

# Comparative Paper on Emergency Medical Services using IoT

Mr. Brijesh Chavan<sup>1</sup> and Seema Rathod<sup>2</sup>

Department of Computer Science and Engineering, Sant Gadge Baba Amravati University, Amravati, India<sup>1</sup>

Professor, Department of Computer Science and Engineering, Sant Gadge Baba Amravati University, Amravati, India<sup>2</sup>

brijeshchavan13@gmail.com<sup>1</sup> and omseemarathod@gmail.com<sup>2</sup>

**Abstract:** *Physical things can be connected to the Internet thanks to the Internet of Things (IoT). Different sensors, medical equipment, artificial intelligence, diagnosis and treatment, and cutting-edge imaging technologies are at the heart of IoT's application in the medical sector. Earnings per share must be able to deliver care swiftly and precisely in order to lower mortality and disability. This could improve the efficiency and quickness of emergency services. The Internet of Things (IoT) in healthcare enables medical personnel to remotely monitor patients by employing big data analytics to look at sensor output. Smart ambulances are important connected devices in EMS. IoT is a cutting-edge concept that delivers the greatest care and performs precision surgery for COVID- 19 pa-disease patients. The GPS on the phone is used by the mobile application to follow a user and to send out SOS alerts. While a tracking session is active, the GPS tracking gadget records the path tresses using a GSM SIM card. Numerous sensors can be incorporated onto wearable IDs to send notifications about any medical condition directly to a smartphone application.*

**Keywords:** IoT

## I. INTRODUCTION

IoT-based medical devices are available in a wide range of sizes and shapes, and also contain high-tech equipment that will be connected to wireless networks. A technology that can provide legal in revealing their identification to doctors while they're in need improves the victim's survival chances in emergency situations [1]. Road traffic injuries are, according to the WHO report on the topic, the leading cause of death worldwide. Over 1.2 million individuals died each year on the road. Developing countries are facing further challenges beyond weak training. In 2002, Razzak and Kellerman carried out a study and found out that the lack of medical transport is a common issue facing most of the healthcare systems in the developing world. [2] Emergency medical service (EMS) events have a high degree of complexity. EPs should be able to treat patients quickly and accurately in order to reduce death and disability. IT can help improve the speed and accuracy of emergency services to patients in critical conditions.

The Internet of Things (IoT) can make hospitals easier to process various information collected by ubiquitous devices [3]. The Internet of things (IoT) provides the connectivity of physical objects with the Internet, and information can be sent or received through the Internet. Various sensors, medical devices, artificial intelligence, diagnostic, and advanced imaging devices are central to IoT's implementation in the medical field [4]

## II. LITERATUE REVIEWS

The usage of the Internet of Things in medical applications, such as remote medical monitoring employing various contemporary technologies, such as wireless technology, is reviewed in this section in a concise but thorough literature study. Additionally, it looks into the most recent developments in the delivery of patient-centered medical care and emergency medical services via the internet.

IoTs designed to control the private health of the elderly and children. The fact that there is no future for e-health is one of its few negatives. According to the report [5], staff members can monitor patients anywhere. However, it has a complicated infrastructure that could be problematic in an emergency [1]. Wireless sensor networks (WSNs) are being used by the healthcare industries to measure vital parameters. Bio-signals like body temperature, blood pressure, pulse oximetry, ECG, and breathing activity are, thus, sensed. Remote medical centers use end-point devices like video and



audio devices [2]

The Internet of Things (IoT) could be used to enhance emergency medical care from the beginning of the process till the admission of the patient to the emergency room. A comprehensive survey on the usage of IoT in the medical field has been presented by the authors. The emergency

response phase is an important phase of the whole process and it is important to avoid errors during this phase. Using IoT in emergency calling and response processing can enhance emergency care.

Information systems must provide a mechanism for retrieving and storing information about EMS events in the form of medical records. EPs need information regarding patient information, surveillance data, current diagnostic, and interventional. The available information must be visible to every healthcare provider to be accessed before or during patient care. The Internet of Things (IoT) in healthcare allows health professionals to monitor patients remotely by analyzing sensor output with big data analytics. In EMS, connected devices play an important role in smart ambulances. The instrument in the ambulance is connected to the hospital through a telemedicine system [3].

