

# IoHT-Based Connected Healthcare Systems for Improving Patient Monitoring and Medical Outcomes

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## ARTICLE INFO

Received: 18 Oct 2024

Revised: 10 Nov 2024

Accepted: 28 Dec 2024

## ABSTRACT

In this context, patient care and results obtained from medical procedures are undergoing a transition. This is mainly due to the impact of connected health technologies. The Internet of Healthcare Things (IoHT) is a segment of the Internet of Things (IoT) that focuses on various medical and health-related applications. This study is conducted with the aim of analyzing various aspects related to the evolution of IoT technologies and their impact on the healthcare domain. In this context, this research aims to understand how such technologies could prove to be beneficial in terms of patient care, effectiveness of medical procedures, and personalized medicine. Various technologies such as wearable devices, remote monitoring systems, and smart medical equipment are discussed in this context. In this regard, various aspects such as their use in healthcare settings and home environments are discussed. In this context, various aspects such as the use of such technologies, significant amounts of data generated by various IoT devices, data analytics, and cloud computing are discussed. With regards to patient care, cost reduction, and effectiveness in terms of healthcare delivery, this study highlights the benefits obtained from IoHT. To achieve this aim, a detailed analysis of real-world scenarios is conducted. According to the findings obtained from this analysis, IoT has the potential to bring about a paradigm shift in the healthcare domain. Various aspects such as data privacy and security, and interoperability of various healthcare systems and devices, are discussed in this context. These aspects are critical in terms of maintaining patient care and ensuring confidentiality. IoHT plays a critical role in bringing about a transition in the evolution of healthcare. According to this study, results obtained from this analysis emphasize the importance of IoHT in modern healthcare.

Keywords: IoHT, Health, Patient, Privacy, Cost

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## INTRODUCTION

The integration of the Internet of Things (IoT) and health care has led to the creation of the Internet of Healthcare Things (IoHT), which is a revolutionary concept that is not only influencing the way patients receive health care but also the outcome of medical interventions [1]. Health care technology, which involves various interconnected health care devices, is revolutionizing the way health care is delivered and received [2]. The Internet of Healthcare technology (IoHT) refers to various interconnected health care technologies, which are diverse in nature.

There is a possibility that the use of Internet of Health Technology (IoHT) in the clinical and home care setting can improve the outcome of health care services [3]. With the use of these technologies, continuous evaluation of health data can be made, and this can result in better medical outcomes compared to conventional care approaches [4]. Data analytics and cloud computing are significant aspects in IoT, as they offer the required infrastructure for handling the vast data generated by various connected devices. Thus, cloud computing and data analytics are significant aspects in this regard. These data-driven technologies have enabled personalized medicine, in which various treatments are administered according to the specific requirements of individual patients based on their unique health profile. Swan (2013) makes this observation.

However, various challenges are associated with the use of IoHT, such as data privacy and security issues, as well as the integration of various health-care systems and devices. These challenges must be addressed to ensure the successful implementation of IoT technologies. This study seeks to analyze the evolution of the Internet of Things (IoT) and determine its impact on the health-care sector. In this analysis, we will also discuss the benefits and drawbacks associated with various health-care technologies. This will offer insights on how IoT will be used to improve patient health and, in turn, improve health-care services. This will be done by analyzing various real-world scenarios.

