Impact of Internet of Medical Things (IoMT) in Pharma

Mayank Kumar
Analyst, Technology Research
and Advisory
Aranca

Mayank Kumar spoke about Internet of Medical Things (IoMT) in Pharma and Supply chain. He also talked about how pharmaceutical companies must prioritize robust cybersecurity measures.

The pharmaceutical industry has long been at the forefront of innovation, inventing and developing life-changing medications for patients worldwide. With the advent of the Internet of Medical Things (IoMT), this industry is experiencing a transformative shift that has the potential to revolutionize drug discovery, streamline supply chain operations, and strengthen cybersecurity measures. IoMT devices, such as wearable health monitors, sensors, and smart pills, are opening up new possibilities for data-driven decision-making and patient-centric strategies. Some of the main application areas of IoMT are:

Drug Discovery and Development

Monitoring Patient Response - In the realm of drug discovery and clinical research, IoMT devices are proving to be invaluable tools for improving the efficiency and effectiveness of pharmaceutical processes. Real-time patient data collection is now possible, due to wearable health monitors, patches, and smart pills such as Abilify MyCite, Proteus Discover, and ID-Cap System. These devices continuously monitor vital signs, glucose levels, heart rate, and other essential health metrics, enabling healthcare providers and researchers to observe patient responses to medications in real time.

Measuring Drug Efficacy - The data collected is crucial in identifying early signs of adverse effects, tracking improvements in patients' conditions while on specific drugs, and assessing the efficacy of different medications for specific conditions. By leveraging machine learning algorithms for data analysis, including feature extraction, regression analysis, ensemble methods, and classification, researchers can uncover patterns and correlations that aid targeted drug development efforts.

Recruiting Patients for Clinical Trials - IoMT devices also play a pivotal role in patient recruitment for clinical trials. Leveraging data analysis and machine learning algorithms, researchers can identify eligible participants
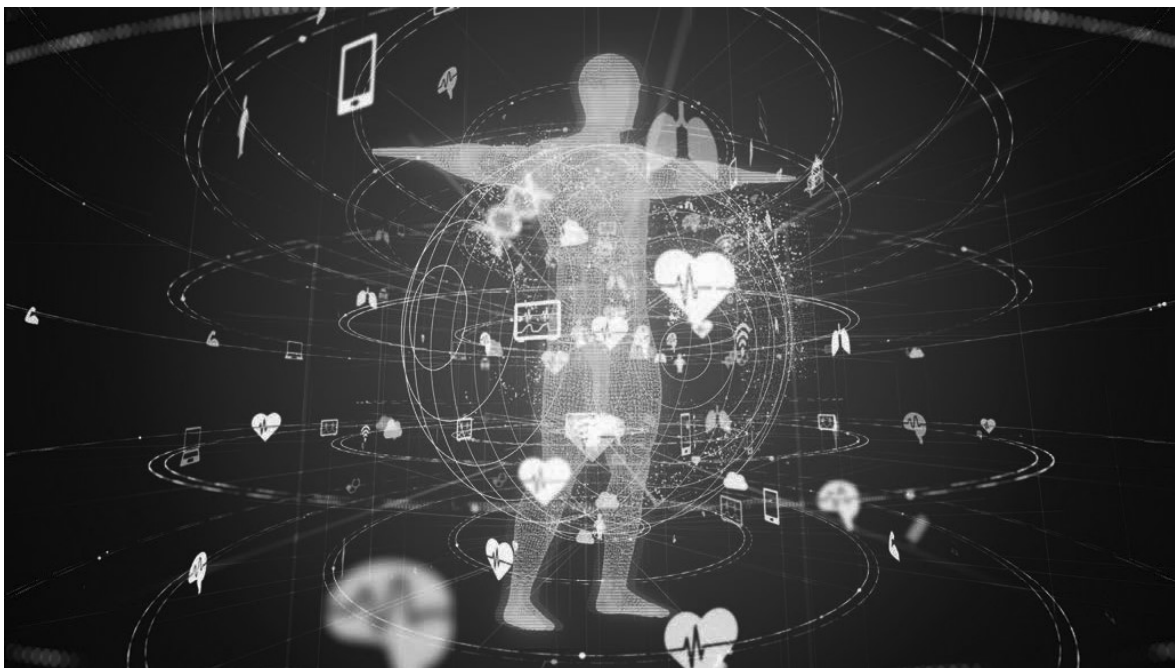
who match specific inclusion criteria, streamlining the recruitment process and ensuring a diverse and well-matched pool of trial subjects. This approach leads to more reliable and generalizable results from clinical trials, ultimately accelerating the drug development timeline.