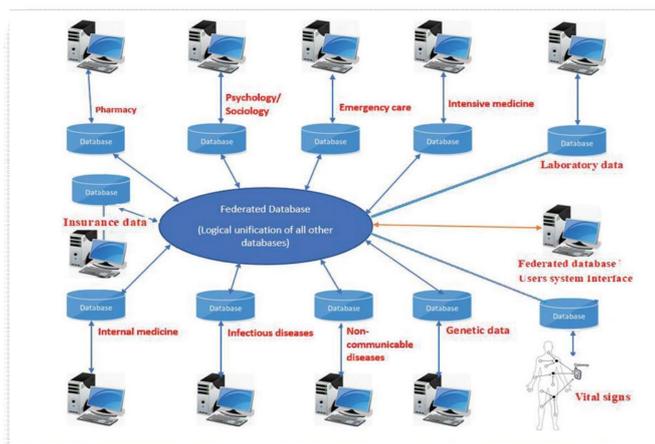
IoT is an innovative concept that provides the best service to COVID-19 pa-disease patients and performs precise surgery. Here all physical objects are connected to the Internet (networked) and devices display continuous process monitoring. The required medical information is well-provided to specified doctors as per their requirements [4].

2.1 Literature Survey Table

Author	Publishing Year	Paper Title	Goal of Existing System
Kajal R.K Pandey, Ketan Arwat, Ishaan Sharma Prof. Sonali Patil	2018	Improvement and Enhancement in Emergency Medical Services using IOT	The device is an IOT-based "virtual assistant" that provides inaccurate medical data about each patient to the ER team. Making sure that the information is made accessible to doctors, it gives personal identity and medical data, such as history and present profession. With the use of the app's software application, an individual can also be monitored.
Thierry Edoh	2019	Internet of Things in Emergency Medical Care and Services	An IoT platform for the delivery of patient-centered, data-based emergency care services is shown and discussed by the author. IoT and wireless body area networks (BANs) provide for precise data collection and are being employed more frequently in medical applications. Although the study's primary focus is a road traffic injury case, experimental findings are also covered.
M. Dachyar, Camryna H. Pertiwi	2020	Improvement in Emergency Medical Services using Internet of Things (IoT). Hospital Emergency Department Case: a BPR Approach	The author describes and offers an IoT platform for the provision of patient-centered, information-based emergency care services. IoT and wireless body area networks (BANs) are being employed more frequently in medical applications since they allow for precise data collecting. Although the experiment's findings are addressed, the study's main instance is a road traffic injury.
M. Javid, I.H. Khan	2021	Internet of Things (IoT) enabled healthcare helps to take the challenges of COVID-19 Pandemic	Healthcare can see disruptive innovation thanks to the Internet of Things (IoT). There is a need to research various IoT-enabled healthcare applications during the COVID-19 Pandemic. This study, which was based on the literature, could help experts think of solutions to linked issues and battle the epidemic.

**III. IOT IMPLEMENTATION IN THE MEDICAL FIELD**

An IoT-based system to monitor blood donation and patient medical records has been demonstrated in a Chinese trial. Additionally, this device can assist in setting up remote personal medical history [1][6]. By evaluating sensor output using big data analytics, IoT in healthcare enables medical practitioners to monitor patients from a distance Information from the sensor will be transmitted to computers or other equipment held by healthcare experts. The use of IoT in hospitals has also been covered in a number of other studies [2][7]. Imagine a world in which all physical things are networked connect and to the Internet and have devices that continuously monitor processes like breathing, heartbeats, blood pressure, body temperature, and other crucial indicators of a person's health and wellbeing[3]



**Figure 1:** IoT implementation in the medical field

**IV. METHODS AND TECHNOLOGIES**

Registered users will receive a wearable identity (bracelet, eyelet for watches, or pendant) containing an individual identification number, basic medical information, and emergency contact information. When someone calls the emergency hotline, they will receive rapid medical assistance [1]. The Internet of Health Things (IoHT) combines network connectivity from the digital and physical worlds with health things. It fully utilizes IoT's expanded data interchange capabilities, improved context awareness, and ability to start activities depending on gathered and evaluated data [2]. Clever sensors in the field of medicine, smart sensors have great digital network communication and output capabilities. accurate and trustworthy outcome It easily monitors and regulates all patient health-related parameters, including blood pressure, temperature, oxygen concentrator, sugar level, infusion system, and fluid management system. helpful to learn about one's health, a broken bone, and the biological issue around it [4]

**4.1 Methods and Technologies Table**

Author	Publishing Year	Paper Title	Method and Technologies
Kajal R.K Pandey, Ketan Arwat, Ishaan Sharma Prof. Sonali Patil	2018	Improvement and Enhancement in Emergency Medical Services using IOT	Two components of the system architecture are the mobile application and wearable identification. The route followed during a tracking session is recorded by a GPS tracking device using a GSM sim card. A mobile application also gives users access to historical route data and a way to follow any members connected to their user accounts.