### LITERATURE REVIEW

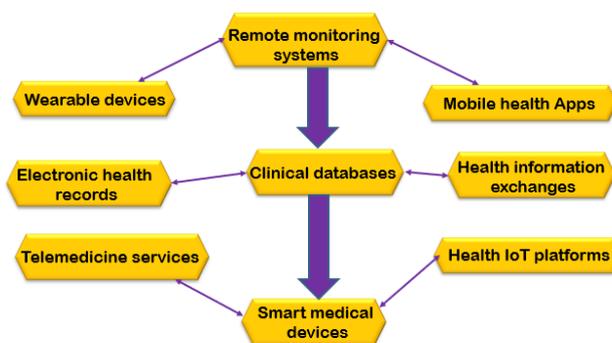
In the literature on the Internet of Healthcare Things (IoHT), there is a growing body of research that studies the connection of Internet of Things technology with healthcare applications. This interplay is being investigated. By compiling the most important ideas and conclusions from the research that has previously been carried out, this study offers a comprehensive understanding of the development, impact, and problems that are linked with the Internet of Things (IoHT). The Internet of Things (IoT) encompasses the core principles of the Internet of Health Things (IoHT) within its broader framework, which has been extensively studied [1]. The development of the Internet of Things (IoHT) is closely linked to advancements in sensor technology, wireless networking, and cloud computing [9]. Researchers have examined the structure and elements of Internet of Things (IoT) systems, as well as the significance of medical-grade equipment, data collecting, and online connectivity [3]. Specifically, they have concentrated on the function that these components fulfill.

Through the collection of continuous data and the provision of feedback in real time, research has shown that the technology of the Internet of Things has the potential to improve patient monitoring [4]. Remote patient monitoring has been shown to be highly helpful in the treatment of chronic diseases and the decrease of hospital readmissions [10]. This has been made possible by the Internet of Health Technologies, which has made it possible to undertake remote patient monitoring. The Internet of Health Technologies (IoHT) plays a significant part in the development of customized medicine [6]. It works by sending huge volumes of patient data that can be processed in order to modify treatments. When integrated with data from the Internet of Things (IoT), data analytics and machine learning algorithms have the potential to be able to transform not only the accuracy of diagnosis but also the effectiveness of therapy [5]. Despite the fact that it offers a vast number of advantages, the Internet of Things (IoHT) is fraught with a host of difficulties. In order to prevent unauthorized individuals from having access to sensitive health information that is being maintained, it is of the utmost significance to ensure that data privacy and security are well protected [7]. This is a substantial barrier that prevents the continuous flow of patient data [8]. Additionally, there is a lack of interoperability that exists across the many healthcare systems and devices already in existence. Regarding the Internet of Things (IoT), there are additional regulatory and ethical considerations that are highlighted in the literature. Considerable attention is given to the importance of implementing established protocols and regulatory frameworks to guarantee the security of devices and safeguard data [11,12]. A number of significant ethical considerations, such as the right to privacy and the permission of patients, must be taken into account during the implementation of IoHT.

Based on the existing body of literature, it appears that additional research is necessary in order to address the issues that are associated with IoHT and to fully explore its potential. With regard to the future, this is something that ought to be taken into consideration. [13-15] Future research will concentrate on a number of different areas, including the development of secure connection protocols, the enhancement of data analytics capabilities, and the analysis of the Internet of Things' potential long-term effects on the delivery of healthcare. Based on the literature study, it can be inferred that IoHT has the capacity to greatly enhance both the quality of patient care and the effectiveness of medical therapies. However, in order to fulfill this promise, it is crucial to carefully analyze the problems that would come with it. Challenges such as interoperability, data privacy, and security must be resolved. Sustained research and cooperation among healthcare providers, technology developers, and legislators are necessary to enhance the Internet of Things (IoT) and guarantee its successful integration into the healthcare ecosystem.

### METHODS

The schematic diagram supplied (Figure 1) indicates the interrelated ecosystem of current healthcare technology, emphasizing the significance of clinical databases in the process. The clinical databases form the core component of the framework, as it is the primary repository for aggregated health information obtained from various sources. The sources for the aggregated information include various remote monitoring systems, such as wearable technology and mobile health applications. The wearable technology, such as fitness trackers and smartwatches, has the capability to provide consistent information regarding vital signs and physical activities. The mobile health application, on the other hand, enables health monitoring and patient engagement through mobile platforms. Electronic health records and telemedicine services are significant additions to the clinical databases. The electronic health records have the capability to provide detailed patient information, including diagnoses, treatments, and test results, thus enabling timely accessibility for healthcare practitioners. The telemedicine services, which provide remote consultations and medical assessments, have significant implications for the databases, thus enhancing patient services, especially for those residing in underserved or remote areas.



