THE FUTURE OF IoMT AND MEDTECH

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ABSTRACT

The integration of Internet of Medical Things (IoMT) and Medical Technology (MedTech) is revolutionizing healthcare, notably during the challenges of the COVID-19 pandemic. This convergence forms a smart, personalized system, offering interconnected services like digital patient monitoring and smart medical treatments. Wearables, IoMT devices, and AI-powered assistants facilitate remote patient monitoring and telemedicine, while blockchain ensures system security. The transition to 5G supports telesurgery. IoMT and MedTech contribute to preventive healthcare, enabling continuous monitoring and personalized interventions. Ethical concerns, including privacy and bias, are crucial for responsible implementation. The essay also explores disruptive potentials, introducing business models for senior monitoring and cost-effective patient care improvements. In summary, the synergy of IoMT and MedTech is reshaping healthcare delivery, emphasizing ethics and innovative models for a transformed industry.

KEYWORDS *Internet of Medical Things (IoMT), Medical Technology, Robotic Surgical system, AI Powered Healthcare system, Application of IoMT & MedTech, Future trends of IoMT, Medical device*

INTRODUCTION

The IoMT is a network of medical devices, sensors, and healthcare systems that are connected to the internet and exchange data with each other. This network allows for the real-time monitoring of patient health, the early detection of disease, and the provision of remote healthcare services **(Srivastava et al., 2022).**

MedTech refers to the application of engineering and technological principles to the healthcare sector. It encompasses a wide range of products, processes, and services that are used to diagnose, treat, monitor, and prevent disease. MedTech plays a crucial role in improving patient outcomes, enhancing the efficiency of healthcare delivery, and fostering innovation in the medical field**(MedTech Europe, from Diagnosis to Cure - Homepage, n.d.).**

AI is revolutionizing healthcare by automating processes and extracting insights from medical data, enabling better decision-making and personalized care.(Ali et al., 2023) Personalized medicine utilizes an individual's health data to provide tailored recommendations and interventions, enabling a more individualized and effective approach to healthcare(Peng et al., 2021). Wearable devices are gaining popularity for tracking health data and monitoring potential health risks. They collect data like heart rate, sleep patterns, and activity levels, providing personalized insights and recommendations**(Ali et al., 2023).**

A distributed computing paradigm known as "edge computing" moves data processing and analysis closer to the point of origin. This is becoming more and more significant in IoMT since it may lower latency, enhance data security, and facilitate instantaneous decision-making**(Shah et al., 2022).**

Robotic surgical systems provide surgeons with enhanced precision, dexterity, and control during complex procedures. These systems enable minimally invasive surgeries, minimizing tissue damage and reducing recovery time for patients**(Bramhe & Pathak, 2022).**

Robotic transportation systems are being implemented in hospitals and healthcare facilities to transport patients, supplies, and equipment. These autonomous systems reduce the burden on staff and improve the efficiency of patient care delivery**(Fragapane et al., 2020).**

REVIEW OF LITERATURE

IOMT AND MEDTECH: THE FUTURE OF HEALTHCARE IS HERE

The introduction of newer gadgets centered around IoMT-based technologies is blamed for the transformation of the antiquated healthcare system into a smart and customized system. Covid 19 has increased the number of IoMT-based devices that are now in use **(Dwivedi et al., 2022).**

When providing care to patients, healthcare professionals can make use of the well-connected network of services and facilities thanks to the IoMT technique. These interrelated services include data analysis tools, a digital patient monitoring system, smart medical treatment, and a well-systematized conduit of clinical advancements **(Pratap Singh et al., 2020).**

In addition to other tactics, the Internet of Medical Things (IoMT) has been implemented to stop the COVID-19 virus from spreading, enhance front-line staff safety, boost effectiveness by reducing the disease's severity on human lives, and lower death rates. Considerable progress has been made in terms of technology and applications, as well as security, all of which have been exacerbated by the IoMT's quick global growth **(Mohd Aman et al., 2021).**

The Internet of Medical Things, or IoMTs, are the healthcare systems of the future. They will connect and monitor every medical device via the Internet, with the help of healthcare professionals. Vital signs of patients are gathered using sensor devices and transmitted to IoMT applications via the Internet. The medical personnel and healthcare specialists receive the information **(Razdan & Sharma, 2022).**

the context of healthcare, the Internet of Things (IoT) refers to a network of interconnected medical devices that can generate, collect, and store data as well as connect to a network, analyse the data, and transmit various types of data, including medical images, physiological and vital body signatures, and genomic data. The IoMT sector has been widely categorized into the following categories: Telehealth and online consultations, consumer health, encompassing wearable technology, In-patient monitoring, connected imaging, hospital operations, and workflow management **(Dash, 2020).**

In order to support population health management, IoMT and MedTech combine and analyse data from various sources. In order to stop disease outbreaks and enhance public health outcomes, predictive analytics assists healthcare practitioners in identifying patterns, allocating resources effectively, and putting targeted treatments into action **(Yun et al., 2018).**