Thierry Edoh	2019	Internet of Things in Emergency Medical Care and Services	Devices can connect with one another directly without the use of base stations or access points thanks to device-to-device (D2D) communication. It is meant to be used to exchange data using ultrawideband (UWB), near-field communications (NFC), Zigbee, Wi-Fi Direct, or LTE Direct.
M. Dachyar, Camryna H. Pertiwi	2020	Improvement in emergency Medical Services using Internet of Things (IoT). Hospital Emergency Department Case: a BPR Approach	Using Business Process and Notation (BPMN) software, the As-Is process model was developed. The business process is represented using BPMN so that the flow may be seen from beginning to end. Each process' data was taken as 30 samples were taken, and the form of the distribution was then determined statistically.
M. Javid, I.H. Khan	2021	Internet of Things (IoT) enabled healthcare helps to take the challenges of COVID-19 Pandemic	Sensors are used to perceive, collect, and receive the necessary data regarding patient health and disease. Here, every physical thing is networked (linked to the Internet), and gadgets show real-time process monitoring. Specific doctors receive the needed medical information in a timely manner in accordance with their requests.

**V. PURPOSE TECHNOLOGIES**

I have examined a variety of papers, but I found the 2018 paper titled "Improvement and Enhancement in Emergency Medical Services using IOT" by Kajal R.K. Pandey, Ketan Arwat, Ishaan Sharma, and Prof. Sonali Patil to be the most informative and understandable.

Registered users will receive a wearable identity (bracelet, eyelet for watches, or pendant) containing an individual identification number, basic medical information, and emergency contact information. When someone calls the emergency hotline, they will receive rapid medical assistance.

**5.1 Architecture of the System**

Two system components are the main emphasis of the system architecture. A mobile application will be made available along with the wearable identification to access the user account, administer the members under this account, and update the medical information for everyone. The mobile application also gives users access to historical route data and a way to follow any members connected to their user accounts. The application also includes a feature that allows users to alert designated contacts in case of an emergency. A GPS tracking device can be requested to track a person using the same mobile application as an IOT extension. The GSM SIM card is used by the GPS tracking device, which records the path travelled during a tracking session.

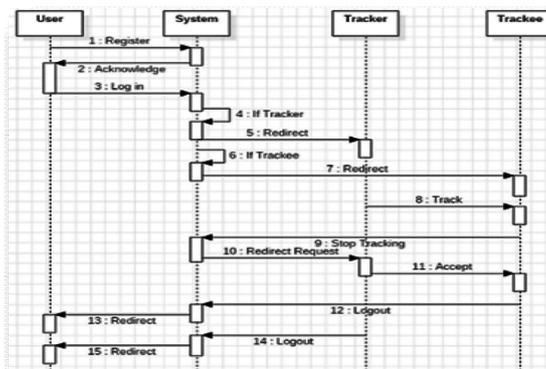


Figure 2: System Architecture

### 6. Performance and Analysis Parameter

1. Tracking: - Two methods are used to track a member: the first is a mobile application that uses the GPS on the phone to do so, and the second is SOS Alert, which does the same. Live location tracing and route recording comprise the tracking. While the SOS Alert contacts emergency contacts by SMS and phone calls.
2. Notifications for applications are also produced. The second tracking method uses a GPS tracking gadget that connects via a GSM SIM card. The mobile application allows you to find this gadget.
3. Safety: - Medical history, trackee information, and tracker information are all protected because joining requires a special referral code that must be provided by the user, and only the user has the power to modify or view anything.
4. Updated medical history: - The user account can modify or include fresh medical information details about any members connected to that user account. The database reflects this update so also on the online web portal.
5. Portability: - Device is portable and allows for tracking wherever the respective member is as long as data connection established
6. Safety: -One guiding principle for the entire system is safety. It is guaranteed to the user and member.

### VII. FUTURE SCOPE

1. Big data: - It should be handled with efficient algorithms as the access time to past data must be as quick as feasible due to the growth in user data, internationalization, and database overhead.
2. Online medical support: -This service can be introduced to assist with medical emergency activities. Users can get prompt advice about first aid in any medical emergency from licensed and verified doctors.
3. Bio-sensors in wearable IDs: - A number of sensors can be incorporated into wearable IDs to receive an immediate alert to the mobile application about any medical situation.

### VIII. CONCLUSION

From the start of the procedure until the patient is admitted to the emergency room, the Internet of Things (IoT) could be used to improve emergency medical care. The authors have provided a thorough analysis of IoT use in the medical industry. Medical smart sensors provide excellent digital network communication and output capabilities with reliable and accurate results. All patient health-related factors, such as blood pressure, temperature, oxygen concentrator, sugar level, infusion system, and fluid management system, are easily monitored and controlled. The Internet of Health Things (IoHT) blends physical and digital network connectivity. The wearable IDs can incorporate a variety of sensors to send direct alerts about any medical scenario to a mobile application. The application connects via a GSM SIM card and a GPS tracking device.

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