Measurement Framework and Indicators for Primary Health Care Using IoT

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Abstract— It is IoT in healthcare that plays a pivotal role in improving patient care and enhancing the efficiency of physicians and hospitals. Patients' health and medical information may be gathered and recorded using different medical equipment such as sensors and web-based or mobile-based apps that interact through network-connected devices. There are no hospitals in the remotest areas, thus this paper proposes to build a system that can provide world-class medical assistance to patients through the internet and wearable devices powered by a raspberry pi microcontroller that can record the patient's heart rate and blood pressure. In the event of a medical emergency, the system should alert the patient's family and doctor of the patient's current health state and comprehensive medical information. Analysis and prediction of chronic diseases and other illnesses such as heart attacks may be done at an early-stage utilising data mining methods, which will also give a decision-making edge.

Indexed Terms— Intensive-care unit (ICU), Internet of Things (IoT), Radio frequency identification (RFID)

I. INTRODUCTION

It is now possible to link any physical item to another for the purpose of exchanging information. Thanks to recent developments in wireless technology such as 6LoWPAN, Wi-Fi, Bluetooth, and ZigBee, it is now possible for a wide range of commonly used devices to communicate with one another. The Internet of Things (which may alternatively be referred to as a "LAN" or a "WSN") may be referred to in a variety of various ways. One of these methods is by using the term "Internet of Things". Internet and Things are the individual components that come together to form the Internet of Things. All of the networks that make up the Internet are linked together by a standard group of protocols that are in widespread usage. When we talk about "things," we're referring to actual objects that may be connected to one another. The Internet of Things is comprised of a wide variety of components, including radio frequency identification tags, sensors, actuators, mobile devices, and the cloud. Through the use of the Internet of Things, almost any service or critical information about any device may be accessible from a distant location at any time (IoT).

1.1 ECONOMIC IMPACT OF IOT

The fast growth of the Internet of Things (IoT) may be attributed to a slew of new technologies, including MEMS, wireless sensor networks, and the internet itself. Sensors may be purchased at a reasonable price from us. By 2025, the Internet of Things (IoT) market is expected to grow to roughly $2.1 trillion, according to industry estimates. It is predicted that the market for internet of things in health care would grow to $117 billion by 2020[3.]. "Internet of things: mapping the value beyond the hype" by McKinsey Global Institute was released in June 2015 and forecasted a $11.1 trillion market for IoT by 2025. Gartner projects that by 2020, up to 26 billion IoT devices will be linked to the Internet. As much as 180 billion euros will be generated by the IoT application industry, according to Intechno Consulting.

1.2 IOT APPLICATION AREAS

NFC, RFID, M2M, and V2V technologies are helping to speed up the adoption of the Internet of Things (IOT). By 2020, it is anticipated that more than 50 billion IoT devices will be connected to the internet. Changes in how people live, work, play and have fun will be profound. IoT has a variety of uses. These applications are expanding in scope and scope every day.

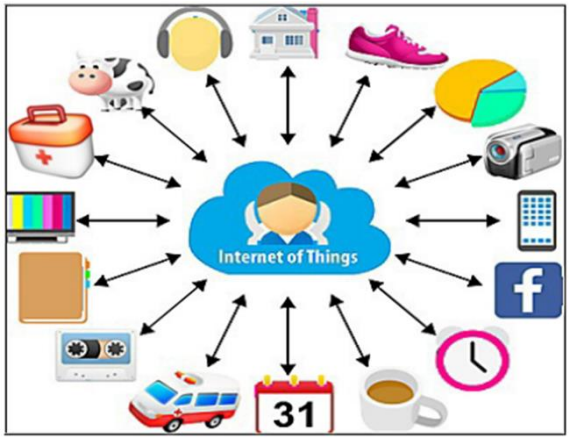

Figure 1: Internet Of Things (IoT)

Figure 2: IoT Application Areas

As follows are some of the many uses for IoT:

- Smart Cities
- Building & Home automation
- Smart Agriculture
- Smart Industry
- Healthcare Monitoring

1.3 INTERNET OF THINGS AND HEALTHCARE MONITORING

The Internet of Things (IoT) is having a major impact on the healthcare industry. IoT in healthcare between 2015 and 2020, is predicted to expand at a compound annual growth rate of 37.6%, according to Forbes magazine and P&S Market Research reports. The Internet of Things (IoT) has the potential to lessen the dependence of healthcare on humans.