THE CONVERGENCE OF IOMT AND MEDTECH: A TECHNOLOGICAL REVOLUTION

The fourth Paradigm of Science is the result of extraordinary advancements in the biosciences, engineering, and technology over the last 20 years, including molecular biology, imaging tools, manufacturing, robotics, and telecommunications. The modern era of scientific innovation is defined by this convergence, which is typified by data storage, technological advancements, and sophisticated tools **(The Impact of IoT in Healthcare: Global Technological Change & The Roadmap to a Networked Architecture in India, 2020).**

Wearables, IoMT devices, interactive room services, and other recent innovations have revolutionised healthcare by enabling remote patient monitoring and decreasing the need for in-person hospital visits. Wearable technology enables telemedicine, which improves patient care while streamlining healthcare operations to make it more convenient and effective for both patients and providers **(Haleem et al., 2022).**

With AI-powered virtual assistants that can extract hidden information from vast amounts of healthcare data to help clinical decision-making, particularly in radiology, IoMT is revolutionising telemedicine **(Dilsizian & Siegel, 2014).**

Blockchain can be used to improve the security and efficiency of IoMT-based healthcare systems. It can provide a tamper-proof record of all interactions, making it difficult for attackers to tamper with data or disrupt operations. Blockchain can also help to reduce costs and improve interoperability between different healthcare systems **(Razdan & Sharma, 2022b).**

Blockchain allows entities to interact without a central authority by storing data in blocks linked together with cryptography. Data in blocks is tamper-proof and can be read by other users. Smart contracts can be processed smoothly on blockchain without a central authority **(Taylor et al., 2020).**

The development of communication along with the switch from 4G to 5G has made telesurgery a reality. In societies where the mobility of professionals is complicated, this has made remote therapy possible. The 5G-capable tactile internet (TI) telesurgery system runs over a network for cutting-edge, healthcare 4.0 applications **(Gupta et al., 2019).**

Through, the use of Internet of Things (IoT)-based technology, surgeons can perform surgery on patients who live far away or on themselves when doing telesurgery. This technique can cover surgical planning, the main surgical process itself and delivering post-surgery therapy services **(Cecil et al., 2018).**

To avoid shortages, cut waste, and keep costs under control, healthcare organisations must practise effective inventory management. Real-time inventory level monitoring is made possible by IoMT devices with sensors, which let healthcare institutions automate restocking procedures. By streamlining the supply chain, critical medical supplies are always accessible when needed, avoiding delays in patient treatment **(Rahman et al., 2022).**

Smart devices with IoMT capabilities are essential for improving drug adherence. Via wearable technology and smartphone apps, patients can receive timely reminders and notifications regarding their drug regimes. By helping patients remember to take their medications as directed, these reminders improve medication compliance and eventually improve patient outcomes **(Al-Arkee et al., 2021).**

Large volumes of patient data are gathered by IoMT devices. Patients and healthcare professionals can make educated judgments regarding their health and treatment options by evaluating this data. In order to comprehend the meaning of their health data and work together on individualised care plans, patients can actively participate in talks with their healthcare providers **(Medical Data, Machine Learning and IoMT-Enabled Healthcare Strategies Hindawi, n.d.).**

Continuous support is provided by IoMT and MedTech for patients with chronic disorders. Effective chronic disease management is made possible by remote monitoring, which makes it possible to identify problems early and take prompt action. Furthermore, MedTech-enabled online patient networks and support groups provide patients a feeling of community and emotional support, enabling them to manage their ailments **(Reynolds et al., 2018).**

Integration of IoMT with MedTech enhances the administration of Electronic Health Records (EHR). The smooth interchange of data between various healthcare systems made possible by connected devices guarantees that patient data is correct, current, and readily available to authorised healthcare practitioners. This connectivity improves care coordination, minimises paperwork, and expedites administrative procedures **(Li et al., 2022).**

APPLICATION OF IOMT AND MEDTECH: ENABLING PREVENTIVE HEALTHCARE AND EARLY DETECTION

The creation of a smart healthcare system based on the Internet of Medical Things (IoMT) and intended for the treatment of paediatric hematologic tumors **(Healthcare Engineering, 2023).**

IoT-based methods that are now employed to identify dementia in its early stages. There has been an amazing amount of outcome-oriented research in this field, with several contributions to offer IoT as a dementia patient support tool **(Juneja et al., 2021).**

The objective of IoMT and ML in "smart healthcare" is to increase elderly persons' access to healthcare, improve their quality of life, and increase the effectiveness of healthcare delivery. Thanks to a network of interconnected wearables, sensors, and other medical devices, the Internet of Medical Things (IoMT) allows for continuous monitoring of an elderly person's health **(Perumal, n.d.)**.

