


[International Conference on Mathematical Modeling and Computational Science](#)

ICMMCS 2023: **[Proceedings of 3rd International Conference on Mathematical Modeling and Computational Science](#)** pp 503–512



[Home](#) > [Proceedings of 3rd International Conference on Mathematical Modeling and Computational Science](#) > [Conference paper](#)

Proposing a Model to Enhance the IoMT-Based EHR Storage System Security

[Shampa Rani Das](#), [Noor Zaman Jhanjhi](#) , [David Asirvatham](#), [Farzeen Ashfaq](#) & [Zahraa N. Abdulhussain](#)

Conference paper | [First Online: 29 August 2023](#)

Part of the [Advances in Intelligent Systems and Computing](#) book series (AISC, volume 1450)

Abstract

The Internet of Medical Things (IoMT) and Electronic Health Records (EHR) are core aspects of today's healthcare facilities, hence these technologies and storage platforms should be equipped with innate safeguarding and secrecy concerns for the welfare of individual human beings. The utmost feasible precautions need to be taken by healthcare organizations with regard to user consent, verifiability, scalability, and authentication protocols, aside from prospective vulnerability intrusions. Especially considering the explosive rise of modern health facilities, fraudsters are consistently searching for means to access healthcare information sources as their prime targets. The significance of data gleaned from the healthcare systems is highly valuable on the black market. Blockchain technology is recognized as a much more alluring way to facilitate information sharing via the entire healthcare distribution network while endangering data confidentiality and integrity. The purpose of this research is to strengthen the IoMT-based EHR storage system security utilizing Hyperledger Fabric infrastructure. The proposed model leverages the usage of Hyperledger Fabric's unalterableness and data protection characteristics to guarantee the confidentiality and integrity of EHRs while also ensuring secure data exchange and identity management for authorized individuals. Hyperledger Fabric strategies must be integrated with edge computing and cloud platforms to further their value-added best attributes. When

our proposed model are objectively implemented in the near future, the key components that can be employed to minimize the exploitation of healthcare data storage would be recognized.

Keywords

EHR storage **IoMT** **Blockchain** **Hyperledger fabric**

Edge computing

This is a preview of subscription content, [access via your institution](#).

<p>▼ Chapter EUR 29.95 Price includes VAT (Malaysia)</p> <ul style="list-style-type: none">• Available as PDF• Read on any device• Instant download• Own it forever <p>Buy Chapter</p>	<p>> eBook EUR 160.49</p>
<p>> Softcover Book EUR 199.99</p>	

Tax calculation will be finalised at checkout

Purchases are for personal use only

[Learn about institutional subscriptions](#)

References

1. Loh, C. M., & Chuah, C. W. (2021). Electronic medical record system using ethereum blockchain and role-based access control. *Applied Information Technology And Computer Science*, 2(2), 53–72.
2. Lee, J., Park, Y. R., & Beck, S. S. (2021). Deriving key architectural features of FHIR-blockchain integration through the qualitative content analysis.
3. Yang, Y., Shi, R. H., Li, K., Wu, Z., & Wang, S. (2022). Multiple access control scheme for EHRs combining edge computing with smart contracts. *Future Generation Computer Systems*, 129, 453–463.
4. George, J. T. (2022). *Introducing blockchain applications: Understand and develop blockchain applications through distributed systems*. Apress.



5. Uddin, M., Memon, M. S., Memon, I., Ali, I., Memon, J., Abdelhaq, M., & Alsaqour, R. (2021). Hyperledger fabric blockchain: Secure and efficient solution for electronic health records. *Computers, Materials & Continua*, *68*, 2377–2397.
-
6. Hira, F. A., Khalid, H., Rasid, S. Z. A., Baskaran, S., & Moshiul, A. M. (2022). Blockchain technology implementation for medical data management in Malaysia: Potential, need and challenges. *TEM Journal*, *11*(1), 64.
-
7. Pang, Z., Yao, Y., Li, Q., Zhang, X., & Zhang, J. (2022). Electronic health records sharing model based on blockchain with checkable state PBFT consensus algorithm. *IEEE Access*, *10*, 87803–87815.
-
8. Keshta, I., & Odeh, A. (2021). Security and privacy of electronic health records: Concerns and challenges. *Egyptian Informatics Journal*, *22*(2), 177–183.

