The use of digital twins in healthcare: The next big revolution?

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A Digital Twin can be understood as a representation of a real asset, in other words, a virtual replica of a physical object, process or even a system. As virtual models, they can integrate with all the latest technologies, such as the Internet of Things (IoT), Cloud Computing and Artificial Intelligence (AI), among others. Digital twins have applications in a wide range of sectors, from manufacturing and engineering to healthcare. They have been used in managing healthcare facilities, streamlining care processes, personalizing treatments, and enhancing patient recovery. By analyzing data from sensors and other sources, healthcare professionals can develop virtual models of patients, organs, and human systems, experimenting with various strategies to identify the most effective approach. This approach can lead to more targeted and efficient therapies while reducing the risk of collateral effects. Digital twin technology can also be used to generate a virtual replica of a hospital to review operational strategies, capabilities, personnel, and care models to identify areas for improvement, predict future challenges, and optimize organizational strategies. The potential impact of this tool on our society and its well-being is quite significant.

In relation to drug development, digital twins enable detailed simulation of molecules, pharmacological interactions and virtual clinical trials. This saves time and resources by accelerating the identification of promising drug candidates. The digital twin has application in the analysis of data related to the use of medications and their effects. By integrating information from patients, healthcare professionals and other sources, the digital twin enables a comprehensive and dynamic view of a medicine's safety profile.

The work was able to contribute in some way to broadening discussions about the future of healthcare, from the perspective of incorporating new technologies, notably Digital Twins.
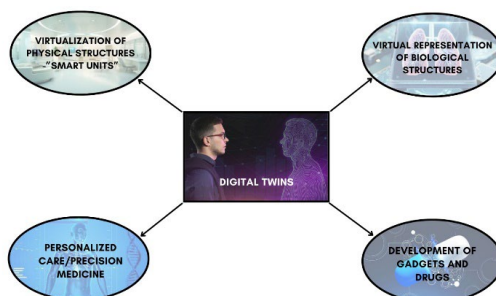

FIGURE 1: MAIN AXES OF THE USE OF DIGITAL TWINS IN HEALTHCARE

Biography

Leonardo de Oliveira El-Warrak has experience in Public Management and Business Administration. He worked for 10 years in operational audits in contracts with Social Organizations in the city of Rio de Janeiro. Master's in public health from ENSP/FIOCRUZ. He is qualified as a "Green Belt" in LEAN/SIX SIGMA projects. Since 2009, he has held several senior positions direction in Public Management as Undersecretary of Healthcare of the City of Rio de Janeiro, Chief Operations Officer at Public Company Riosaúde and Healthcare Manager for two regions in the city of Rio de Janeiro. Have experience in teaching, working as a MBA professor at Getúlio Vargas Foundation (FGV) and Medical College at Rio de Janeiro, authored books on Quality in Health. He is currently linked to the PhD program in software engineering at the Federal University of Rio de Janeiro where he has been carrying out work on digital health and digital twins in healthcare.