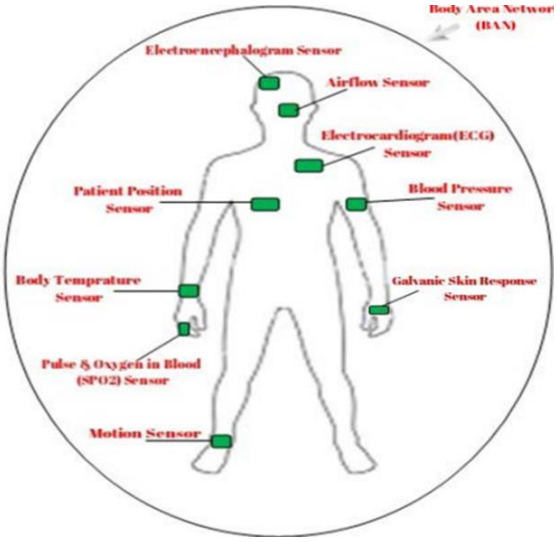

Figure 3: Body Area Networks

Patients' health data, for example, blood pressure and body temperature, and breathing patterns, is recorded by IoT wearable sensors (medical sensors). It will be sent to the hospital or caregiver in charge of the patient for further action.

A. IoT-based healthcare monitoring employs medical sensors and wearables

It is now feasible to monitor a person's health state from afar utilising wearable technology such as medical sensors and data analysis. There are a wide variety of wearable gadgets and sensors that may be integrated into clothing, eyeglasses, socks, hats, and shoes, as well as other electronic devices like smartphones, headsets, and wristwatches. There are two types of medical sensors that may be categorised: non-contact sensors and on-body sensors On-body sensors are divided into two categories: passive and active:

- Smell, Glucose, and Sweat Detection Using Optical Monitoring Sensors for Physiological Behaviour.
- Drug delivery patches, chronic pain relievers, and an emergency sensor all use therapeutic sensors.

2. SMART HEALTHCARE MONITORING USING IOT

Interconnected sensors and apps make it simpler to gather and exchange data via IoT, which is also known as the Internet of Things (IoT). The Internet of Things differentiates itself in the healthcare sector by continuously monitoring a patient and reviewing many

indicators. Constant monitoring of the patient indicates a favourable result. A large range of medical sensors-equipped devices may be found in today's intensive care units (ICUs). Without 24-hour monitoring, an emergency may not be reported to the doctor in time. It's possible that experts and others who work with the patient's family may have trouble communicating data. However, the majority of people in less developed countries like India cannot afford or have access to this kind of improvement. Because of this, these fixes may be added to current devices that don't already have these capabilities. A Raspberry Pi-based solution for remote health monitoring is shown in this article.

The paper's main goal may be summarised thusly:

a. Using the Internet of Things (IoT) to get real-time medical data on a patient.
b. Classification and processing of patient information.
c. To use data mining methods to analyse and anticipate any illness or problem in the early stages of its development, which will also give an approach that is helpful for making decisions.
d. To give healthcare solutions based on the Internet of Things at any time or place.

3. GSM/GPS-BASED REAL-TIME HEALTHCARE MONITORING AND TRACKING SYSTEM

Physical, mental, and social well-being are all considered part of a person's definition of health. People's desire for a higher quality of life is inextricably linked to their physical and emotional well-being. Sadly, the issue of As a result of several factors, such as poor health services, wide disparities between rural and urban areas, physicians and nurses who were absent at the most difficult moment, global health has become a riddle There's been much hype about the Internet of Things (IoT) in the previous decade since it enables any item to be connected inside. There are several IoT applications, including smart parking and healthcare, as well as a smart home, city, and agricultural sectors. In healthcare, the Internet of Things (IoT) is primarily used to provide health and environmental condition monitoring. The Internet of Things (IoT) is all about connecting computers to the internet through sensors and networks. Health monitoring devices may include them. The sensor data is subsequently sent to a central location point, such as M2M, which may be a computer, a person, a portable device, or a smartphone.

THE OPERATIONAL FRAMEWORK OF PRIMARY HEALTHCARE PROVIDERS

Response to World Health Assembly resolution WHA72.2 on primary health care was submitted to and recognised by the Seventy-third World Health Assembly in 2020 via the operational framework for primary health care: turning vision into action (3, 6). This paradigm has a total of fourteen actionable levers, including four strategic and 10 operational levers, which are all linked and mutually reinforcing (Table 1). Key health sector aspects may be addressed by the levers, which expand on the building blocks of the health system. For all other operational levers, the key strategic levers must be in place firstEach lever has a narrative explanation, specific actions and interventions that may be conducted at national, subnational, and community levels, and a list of resources for each lever in the PHC operational framework (a).

