Chapter 5
Multimodal IoT-Based Autonomous Emergency and Response Care for Healthcare Ecosystems

D. Sudha
Sathyabama Institute of Science and Technology, India

S. Violet
Meenakshi College of Engineering, India

Thirupurasundari D. R.
Bharath Institute of Higher Education and Research, India

Anlin Sahaya Infant Tinu M.
Rohini College of Engineering and Technology, India

Balasubramanian Prabhu Kavin
https://orcid.org/0000-0001-6939-4683
SRM Institute of Science and Technology, India

Santosh Reddy Addula
https://orcid.org/0009-0000-3286-8224
University of the Cumberlands, USA

ABSTRACT

Emergency and response care is a critical part of a country's healthcare infrastructure. The nation's healthcare sector is more concerned with developing a comprehensive, autonomous emergency, and response care by including multimodal data collected from different IoT devices. The existing systems use the body area networks (BAN) along with IoT sensors to gather critical health data to save lives. This system considers data from biosensors, medical IoT sensors, and patient activity sensors. However, most of the decision-making part resides on the medical practitioners, and also there are few provisions for integrating multi modal data like x-rays, MRI, and CT images as a part of automated emergency and response system. The chapter is a

DOI: 10.4018/979-8-3693-7703-1.ch005

holistic intelligent framework which includes multimodal data as a part of decision support systems. This system has multiple layers of data analysis, as each mode of data world require different processing and ML models.

INTRODUCTION

A medical emergency is the unexpected and sudden onset of a specific medical condition natural causes, accidents, injury (Tania, Peter, & Kristof, 2024). Absence of proper services during the emergency condition could heavily affect the patient's health which may result in impairment of body functions, organ dysfunction and in acute case it may lead to the loss of life. All these may result in long term consequences in the medical condition of the patient.

Medical emergency services must be delivered to patients who need immediate care and hence it is prioritise the patients based on their clinical conditions. So, the emergency team users a tool called Triage to delineate the patients who in life threatening situations. After stabilization of these patients, the patients in the next line will be served. A good well equipped emergency department of any healthcare provider will have high resolution monitors, lifesaving drugs and point of care diagnostics to render uninterrupted and uncompromised service to the patients (Matinrad & Reuter-Oppermann, 2022). This team should be well connected with other departments such as blood bank, testing laboratories and radiology.

The pivotal characteristics of emergency care and response systems in hospitals is time sensitive nature and rapid decision making, which makes them start apart from the regular healthcare activities. Any delay in the decision making or treatment may jeopardise the patient's health condition leading to adverse effects. The past decades has witnessed a dramatic increase in the emergency cases, thus demanding well equipped workforce networks 24 x 7 (D Buist, et al., 2002). The emergency medical system is expected to provide unscheduled services and critical care for patients who require immediate attention. A skilled emergency team could save many lives by leveraging the modern-day technologies to build advanced sophisticated medical equipment.

Genesis of Emergency and Response System

A fully functioning emergency response team was found in the mid-19th century where the European countries and United States decided to offer casualty services under the genre of workers compensation plans, local governments and railroad companies. However, a fully specialised trauma centre what's constituted in 1911 University of Louisville Hospital in Louisville, Kentucky. Around 1930s