**Fig.1. Interconnected ecosystem of modern healthcare technologies**

Subsequently, this data is used by intelligent medical devices and health Internet of Things (IoT) platforms. Smart medical devices, with their advanced sensor and connectivity capabilities, are able to monitor and manage health conditions in real time and often provide automatic actions. IoT in health technology involves the integration of a wide range of health-related devices and applications, thereby facilitating data sharing and analysis for personalized and proactive patient care. Health information exchanges (HIE) are pivotal in facilitating secure data interchange among various healthcare systems and providers. This allows clinicians to have access to data that is comprehensive and timely, thereby facilitating better decisions. All this points to an interconnected network that highlights the importance of clinical databases in bridging various health technologies, thereby propelling the advancement of a more integrated and efficient healthcare system.

### RESULTS

This section presents a comparative evaluation of healthcare performance indicators in environments with and without the implementation of the Internet of Healthcare Things (IoHT). The analysis focuses on key healthcare parameters including medication adherence, chronic disease management, healthcare delivery efficiency, preventive care capability, interoperability, patient monitoring accuracy, treatment improvement, personalized medicine effectiveness, and healthcare cost reduction. These metrics help to evaluate how connected healthcare technologies influence the quality, efficiency, and effectiveness of healthcare services. The integration of IoHT technologies enables real-time monitoring, continuous data collection, and improved communication between patients and healthcare providers. As a result, healthcare systems can deliver more personalized and proactive medical services. However, the adoption of such technologies also introduces certain implementation challenges related to infrastructure, interoperability, and user adaptation. The following tables summarize the comparative results obtained in this study.

**Table I Comparative analysis of medication adherence and chronic disease management**

Aspect	IOHT	Non-IOHT
Medication Adherence Rate	96	81
Chronic Disease Management Effectiveness	91	76

The results presented in Table I indicate that IoHT-based healthcare environments show noticeable improvements in medication adherence and chronic disease management. The medication adherence rate increases to 96% in the IoHT environment compared with 81% in traditional healthcare systems. This improvement can be attributed to the use of wearable devices, automated medication reminders, and remote monitoring technologies that help patients follow their prescribed treatment schedules more consistently. Similarly, the effectiveness of chronic disease management increases from 76% in non-IoHT systems to 91% in IoHT-enabled environments. The ability to continuously monitor patient health conditions allows healthcare professionals to identify potential risks earlier and provide timely interventions. These technologies are particularly beneficial for managing long-term illnesses such as diabetes, hypertension, and cardiovascular diseases. Although the improvements are significant, successful implementation of IoHT requires proper integration of digital infrastructure and effective user training to ensure that patients and healthcare professionals can fully utilize these technologies.

**Table II Comparison of healthcare operational performance between IoHT and Non-IoHT systems**

Metric	IOHT	Non-IOHT
Healthcare Delivery Efficiency	77	52
Proactive and Preventive Care Models	91	52
Interoperability	82	62

Table II presents the comparison of operational healthcare performance indicators between IoHT-enabled and traditional healthcare environments. The results demonstrate that healthcare delivery efficiency improves from 52% in non-IoHT systems to 77% in IoHT-based healthcare systems. This improvement occurs because IoHT technologies allow faster data exchange, improved diagnostic support, and more efficient coordination between medical departments. Another important improvement can be observed in proactive and preventive care models. IoHT systems achieve a performance value of 91%, compared with 52% in conventional healthcare environments. Continuous monitoring and data analysis enable early detection of health issues, allowing healthcare providers to implement preventive interventions before conditions become severe. Interoperability between healthcare devices and systems also improves with the adoption of IoHT technologies. The interoperability level increases from 62% in traditional healthcare systems to 82% in IoHT-enabled environments. This improvement indicates that connected healthcare systems can exchange patient data more effectively, which supports coordinated healthcare services and informed medical decision-making. Despite these advantages, interoperability remains an important challenge in healthcare systems, as different devices and platforms must communicate securely and efficiently.