Another ground-breaking IoMT application in the healthcare space is the monitoring of patients' medical conditions while they are within an ambulance. SASs seek to enhance the quality of ambulance services by reducing the time needed for patients to be transported to a medical facility, all the while giving the patient the appropriate care inside the ambulance **(Kotronis et al., 2019)**.

Pressure sensors and other wearable medical devices are part of the Internet of Medical Things (IoMT), which is a physically connected network of sensors and software programmes that allows items to communicate with different healthcare and IT systems. High blood pressure, often known as hypertension, is a common medical problem that is frequently misdiagnosed or left untreated **(Syed et al., 2019)**.

MedTech apps encourage a healthy lifestyle by offering users individualised diet programmes, workout regimens, and health advice. These apps enable users to take control of their health and well-being and make knowledgeable decisions about it **(Mummah et al., 2017).**

IoMT and MedTech assist healthcare organizations in allocating resources efficiently. Predictive analytics identify areas with high disease prevalence, enabling targeted allocation of healthcare resources, staff, and facilities to meet the specific needs of communities **(Cresswell & Sheikh, 2013).**

By facilitating prompt interventions, remote patient monitoring using IoMT devices lowers the rate of readmissions to hospitals. MedTech solutions provide ongoing chronic disease monitoring, guaranteeing that patients receive the care they require without requiring frequent hospital stays and, thereby, lowering healthcare expenses **(Quality, 1998).**

IOMT AND MEDTECH: THE ETHICAL IMPLICATIONS OF AI-POWERED HEALTHCARE

Due to its potential to enhance patient care as well as its breadth of offering more dependable clinical data, boosting productivity, and cutting costs, the Internet of Medical Things (IoMT) has emerged as a strategic goal for e-healthcare going forward. It makes sense that many healthcare organisations now prefer to take use of the advantages provided by the IoMT **(Hireche et al., 2022).**

IoMT's largest problem is privacy and security. A single rogue device has the potential to breach patient privacy due to the sensitive and intrusive nature of medical data. Data breaches can result in dangerous circumstances, inaccurate diagnoses, and treatments, and even death. IoMT places a high priority on security and privacy, and to fend against threats and attacks, new, strong, and lightweight techniques must be developed **(Hireche et al., 2022).**

To defend against the risks and assaults that IoMT infrastructures are vulnerable to, new, strong, and lightweight mechanisms must be created. In fact, according to a report, the market for healthcare security alone is predicted to grow to $8.7 billion in the United States by 2023 **(Vaiyapuri et al., n.d.).**

System for secure data transmission in IoMT does not reveal any information about the patient's identity or medical data. It achieves a high level of security and saves data transmission, but it requires large computation and storage costs **(Kumar & Chand, 2020).**

A new era in healthcare has begun with the convergence of the Internet of Medical Things (IoMT) and Medical Technology (MedTech), where Artificial Intelligence (AI) is essential to patient care, diagnosis, and treatment. Healthcare powered by AI has enormous potential benefits, but there are also ethical issues that need to be carefully considered given how quickly this technology is developing. The ethical implications of IoMT and MedTech are examined in this essay, with a particular emphasis on the moral dilemmas raised by AI in the field of healthcare **(Naik et al., 2022).**

AI systems are primarily dependant on massive volumes of patient data. Ensuring the privacy and security of this data is paramount. Unauthorized access or data breaches could have severe consequences, compromising patient confidentiality and trust (Naik et al., 2022).AI systems, if not properly trained, can perpetuate biases present in the data they are trained on. This can lead to discriminatory practices, affecting marginalized communities and reinforcing existing inequalities in healthcare **(Parikh et al., 2019).**

Understanding how AI systems make decisions can frequently be difficult due to their complexity. It might be challenging to evaluate the validity of AI-generated recommendations when there is a lack of openness and accountability, as this can undermine confidence between patients and healthcare providers **(Bilgic et al., 2022).**

Medical professionals' decision-making abilities could be enhanced by AI. However, an over-reliance on AI could harm patient satisfaction and medical quality as well as weaken the doctor-patient relationship **(Dalton-Brown, 2020).**

The implementation of AI in healthcare often involves complex algorithms that patients may not fully comprehend. Ensuring informed consent becomes challenging in such scenarios. Patients must have a clear understanding of the AI-based interventions, their implications, and alternative options. Upholding patient autonomy and informed decision-making becomes a critical ethical consideration **(Gerke et al., 2020).**

It's still difficult to guarantee smooth data transmission and connectivity between various IoMT systems and devices. Establishing interoperability standards is necessary to provide seamless integration and data sharing **(Dong et al., 2019).**

The widespread adoption of IoMT raises concerns about the security and privacy of patient data. Healthcare organizations must implement robust security measures to safeguard sensitive health information and ensure patient trust **(Gehring et al., 2017).**