Bioinformatics for IoMT- The integration of bioinformatics with IoMT in the pharmaceutical industry is paramount for data processing and drug discovery. Various open-source software platforms like KNIME, RapidMiner, and Orange, alongside proprietary solutions such as Cognite Data Fusion, IBM Watson Health, Oracle Health Sciences Data Cloud, and SAP Cloud for Healthcare, facilitate data analysis, data mining, and predictive modeling. These platforms enable researchers to analyze vast amounts of data generated by IoMT devices, extracting valuable insights and driving evidence-based decision-making throughout the drug discovery and development process.

Supply Chain

IoMT's impact extends beyond drug discovery and development, significantly influencing the pharmaceutical supply chain. The implementation of IoMT devices and platforms empowers pharmaceutical companies to gather real-time data on various processes, including manufacturing, distribution, and patient usage.

Data-Driven Insights - By analyzing this real-time data, pharmaceutical companies can gain invaluable insights into inefficiencies and bottlenecks within the supply chain. Armed with this knowledge, companies can implement targeted improvements, streamline processes, and optimize resource allocation, ultimately leading to lean and more cost-effective operations.

Patient-Centric Strategies - The IoMT also enables pharma companies to develop patient-centric strategies, enhancing the overall patient experience. With the help of IoMT devices, patients can actively engage with their medication packaging, receive personalized information, and contribute to their treatment plans. This heightened level of engagement fosters better medication adherence and improved health outcomes for patients.

Risk Minimization through Agility and Visibility - The adoption of IoMT and data analytics provides pharmaceutical companies with great visibility into their supply chain. This heightened visibility enables proactive risk mitigation and effective responses to disruptions, ensuring a more agile and resilient supply chain.

Compliance and Regulation - While IoMT and data analytics offer significant benefits to the pharmaceutical industry, companies must prioritize robust security measures to protect against cyber threats and adhere

to data protection and privacy regulations. Ensuring the responsible and secure handling of patient data is crucial to maintaining trust and compliance with regulatory requirements.

Cybersecurity

Pharmaceutical companies must prioritize robust cybersecurity measures when utilizing IoMT devices to safeguard sensitive patient data and ensure the integrity of their operations. Key security measures include:

Robust Authentication and Access Controls - To enhance the security of IoMT devices, it is essential to establish strong authentication mechanisms and access controls. This involves implementing password policies, multi-factor authentication, and other appropriate methods to ensure that only authorized personnel can access the devices.

Regular Firmware Updates - To safeguard IoMT devices from known vulnerabilities, it is imperative to schedule and apply regular firmware updates. Keeping the devices updated with the latest software releases helps bolster their defenses against potential threats.

Network Segmentation - To mitigate potential risks, IoMT devices should be segregated from the corporate network. By adopting network segmentation, these devices are isolated from other systems and networks, reducing the attack surface and enhancing overall security.

Data Encryption - To safeguard sensitive data transmitted or stored on IoMT devices, it is crucial to implement robust encryption protocols. Encrypting data ensures that even if unauthorized individuals gain access to the information, it remains unreadable and protected.

Vulnerability Scanning - Conducting periodic vulnerability scans is vital to identify potential security flaws in IoMT devices. By proactively scanning and promptly addressing any vulnerabilities discovered, organizations can maintain a high level of security and reduce the risk of exploitation.

Biopharma Processing

The utilization of IoMT devices in biopharma processing has brought about significant advancements in various aspects of pharmaceutical manufacturing.

Real-time Monitoring - IoMT devices play a pivotal role in monitoring critical parameters, such as temperature, pH, dissolved oxygen, and nutrient levels, throughout the cell culture and upstream processing phases. The real-time data collection capabilities facilitate immediate adjustments and interventions, ensuring optimal conditions for cell growth and product yield.

Remote Sensing - Incorporating IoMT sensors and devices at different stages of the biopharma processing chain enables seamless remote monitoring of manufacturing facilities. This empowers experts and quality control personnel to assess processes and address issues without the need for physical presence on-site.

Data Analytics - The extensive data generated by IoMT systems can be leveraged for advanced analytics and machine learning algorithms. By analyzing this data, patterns can be identified, process parameters optimized, and potential deviations or failures predicted. Consequently, this drives enhanced process efficiency and reduces the likelihood of production errors.

Pharmacokinetics and Pharmodynamics - IoMT has proven to be invaluable in studying drug interactions, drug response, and characterizing drug responses. Notable studies on drugs such as gefitinib, rosuvastatin, and ipilimumab have extensively utilized IoMT technology to further our understanding in this area. IoMT is transforming the pharmaceutical industry by enhancing drug discovery, optimizing supply chain operations, and bolstering cybersecurity measures. IoMT will also contribute to personalized medicine plans for patients. With more sophisticated data analytics tools, patient care will evolve further. One significant trajectory will be amalgamation of real-time data analytics and machine learning algorithms, culminating in predictive models that can anticipate market demands and optimize production processes. This predictive intelligence could potentially revolutionize inventory management and minimize wastage, fostering a more sustainable and cost-effective industry. The emergence of IoMT within the pharmaceutical industry is not merely a trend but a completely new dimension that will design the future. ■