Since May 2020, Zipline has allowed drones to deliver vital medical equipment to rural health facilities in Rwanda and Ghana. The company carries drones carrying more than 160 medical supplies and services to more than 2,500 hospitals and health centers across Rwanda and Ghana throughout the epidemic. Other types of drones were active in disinfecting or detecting Covid-related symptoms.

4-8 disinfection process

In hospitals around the world, IoI-related non-curing robots were used, patient rooms were cleaned, Covid 19 was disinfected and sterilized, and special UV light was added to effectively kill the virus. The robot enters the room and closes the door because the radiation may be dangerous to humans.

Upon completion, the robot warns personnel about the safety of re-opening the entrance. This reduces the risk for primary caregivers in hospitals and other medical facilities, and allows patient wards to be changed and prepared for the next patient. The Internet of Things helped patients before the epidemic spread in the healthcare sector. In addition to managing insulin and exercise or heart rate regulation, the IoT mainly addresses age-related issues (currently at significant risk) based on the patient's condition and wishes. Connected wireless devices, monitoring They improve the distance to help faster in times of crisis. In addition, the Internet of Things can track signaled devices and alert you to emergencies. For example, if an overturned wheelchair or nebulizer breaks down, or the oxygen tank starts to empty, a call for help is made immediately. In the face of COVID19, the medical IoT continues to protect patients and healthcare professionals in parallel and will be even greater in the future after the epidemic [7,].

This app - together with IoT sensors at the vaccine location, monitors the location, temperature and inventory of the vaccine and ensures safe and reliable delivery. The use of eVin in India led to an 80% reduction in vaccine inventory [12].

5- Challenges and opportunities

IoT implementation is often challenged by connectivity, power, bandwidth, and cost. However, it is expected that lower IoT costs in healthcare will lead to increased (including sensors) and greater acceptance of mobile bandwidth. The cost-effectiveness of standard low-energy wireless technologies also contributes to this process. In addition, the large-scale use of technology in the health sector is based on the transfer of data and health records, which raises privacy and security issues. These concerns have led to the implementation of national IoT regulations in developed markets [6]. However, appropriate legislation in poor countries is still needed to strengthen IoT acceptance. Finally, functional IoT health care is often limited. A significant percentage of health problems require a physical examination to make a diagnosis. In addition, photographs and videos provided using IoT-enabled telemedicine may not be of high quality and require physical therapy. Involvement of mobile operators accelerates IoT adoption in healthcare. An example of this is Controller, a company specializing in virus chain monitoring products. The organization works with Vodafone mobile operator to monitor vaccine control data using the Vodafone IoT management platform in real time. As Europe and the United States become the Controllant Growth Zone, the company is expanding its operations to Africa with planned pilot projects in Kenya and Nigeria. Such mobile alliances provide new potential for IoT-enabled healthcare in underdeveloped areas. IoT technology gives emerging economies the opportunity to effectively combat COVID-19, and in particular to advance the digitalization of health systems by bridging significant gaps in price, quality and accessibility. Beyond Covid-19, the development of additional IoT helps predict future

epidemics, the use of statistical methods, and integration with artificial intelligence and big data. Thus, in the near future, the IoT will be a vital facilitator for the transfer of health from a reactive system to an active system [3].

6- Advantages and disadvantages of IoT in medicine

6-1 The following are among the benefits of iot in medicine.

6-1 -1 Increase the speed of treatment

As you can see in the Apple Watch example, the patient's vital signs were diagnosed as soon as possible, and rescue workers were notified. In addition, in other cases, physicians can remotely monitor patients who have been discharged from the hospital online for a short period of time to achieve complete recovery.

6-1-2 Increase measurement accuracy

As you know, electronic devices are 100 times more accurate than humans. By using technology in the medical, treatment and health industry, many human errors can be prevented. Whether it is about measuring a person's symptoms and health parameters, or about medical records and test results listed on his or her health card.

6-2 IoT Challenges in Medicine

But for all the benefits that IOMT has brought to us, there are challenges that prevent IoT from advancing in medicine. And maybe even reduce its value. Traditional practitioners' prejudices, security, and the lack of integrated protocols are just some of the challenges that we will address below.