IOMT AND MEDTECH: DISRUPTING THE HEALTHCARE INDUSTRY WITH NEW BUSINESS MODELS

A business model is created to keep an eye on the activities of senior citizens and offer them automatic support when needed. IoMT is essential to the monitoring of senior citizens. This model uses an artificial neural network (ANN) technique to effectively and intelligently monitor elderly individuals **(Khan et al., 2021).**

Predictive analytics will be utilised by certain firms to provide healthcare consulting services by gathering data through IoMT technologies. Therefore, the proliferation of smartphone usage and connected healthcare devices will accelerate the Internet of Medical Things (IoMT) in the healthcare sector, enabling the delivery of better, more effective patient care at a reasonable cost **(Venkatesh, 2019).**

The process of making smart items is known as IoT. It could be applied to private health, chronic illness surveillance, care for the young and old, and fitness management. The use of smart healthcare is a major motivator for developing a novel business plan for health **(Scholarworks@uaeu et al., 2019)**.

A few years ago, doctors could not have performed real-time analysis on medical devices due to limitations in IoT technology. Additionally, it has helped healthcare facilities serve a larger patient base at a lower cost by reaching more individuals at once. The use of big data and cloud computing has also improved and streamlined doctor-patient communication **(Pradhan et al., 2021).**

Internet-of-things-based in-home health care services hold promise for addressing the issues brought on by the ageing population. However, the available research is not very cohesive and demonstrates a lack of interoperability**(Bui & Zorzi, 2011)**.

This proposes a business-technology co-design process (business model, device and service integration architecture, and information system integration architecture) for the cross-border integration of in-home healthcare equipment and services. An ecosystem for cooperative health-IoT is developed, and all parties' information systems are connected into a cooperative health cloud and made available to patients at home with the in-home health care station **(Pang et al., 2015)**.

