

# Chapter 5

## Digital Twin in Healthcare Present and Future Scope: Digital Twin in Healthcare

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### **ABSTRACT**

*With the massive digital innovation and adaptations, healthcare is also changing quickly to digital health care. The term ‘digital twin’ refers to a wide-reaching concept that comprises the structure via amalgamating many technologies and functionalities for digital transformation in the healthcare sector. The digital twin (DT) will enable the healthcare industry to reform, enhance, and optimize comprehensive and complicated clinical trials. This chapter will feature digital twin broadly, using the 4P Medicine framework for a sustainable medical solution. DT will enable personalized, predictive, participative, and preventive medical solutions for patients of today to an improved state of patient of tomorrow by incorporating pre-specified covariate modifications.*

### **INTRODUCTION**

#### **The Objective of The Chapter**

1. Unprecedented times have taught us the need of medical doctors, consultancy, and the importance of digital medical healthcare. So, the prime objective is to explore how digital twins are transforming the future of healthcare.
2. Digital Twin applications in hospital and healthcare industry for enhancing operational productive efficiency.
3. To know how medical simulations and trainings on digital twin will enable pre- and post-surgical interpretations in mitigating damage to human anatomy.

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## **BACKGROUND**

We all have witnessed how COVID19 pandemic has revolutionized the healthcare industry. Today healthcare sector is moving with a fast pace and at all three levels – Design, Development & Delivery- Digital innovations are the future. Artificial Intelligence (AI), Blockchain, Virtual Reality (VR), Augmented Reality (AR), Internet of Things (IOT) and Quantum Computing are all modernizing and transforming the future of healthcare. Among the most advance technical interface Digital Twin is the most symbolic term that is creating a new paradigm. This technique is evoking speed, accuracy and is saving time, energy, and stress of patients and medical practitioners. The Chapter will highlight the importance of smart healthcare adaption's using digital twin.

Digital twin is the future of sustainable healthcare. We all know how COVID19 reveals the launch of biological wars and has created a havoc to human lives. Medical aids and support systems collapsed during the pandemic tides worldwide. Hence, we require a robust system where there is a process of automation supporting man with the help of advance machine. With the emerging new age technological innovation, new types of medical concerns are emerging and to handle the high medical demands of huge population it is becoming utmost important to be equipped with higher- quality medical services. Digital Twins are vitally helping in Virtual Organs, Genomic Medicine, Personalized Health Information, Customized Drug Treatment, Complete Body Scanning, Planning of Surgery, Improvement in Healthcare Organization, Driving Efficiency, Supply Chain Resilience, Improving Caregiver Experience, Shrinking Critical Window Treatment, Value Based Healthcare, Faster Construction of Hospitals, Call Centre Interaction Streamlining, Medical Device and Drug Manufacturing & Development, Medical Device Software's, Drug Risk Classification, New Product Line Stimulations, Improvement in Device Uptime, Drug Delivery Improvement, Post Market Surveillance, Human Variability Stimulation and Digital Twin Labs etc.

The innovative healthcare models and ideas help in addressing critical and sensitive healthcare problems with much more precision and accuracy. This chapter we will broadly highlight the modern technologies in medicine industry that are going to shape better sustainable solutions to human in future. Digital twins (DT) are one of the modern virtual techniques which can help medical practitioners to innovate, design, develop a human clone where all testing and monitoring of imposed medicine and results can be evaluated. This helps the researchers to thoughtfully investigate the imposed drug and treatment on the patient and find the characteristics for effective delivery. The Digital Twins can create models of high use from information gained through wearable devices, patient's records, and processes and then connect vital links in the medical healthcare ecosystem of doctors, span patients, drugs and device manufacturers. They are showing remarkable promises in customizing medical treatments to patients based on their exclusive genetics, behaviour, anatomy and many other traits. Researchers are already encouraging medical fraternity to collaborate further in scaling Digital Twin research and operations across mass personalization platforms and sync it with most modern customer data platforms of today.

The evolution of technology innovation has remarkably modernised each sector today. Things which were an imagination earlier are real today. One of such innovation in healthcare industry is Digital twin which works in health precision management solutions. DT has its wide-reaching impact and lays a foundation in understanding human body, its biological, social, and psychological aspects and is an asset to both patients and health providers. Today digital twin is not only supporting health researchers and diagnostic management systems in acquiring the right blend of data collection for communicating meaningful clinical outcomes in understanding patient history, simulations, mutations, for better predic-

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