9. Yang, X., Li, T., Pei, X., Wen, L., & Wang, C. (2020).

📖 53 🟢 1 🔄 29 📄 0

Medical data sharing scheme based on attribute cryptosystem and blockchain technology. *IEEE Access*, 8, 45468–45476.

10. Kim, M., Yu, S., Lee, J., Park, Y., & Park, Y. (2020).

📖 41 🟢 0 🔄 31 📄 0

Design of secure protocol for cloud-assisted electronic health record system using blockchain. *Sensors*, 20(10), 2913.

11. Gupta, R., Kanungo, P., Dagdee, N., Madhu, G., Sahoo, K. S., **Jhanjhi**, N. Z., Masud, M., Almalki, N. S., AlZain, M. A. (2023). Secured and privacy-preserving multi-authority access control system for cloud-based healthcare data sharing. *Sensors*, 23(5), 2617.

12. Alrebdi, N., Alabdulatif, A., Iwendi, C., & Lian, Z.

📖 14 🟢 0 🔄 7 📄 0

(2022). SVBE: Searchable and verifiable blockchain-based electronic medical records system. *Scientific Reports*, 12(1), 266.

13. Verma, D. K., Tyagi, R. K., & Chakraverti, A. K. (2022). Secure data sharing of electronic health record (EHR) on the cloud using blockchain in Covid-19 Scenario. In *Proceedings of trends in electronics and health informatics: TEHI 2021* (pp. 165–175). Singapore, Springer Nature Singapore.

14. Dakhane, A., Waghmare, O., & Karanjekar, J. (2021). AI framework using blockchain for healthcare database. *International research Journal of Modernization in engineering Technology and Science*, 2(8), 17017.

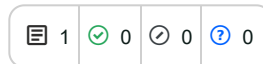
15. Kumar, R., Kumar, P., Tripathi, R., Gupta, G. P., Islam, A. N., & Shorfuzzaman, M. (2022). Permissioned blockchain and deep learning for secure and efficient data sharing in industrial healthcare systems. *IEEE Transactions on Industrial Informatics*, 18(11), 8065–8073.

16. Chamola, V., Goyal, A., Sharma, P., Hassija, V., Binh, H. T. T., & Saxena, V. (2022). Artificial intelligence-assisted blockchain-based



framework for smart and secure EMR management. *Neural Computing and Applications*, 1–11.

17. Awasthi, M. V., Karande, N., & Bhattacharjee, S. (2022). Convergence of blockchain, IoMT, AI for healthcare platform framework. *International Journal of Engineering Research Management (IJERM)*, 9, 1–7.
-
18. Li, H., & Wang, X. (2022). Design and implementation of electronic medical record system based on hyperledger fabric. In *Proceedings of the 2022 4th blockchain and internet of things conference* (pp. 68–72).
-
19. Manoj, T., Makkithaya, K., & Narendra, V. G. (2022). A blockchain based decentralized identifiers for entity authentication in electronic health records. *Cogent Engineering*.
-
20. Rajawat, A. S., Goyal, S. B., Bedi, P., Simoff, S., Jan, T., & Prasad, M. (2022). Smart scalable ML-blockchain framework for large-scale clinical



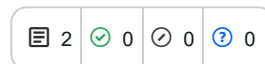
information sharing. *Applied Sciences*, 12(21), 10795.

21. Liu, J., Zhang, X., & Wang, X. (2021). *Blockchain-based electronic health records: A new era of patient data management*.

22. Reegu, F. A., Mohd, S., Hakami, Z., Reegu, K. K., & Alam, S. (2021). Towards trustworthiness of electronic health record system using blockchain. *Annals of the Romanian Society for Cell Biology*, 25(6), 2425–2434.

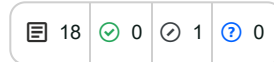
23. Reegu, F. A., Abas, H., Hakami, Z., Tiwari, S., Akmam, R., Muda, I., Almashqbeh, H. A., & Jain, R. (2022). Systematic assessment of the interoperability requirements and challenges of secure blockchain-based electronic health records. *Security and Communication Networks*.