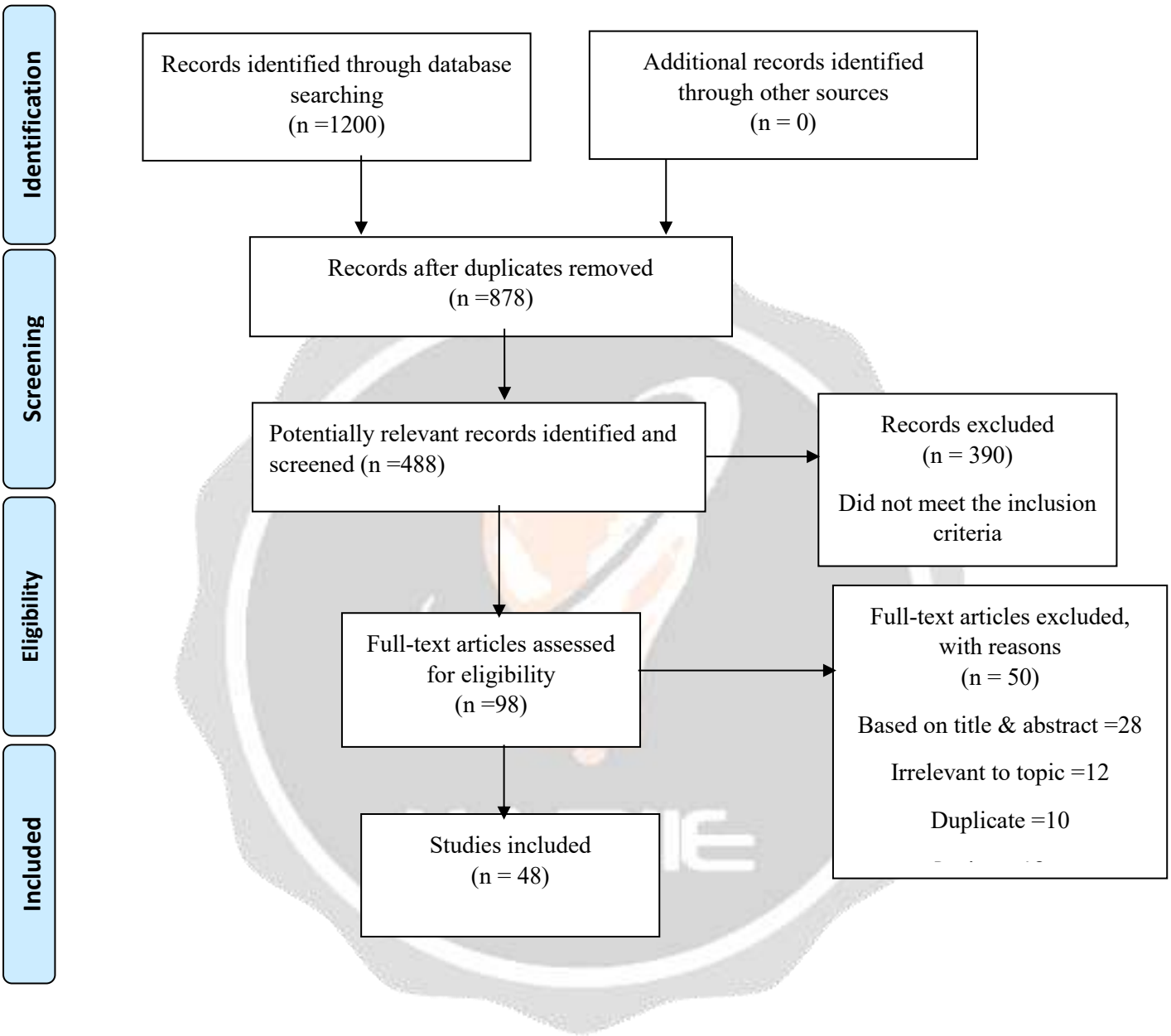
METHODOLOGY

The literature search was limited to articles published from 1998-2023. The search for articles was done online by using the search words ‘IoMT and MedTech’, ‘telesurgery’, ‘precise medication’ in the title and keywords in research databases at Wiley, Elsevier, ERIC, Springer, and Frontiers.

ANALYSIS

The method used is the Preferred Reporting Item for Systemic Reviews and Meta Analytics (PRISMA) method. All articles that have passed the selection process were then reviewed and summarised based on the objectives, year of publication, number of citations, and suggestions for further research.

PRISMA Flow Diagram



INCLUSION & EXCLUSION CRITERIA

The be included in the current study, studies have to meet some criteria

(a) Studies have included some kind of selection criteria (future of Iomt and medech). These criteria limited the number of studies (b) Accordingly excluded the studies in which it based on irrelevant information there is no proper Title, Abstract or review.

FINAL DATA SET

The research database search resulted in all keywords search results obtained 1200 research articles. After scanning the title, there was the same article in two different databases. The results after deducting the duplicates are 878 articles. A total of articles was screened. 390 Articles excluded that they not meet the inclusion criteria.

Articles accessed for eligibility are 98 articles. A Total number of 50 articles were excluded based on title and abstract (28) Irrelevant to topic (12) Duplicate (10).

The final data set consists of 48 articles.

The oldest included study was published in the year 1998 and the most recent study was conducted on 2023. The Entire process is shown in the figure.

DISCUSSION

Healthcare is being revolutionized by the confluence of Medical Technology (MedTech) and the Internet of Medical Things (IoMT). Smart and personalized solutions are made possible by IoMT, particularly in light of the COVID-19 pandemic. By connecting medical equipment, it enhances pandemic preparedness and patient care. IoMT improves the effectiveness of healthcare and is divided into telemedicine, wearables, and other areas. AI, 5G, and wearables are revolutionizing surgical techniques and patient monitoring. IoMT helps with medication adherence and inventory management, while blockchain guarantees safe data. AI biases and privacy are two ethical issues. Predictive analytics provides medical care that is less expensive, and new business models keep an eye on the elderly. IoMT helps with early detection, better chronic disease management, and preventative healthcare. Data security and interoperability present challenges, but solving them will allow IoMT to realize its full potential in upending the healthcare sector.

CONCLUSION

In summary, a revolutionary era in healthcare has been brought about by the convergence of the Internet of Medical Things (IoMT) and Medical Technology (MedTech). Numerous applications, including preventive healthcare and remote patient monitoring as well as the creation of creative business models, have been made possible by the integration of these technologies. However, the rapid advancement of IoMT and MedTech also brings forth ethical considerations, particularly regarding patient privacy, data security, and the responsible use of artificial intelligence in healthcare. It is critical for stakeholders to address the ethical implications, implement strong security measures, and guarantee openness in AI-driven decision-making processes as emerging technologies continue to disrupt the healthcare sector. Furthermore, the advantages that could arise from better patient care, more efficient operations, and new business models highlight how crucial it is to carry out more research, work with others, and create standards to guarantee the safe and efficient application of IoMT and MedTech in the changing healthcare environment.

CONFLICT OF INTEREST:

The authors have no conflicts of interest regarding this investigation.

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REFERENCES

1. Al-Arkee, S., Mason, J., Lane, D. A., Fabritz, L., Chua, W., Haque, M. S., & Jalal, Z. (2021). Mobile Apps to Improve Medication Adherence in Cardiovascular Disease: Systematic Review and Meta-analysis. *Journal of Medical Internet Research*, *23*(5). https://doi.org/10.2196/24190
2. Ali, S., Abuhmed, T., El-Sappagh, S., Muhammad, K., Alonso-Moral, J. M., Confalonieri, R., Guidotti, R., Del Ser, J., Díaz-Rodríguez, N., & Herrera, F. (2023). Explainable Artificial Intelligence (XAI): What we know and what is left to attain Trustworthy Artificial Intelligence. *Information Fusion*, *99*, 101805. https://doi.org/10.1016/J.INFFUS.2023.101805
3. Bilgic, E., Gorgy, A., Yang, A., Cwintal, M., Ranjbar, H., Kahla, K., Reddy, D., Li, K., Ozturk, H., Zimmermann, E., Quaiattini, A., Abbasgholizadeh-Rahimi, S., Poenaru, D., & Harley, J. M. (2022).