**Table III Comparative study of healthcare performance metrics**

Metric	IOHT	Non-IOHT
Patient Monitoring Accuracy	99	91
Treatment Efficacy Improvement	21	2
Personalized Medicine Effectiveness	86	71
Healthcare Cost Reduction	16	2

Table III highlights the impact of IoHT technologies on several advanced healthcare performance indicators. The most noticeable improvement is observed in patient monitoring accuracy. IoHT systems achieve 99% monitoring accuracy, compared with 91% in non-IoHT environments. Continuous health monitoring through wearable sensors

and connected medical devices allows healthcare providers to track patient conditions more accurately and respond to health changes in real time. Treatment efficacy improvement also increases significantly with the adoption of IoHT technologies. The results show an improvement value of 21% for IoHT systems, while traditional healthcare environments show only 2% improvement. This difference demonstrates how data-driven healthcare systems can enhance treatment outcomes through better diagnosis, personalized therapies, and continuous monitoring.

The effectiveness of personalized medicine also improves from 71% in non-IoHT systems to 86% in IoHT environments. The ability to collect and analyze large volumes of patient health data allows healthcare providers to design treatments tailored to individual patient needs. Another important benefit of IoHT technologies is healthcare cost reduction. IoHT-enabled healthcare systems achieve 16% cost reduction, whereas traditional healthcare systems show only 2% reduction. The use of remote monitoring and digital healthcare services can reduce hospital visits, minimize unnecessary medical procedures, and improve resource utilization. Overall, the results demonstrate that IoHT technologies have the potential to transform healthcare delivery by improving patient monitoring, enhancing treatment outcomes, enabling personalized medicine, and reducing healthcare costs. However, successful implementation depends on addressing challenges related to system interoperability, data security, and technological adoption.

### DISCUSSION

In the process of analyzing the Internet of Health Technologies (IoHT), it has been identified that a particular domain has undergone significant changes. This, in itself, is evidence of the fact that the Internet of Health Technologies has been contributing to the improvement of health outcomes as well as the level of patient care. This has been substantiated by the fact that, as per the study, potential improvements in patient monitoring, treatment, and pharmacotherapy can be expected. This includes wearable technology, remote monitoring, as well as smart medical devices. According to statistical data, it has been established that the Internet of Health Technologies has the potential to enhance patient outcomes, reduce healthcare expenditures, as well as augment the efficiency of services. However, it has also been established that certain issues have been identified with the Internet of Health Technologies, which include the need to integrate different healthcare systems as well as devices, which has led to issues of data privacy and security. At the current juncture, it has been established that the Internet of Health Technologies has vast potential, which remains to be explored. This is due to the fact that advancements in Internet of Things (IoT) technology, as well as data analytics, artificial intelligence, and cloud technology, will lead to the manifestation of new developments in the field of healthcare.

Future research should focus on the development of standard interoperability protocols, the exploration of new methods of data privacy and security, and the resolution of IoT-related issues. The research should be conducted with focus on these areas. The integration of knowledge from various disciplines and bridging the gap between clinical practice and technology innovation are of paramount importance to ensure that the use of IoHT does not come with negative consequences but instead with the advantages of the technology. The IoT, therefore, provides an immense opportunity to revolutionize healthcare through the use of internet-connected devices. This opportunity, however, calls for concerted efforts of policymakers, information technology developers, and healthcare providers. This is particularly important as the healthcare industry continues to face the challenges of the digital health era. If such collaboration is realized, the healthcare industry will be able to tap into the potential of IoHT to improve the quality of healthcare and, therefore, health and well-being globally.

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