Table 1. PHC operational framework levers

Title	Full description
Core strategic levers	
Political commitment and leadership	Commitment and leadership that puts PHC at the heart of efforts to achieve universal health coverage and recognises PHC's broad contribution to the SDGs
Governance and policy frameworks	Policy frameworks and legislation that support PHC by promoting community leadership and mutual responsibility among stakeholders.
Funding and allocation of resources	Provident Health Treatment (PHC) funding with the purpose of promoting access, providing a platform for high-quality care and services, and avoiding financial hardship
Operational levers	

Models of care	Primary care and public health models that emphasise patient-centeredness and high-quality, holistic treatment as the foundation of comprehensive, lifelong health care
Primary health care workforce	Effective management oversight and suitable remuneration are necessary to ensure that a dedicated multidisciplinary primary health care workforce is adequately staffed and distributed.
Physical infrastructure	Accessible primary care facilities with dependable water, sanitization, waste disposal or recycling, telecommunications connection, electricity, and transportation systems to link patients to additional healthcare providers that can deliver effective services to their patients
Medicines and other health products	Making high-quality medications and other health care goods readily available to the public at reasonable costs via open, accountable systems is essential to promoting good health.

a. The necessity for a conceptual framework for PHC monitoring is evident

WHA72.2 on primary health care requested the Globe Health Organization to report on the progress made in developing PHC across the world, as part of the reporting on progress toward realising UHC, The Operational framework for PHC's fourteenth lever says that "monitoring, assessment and review of health progress and performance are necessary to guarantee that priority actions and decisions are executed as planned against agreed goals and targets". These operational framework levers must be used by countries to identify and address priority issues; assess gaps; set goals; monitor progress; and track performance in order to enhance three PHC components: integrated health services with a focus on primary care and public health roles; multisectoral policy and action; and empowered individuals and communities.

As seen in Figure 5, the PHC theory of change illustrates how the PHC method interacts with desired outcomes. a better understanding of health-related issues, increased community involvement, health literacy, and health-seeking behaviours; b addressing the wider range of socio-economic-political-environmental-healthcare; and c improving the overall health and well-being of people and communities. As a result, the PHC theory of change assumes that achieving UHC and SDG goals would be impossible without first putting the PHC strategy and levers into action. As the ultimate objective of improving PHC is to ensure that everyone has access to quality healthcare, governments must be able to monitor their choices, activities, and investments in PHC in order to determine if they are achieving the intended outcomes.

Figure 5 PHC theory of change

4. PATIENT-MONITORING SYSTEMS

You should be able to answer these questions after reading this:

- It's important to understand the purpose of patient monitoring.
- What are the principal uses of computerised patient-monitoring systems in the ICU?
- Microprocessors in bedside monitors: what are the benefits?
- What are the most critical aspects of obtaining high-quality data in the intensive care unit, whether automatically or manually?

5.1 What Is Patient Monitoring?

The management of critically sick patients includes the continuous monitoring of a wide range of patient data, including heart rate and rhythm, respiration rate, blood pressure, and blood-oxygen saturation. Electronic monitors are widely employed to gather and show physiological data when rapid decision-making is critical to patient care. It is becoming more common to use non invasive sensors on less critically sick patients in medical and surgical wards, birth rooms, nursing homes, and even patients' own homes to gather vital data that may otherwise go unrecorded.

5.2 Intensive-Care Unit Monitoring

It is estimated that there are at least five distinct patient populations that need regular physiological monitoring:

1. A drug overdose or other condition that inhibits the ability of a patient to breathe anaesthesia is an example of an unstable physiological regulatory system.
2. Patients who are at high risk of death, such as those who have been diagnosed with an acute myocardial infarction (heart attack)
3. For example, patients who have just had open-heart surgery or preterm infants whose hearts and lungs have not yet completely matured.

CONCLUSION

The Internet of Things is still in its infancy, but it has the potential to provide enormous benefits to human healthcare and the companies that are involved with it. The combination of advanced sensor technology and high-speed internet makes it feasible to follow individuals as well as other things. This study focuses on healthcare applications that are based on the Internet of Things, their supporting technologies, as well as contemporary difficulties and challenges in healthcare. It is suggested that hospitals make use of the aforementioned technologies in order to collect and retain large amounts of data in an online database. On a mobile device, you may have access to the findings via the use of an application. It is possible that the addition of components of artificial intelligence to the system will be of even greater use to medical professionals and patients.

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