Exploring the roles of artificial intelligence in surgical education: A scoping review. *American Journal of Surgery*, *224*(1), 205–216. https://doi.org/10.1016/J.AMJSURG.2021.11.023

4. Bramhe, S., & Pathak, S. S. (2022). Robotic Surgery: A Narrative Review. *Cureus*, *14*(9). https://doi.org/10.7759/CUREUS.29179
5. Bui, N., & Zorzi, M. (2011). Health care applications: A solution based on the Internet of Things. *ACM International Conference Proceeding Series*. https://doi.org/10.1145/2093698.2093829
6. Cecil, J., Gupta, A., Pirela-Cruz, M., & Ramanathan, P. (2018). An IoMT based cyber training framework for orthopedic surgery using Next Generation Internet technologies. *Informatics in Medicine Unlocked*, *12*, 128–137. https://doi.org/10.1016/j.imu.2018.05.002
7. Cresswell, K., & Sheikh, A. (2013). Organizational issues in the implementation and adoption of health information technology innovations: an interpretative review. *International Journal of Medical Informatics*, *82*(5). https://doi.org/10.1016/J.IJMEDINF.2012.10.007
8. Dalton-Brown, S. (2020). The Ethics of Medical AI and the Physician-Patient Relationship. *Cambridge Quarterly of Healthcare Ethics*, *29*(1), 115–121. https://doi.org/10.1017/S0963180119000847
9. Dash, S. P. (2020). The Impact of IoT in Healthcare: Global Technological Change & The Roadmap to a Networked Architecture in India. In *Journal of the Indian Institute of Science* (Vol. 100, Issue 4, pp. 773–785). Springer. https://doi.org/10.1007/s41745-020-00208-y
10. Dilsizian, S. E., & Siegel, E. L. (2014). Artificial intelligence in medicine and cardiac imaging: Harnessing big data and advanced computing to provide personalized medical diagnosis and treatment. *Current Cardiology Reports*, *16*(1). https://doi.org/10.1007/s11886-013-0441-8
11. Dong, X., Chowdhury, S., Qian, L., Li, X., Guan, Y., Yang, J., & Yu, Q. (2019). Deep learning for named entity recognition on Chinese electronic medical records: Combining deep transfer learning with multitask bi-directional LSTM RNN. *PLOS ONE*, *14*(5), e0216046. https://doi.org/10.1371/JOURNAL.PONE.0216046
12. Dwivedi, R., Mehrotra, D., & Chandra, S. (2022). Potential of Internet of Medical Things (IoMT) applications in building a smart healthcare system: A systematic review. *Journal of Oral Biology and Craniofacial Research*, *12*(2), 302–318. https://doi.org/10.1016/j.jobcr.2021.11.010
13. Fragapane, G., Hvolby, H.-H., Sgarbossa, F., Strandhagen, J. O., Ola, J., & Autonomous, S. (2020). *Autonomous Mobile Robots in Hospital Logistics*. 672–679. https://doi.org/10.1007/978-3-030-57993-7_76ï
14. Gehring, J., Auli, M., Grangier, D., Yarats, D., & Dauphin, Y. N. (2017). Convolutional Sequence to Sequence Learning. *34th International Conference on Machine Learning, ICML 2017*, *70*, 1243–1252. https://doi.org/10.5555/3305381.3305510
15. Gerke, S., Minssen, T., & Cohen, G. (2020). Ethical and legal challenges of artificial intelligence-driven healthcare. In *Artificial Intelligence in Healthcare* (pp. 295–336). Elsevier. https://doi.org/10.1016/B978-0-12-818438-7.00012-5
16. Gupta, R., Tanwar, S., Tyagi, S., & Kumar, N. (2019). Tactile-internet-based telesurgery system for healthcare 4.0: An architecture, research challenges, and future directions. *IEEE Network*, *33*(6), 22–29. https://doi.org/10.1109/MNET.001.1900063
17. Haleem, A., Javaid, M., Pratap Singh, R., & Suman, R. (2022). Medical 4.0 technologies for healthcare: Features, capabilities, and applications. In *Internet of Things and Cyber-Physical Systems* (Vol. 2, pp. 12–30). KeAi Communications Co. https://doi.org/10.1016/j.iotcps.2022.04.001
18. Hireche, R., Mansouri, H., & Pathan, A.-S. K. (2022). Security and Privacy Management in Internet of Medical Things (IoMT): A Synthesis. *Journal of Cybersecurity and Privacy*, *2*(3), 640–661. https://doi.org/10.3390/jcp2030033
19. Juneja, S., Dhiman, G., Kautish, S., Viriyasitavat, W., & Yadav, K. (2021). A Perspective Roadmap for IoMT-Based Early Detection and Care of the Neural Disorder, Dementia. In *Journal of Healthcare Engineering* (Vol. 2021). Hindawi Limited. https://doi.org/10.1155/2021/6712424
20. Khan, M. F., Ghazal, T. M., Said, R. A., Fatima, A., Abbas, S., Khan, M. A., Issa, G. F., Ahmad, M., & Khan, M. A. (2021). An iomt-enabled smart healthcare model to monitor elderly people using machine learning technique. *Computational Intelligence and Neuroscience*, *2021*. https://doi.org/10.1155/2021/2487759
21. Kotronis, C., Routis, I., Politi, E., Nikolaidou, M., Dimitrakopoulos, G., Anagnostopoulos, D., Amira, A., Bensaali, F., & Djelouat, H. (2019). Evaluating Internet of Medical Things (IoMT)-Based Systems from a Human-Centric Perspective. In *Internet of Things (Netherlands)* (Vol. 8). Elsevier B.V. https://doi.org/10.1016/j.iot.2019.100125
22. Kumar, M., & Chand, S. (2020). A Secure and Efficient Cloud-Centric Internet-of-Medical-Things-Enabled Smart Healthcare System with Public Verifiability. *IEEE Internet of Things Journal*, *7*(10), 10650–10659. https://doi.org/10.1109/JIOT.2020.3006523