6-2-1 The prejudice of traditional physicians

It can be said that one of the major problems facing the Internet of Things in medicine is the bias of many physicians in traditional and old-fashioned ways. "Lack of proper culture building", "fear of working with technology" and other factors have led traditional practitioners to oppose IOMT and continue to prefer paper and traditional methods to new ones.

6-2-2 Lack of integrated protocols

The next problem is that there is no uniform and uniform protocol and platform in the Internet space to which all components and sensors for measuring health symptoms are connected and work in harmony with each other.

6-3-3 Security and Privacy

The next issue is patients' privacy, information and personal data. Many people in the community will not easily trust the new systems. Their perception is that their information and privacy may be compromised by hacking into cloud and smart systems. Therefore, it is necessary to try to gain public trust in the use of the Internet of Things in medicine by creating the right culture.

7 – Result

The Internet of Things is making significant strides in upgrading medical facilities and information systems during the Covid-19 epidemic. Increases digitalization and proper management of medical procedures in hospitals. When the device / tool is connected to the Internet, the Internet of Things activates new medical applications. For patients, web-based tools are introduced in several ways to monitor patient health. Warns people about public health concerns by monitoring climate change. This technology helps the hospital to manage properly during COVID-19. It plays an important role in drug monitoring by providing verified information. This information also helps to distribute the appropriate equipment / device to the patient. This technique is useful for reducing hospital waste with the right information system. Reduces the risk of hospital accidents and addresses all issues with the help of documented information. This system helps protect expensive medical devices from theft. With a better

technical solution, IoT provides superior, relevant and reliable data. In practice, it offers innovative solutions to the challenging challenge of the medical sector during the COVID-19 epidemic. This not only creates facilities, but also saves the patient's life. It provides an essential emergency assistance service to minimize related damage. The fastest acceptance in the medical profession is due to its efficiency. The Internet of Things is designed to better manage chronic diseases, medical crises, improve patient care, fitness, blood pressure management, health inspections, measurement and control, heart rate inspections, and hearing aids. This device is capable of continuous and reliable monitoring of COVID-19 patients and improved personalization of the medical department. IoT-enabled devices help digitally store personal health information of Covid-19 patients and interact with other databases. This technology can help keep records to a minimum. Eliminates mistakes and results in a timely manner by making informed choices. By adopting this technology, medical devices and networks will become smarter and more efficient along Quaid-19. Thus, these technologies provide rapid information and communication to improve the patient's quality of life. In the future, this technology will improve patient's health for better treatment and use for any COVID-19 pandemic.

8- conclusion

IoT makes substantial advances during the COVID-19 pandemic to enhance facilities and the information system in the medical field. It enhances the digitalization and appropriate administration of medical procedures in hospitals. When device/instruments are linked to the Internet, IoT enables new medical applications. For patients, web-based gadgets are introduced in numerous ways to monitor patient health better. It warns people about concerns about public health by monitoring climate change. This technology allows the hospital to be appropriately managed during COVID-19. In monitoring the medicine, it plays an important role by giving confirmed information. This information may also aid the correct distribution of the suitable equipment/device for the appropriate patient. This technique is helpful to reduce waste in the hospital with the correct information system. It decreases the risk of hospital accidents and handles all issues with the aid of welldocumented information. This system may help protect costly medical gadgets from being stolen. With a better technical solution, IoT gives superior, relevant and trustworthy data. It permits human testing researchers with the slightest danger. In practice, it provides innovative solutions to a tough challenge in the medical sector during the COVID-19 pandemic. It generates not only the facilities but also saves the lives of each patient. It offers an essential emergency assistance service to minimize the related losses. The most rapid acceptance in the medical profession is owing to its efficiency. IoT is designed to manage better chronic illness, medical crises, improved patient care, fitness, management of blood pressure, health inspections, measurements and control, cardio frequency inspection and audiological aids. It is capable of continuous, reliable monitoring of COVID-19 patients and of improved personalization of the medical sector. IoT-enabled devices may assist digital storage of personal health information for COVID-19 patients and interact with other databases. This technology can aid manual record-keeping to a minimum. It eliminates mistakes and results on time by making a well-informed choice. By adopting this technology, medical devices and networks during COVID-19 become more intelligent and more efficient. These technologies thus provide rapid information and communication to enhance the quality of life of the patient. In the future, this technology will improve the patient’s health to better treatment and utilize it for any COVID-19 pandemic.

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