23. Li, E., Clarke, J., Ashrafian, H., Darzi, A., & Neves, A. L. (2022). The Impact of Electronic Health Record Interoperability on Safety and Quality of Care in High-Income Countries: Systematic Review. *Journal of Medical Internet Research*, *24*(9). https://doi.org/10.2196/38144
24. *Medical Data, Machine Learning and IoMT-enabled Healthcare Strategies | Hindawi*. (n.d.). Retrieved November 2, 2023, from https://www.hindawi.com/journals/bmri/si/407532/
25. *MedTech Europe, from diagnosis to cure - Homepage*. (n.d.). Retrieved November 23, 2023, from https://www.medtecheurope.org/
26. Mohd Aman, A. H., Hassan, W. H., Sameen, S., Attarbashi, Z. S., Alizadeh, M., & Latiff, L. A. (2021). IoMT amid COVID-19 pandemic: Application, architecture, technology, and security. In *Journal of Network and Computer Applications* (Vol. 174). Academic Press. https://doi.org/10.1016/j.jnca.2020.102886
27. Mummah, S., Robinson, T. N., Mathur, M., Farzinkhou, S., Sutton, S., & Gardner, C. D. (2017). Effect of a mobile app intervention on vegetable consumption in overweight adults: A randomized controlled trial. *International Journal of Behavioral Nutrition and Physical Activity*, *14*(1), 1–10. https://doi.org/10.1186/S12966-017-0563-2/FIGURES/3
28. Naik, N., Hameed, B. M. Z., Shetty, D. K., Swain, D., Shah, M., Paul, R., Aggarwal, K., Brahim, S., Patil, V., Smriti, K., Shetty, S., Rai, B. P., Chlosta, P., & Somani, B. K. (2022). Legal and Ethical Consideration in Artificial Intelligence in Healthcare: Who Takes Responsibility? *Frontiers in Surgery*, *9*, 862322. https://doi.org/10.3389/FSURG.2022.862322/BIBTEX
29. Pang, Z., Zheng, L., Tian, J., Kao-Walter, S., Dubrova, E., & Chen, Q. (2015). Design of a terminal solution for integration of in-home health care devices and services towards the Internet-of-Things. *Enterprise Information Systems*, *9*(1), 86–116. https://doi.org/10.1080/17517575.2013.776118
30. Parikh, R. B., Teeple, S., & Navathe, A. S. (2019). Addressing Bias in Artificial Intelligence in Health Care. *JAMA - Journal of the American Medical Association*, *322*(24), 2377–2378. https://doi.org/10.1001/JAMA.2019.18058
31. Peng, J., Jury, E. C., Dönnes, P., & Ciurtin, C. (2021). Machine Learning Techniques for Personalised Medicine Approaches in Immune-Mediated Chronic Inflammatory Diseases: Applications and Challenges. *Frontiers in Pharmacology*, *12*, 720694. https://doi.org/10.3389/FPHAR.2021.720694/BIBTEX
32. Perumal, U. (n.d.). SMART HEALTH CARE FOR MONITORING ELDERLY PEOPLE USING IoMT AND ML. *Journal of Data Acquisition and Processing*, *38*(2), 2023. https://doi.org/10.5281/zenodo.777578
33. Pradhan, B., Bhattacharyya, S., & Pal, K. (2021). IoT-Based Applications in Healthcare Devices. In *Journal of Healthcare Engineering* (Vol. 2021). Hindawi Limited. https://doi.org/10.1155/2021/6632599
34. Pratap Singh, R., Javaid, M., Haleem, A., Vaishya, R., & Ali, S. (2020). Internet of Medical Things (IoMT) for orthopaedic in COVID-19 pandemic: Roles, challenges, and applications. In *Journal of Clinical Orthopaedics and Trauma* (Vol. 11, Issue 4, pp. 713–717). Elsevier B.V. https://doi.org/10.1016/j.jcot.2020.05.011
35. Quality, A. for H. R. and. (1998). U.S. Preventive Services Task Force Evidence Syntheses, formerly Systematic Evidence Reviews. *Rockville: (MD).*, *131*, 1–9. http://www.ncbi.nlm.nih.gov/books/NBK43437/?report=reader
36. Rahman, A., Hossain, M. S., Muhammad, G., Kundu, D., Debnath, T., Rahman, M., Khan, M. S. I., Tiwari, P., & Band, S. S. (2022). Federated learning-based AI approaches in smart healthcare: concepts, taxonomies, challenges and open issues. *Cluster Computing 2022 26:4*, *26*(4), 2271–2311. https://doi.org/10.1007/S10586-022-03658-4
37. Razdan, S., & Sharma, S. (2022a). Internet of Medical Things (IoMT): Overview, Emerging Technologies, and Case Studies. In *IETE Technical Review (Institution of Electronics and Telecommunication Engineers, India)* (Vol. 39, Issue 4, pp. 775–788). Taylor and Francis Ltd. https://doi.org/10.1080/02564602.2021.1927863
38. Razdan, S., & Sharma, S. (2022b). Internet of Medical Things (IoMT): Overview, Emerging Technologies, and Case Studies. In *IETE Technical Review (Institution of Electronics and Telecommunication Engineers, India)* (Vol. 39, Issue 4, pp. 775–788). Taylor and Francis Ltd. https://doi.org/10.1080/02564602.2021.1927863
39. Reynolds, R., Dennis, S., Hasan, I., Slewa, J., Chen, W., Tian, D., Bobba, S., & Zwar, N. (2018). A systematic review of chronic disease management interventions in primary care. *BMC Family Practice*, *19*(1). https://doi.org/10.1186/S12875-017-0692-3
40. Scholarworks@uaeu, S., Hasan, M., Al Thawadi, A., Thawadi, A., & Abdullah, M. H. (2019). *Innovative Business Model for Smart Healthcare Insurance Innovative Business Model for Smart Healthcare Insurance Recommended Citation Recommended Citation*. https://scholarworks.uaeu.ac.ae/info_sec_theses

41. Shah, S. H. A., Koundal, D., Sai, V., & Rani, S. (2022). Guest Editorial: Special Section on 5G Edge Computing-Enabled Internet of Medical Things. *IEEE Transactions on Industrial Informatics*, *18*(12), 8860–8863. https://doi.org/10.1109/TII.2022.3193708
42. Srivastava, J., Routray, S., Ahmad, S., & Waris, M. M. (2022). Internet of Medical Things (IoMT)-Based Smart Healthcare System: Trends and Progress. *Computational Intelligence and Neuroscience*, *2022*. https://doi.org/10.1155/2022/7218113
43. Syed, L., Jabeen, S., S., M., & Alsaeedi, A. (2019). Smart healthcare framework for ambient assisted living using IoMT and big data analytics techniques. *Future Generation Computer Systems*, *101*, 136–151. https://doi.org/10.1016/j.future.2019.06.004
44. Taylor, P. J., Dargahi, T., Dehghantanha, A., Parizi, R. M., & Choo, K. K. R. (2020). A systematic literature review of blockchain cyber security. In *Digital Communications and Networks* (Vol. 6, Issue 2, pp. 147–156). Chongqing University of Posts and Telecommunications. https://doi.org/10.1016/j.dcan.2019.01.005
45. *The Impact of IoT in Healthcare: Global Technological Change & The Roadmap to a Networked Architecture in India*. (2020).
46. Vaiyapuri, T., Binbusayyis, A., & Varadarajan, V. (n.d.). Security, Privacy and Trust in IoMT Enabled Smart Healthcare System: A Systematic Review of Current and Future Trends. In *IJACSA) International Journal of Advanced Computer Science and Applications* (Vol. 12, Issue 2). www.ijacsa.thesai.org
47. Venkatesh, A. N. (2019). Reimagining the future of healthcare industry through internet of medical things (IoMT), artificial intelligence (AI), machine learning (ML), big data, mobile apps and advanced sensors. *International Journal of Engineering and Advanced Technology*, *9*(1), 3014–3019. https://doi.org/10.35940/ijeat.A1412.109119
48. Yun, J. E., Park, J. E., Park, H. Y., Lee, H. Y., & Park, D. A. (2018). Comparative Effectiveness of Telemonitoring Versus Usual Care for Heart Failure: A Systematic Review and Meta-analysis. *Journal of Cardiac Failure*, *24*(1), 19–28. https://doi.org/10.1016/J.CARDFAIL.2017.09.006