24. Sonkamble, R. G., Bongale, A. M., Phansalkar, S., Sharma, A., & Rajput, S. (2023). Secure data



transmission of electronic health records using blockchain technology. *Electronics*, 12(4), 1015.

25. Khan, A. A., Wagan, A. A., Laghari, A. A., Gilal, A. R., Aziz, I. A., & Talpur, B. A. (2022). BloMT: A state-of-the-art consortium serverless network architecture for healthcare system using blockchain smart contracts. *IEEE Access*, 10, 78887–78898.
-



26. Nazir, S., & Dua, A. (2022). IoT-based electronic health records (EHR) management system using blockchain technology. In *Blockchain* (pp. 135–163). Chapman and Hall/CRC.
-

27. Wang, Q., & Qin, S. (2021). A hyperledger fabric-based system framework for healthcare data management. *Applied Sciences*, 11(24), 11693.
-



28. Frikha, T., Chaari, A., Chaabane, F., Cheikhrouhou, O., & Zaguia, A. (2021). Healthcare and fitness data management using the IoT-

based blockchain platform. *Journal of Healthcare Engineering*.

29. Fatokun, T., Nag, A., & Sharma, S. (2021).

 34  0  19  0

Towards a blockchain assisted patient owned system for electronic health records. *Electronics*, 10(5), 580.

30. Al Mamun, A., Azam, S., & Gritti, C. (2022).

 22  0  12  0

Blockchain-based electronic health records management: A comprehensive review and future research direction. *IEEE Access*, 10, 5768–5789.

31. Shafiq, D. A., Jhanjhi, N. Z., & Abdullah, A. (2022).

 40  0  14  0

Load balancing techniques in cloud computing environment: A review. *Journal of King Saud University-Computer and Information Sciences*, 34(7), 3910–3933.

32. Mishra, S. K., et al. (2020). Energy-aware task allocation for multi-cloud networks. *IEEE Access*, 8, 178825–178834.



<https://doi.org/10.1109/ACCESS.2020.3026875>

33. Ali, S., Hafeez, Y., Jhanjhi, N. Z., Humayun, M., Imran, M., Nayyar, A., Singh, S., Ra, I. H. (2020). Towards pattern-based change verification framework for cloud-enabled healthcare component-based. *IEEE Access*, 8, 148007–148020.
-

34. Shafiq, D. A., Jhanjhi, N. Z., & Abdullah, A. (2019). Proposing a load balancing algorithm for the optimization of cloud computing applications. In *2019 13th International conference on mathematics, actuarial science, computer science and statistics (MACS)* (pp. 1–6). IEEE.
-

35. Gill, S. H., Razzaq, M. A., Ahmad, M., Almansour, F. M., Haq, I. U., Jhanjhi, N. Z., Alam, M. Z., & Masud, M. (2022). Security and privacy aspects of cloud computing: A smart campus case study. *Intelligent Automation & Soft Computing*, 31(1).
-

Author information

Authors and Affiliations

School of Computer Science, Taylor's University, Selangor, Malaysia

Shampa Rani Das, Noor Zaman Jhanjhi, David Asirvatham & Farzeen Ashfaq

Collage of Engineering, Medical Instruments Technology

Engineering, National University of Science and Technology, Dhi Qar, Iraq

Zahraa N. Abdulhussain

Corresponding author

Correspondence to [Noor Zaman Jhanjhi](#).

Editor information

Editors and Affiliations

Department Of Creative Technologies and Product Design, National Taipei University of Business, Taoyuan, Taiwan

Sheng-Lung Peng

School of Computer Science, SCS, Taylor's University, Subang Jaya, Malaysia

Noor Zaman Jhanjhi

**Department of Computer Science and Engineering, Sister Nivedita
University, Kolkata, West Bengal, India**

Souvik Pal

**College of Engineering and Computer Science, Joshi Research
Center 489, Wright State University, Dayton, OH, USA**

Fathi Amsaad

Rights and permissions

[Reprints and Permissions](#)

Copyright information

© 2023 The Author(s), under exclusive license to Springer Nature
Singapore Pte Ltd.

About this paper

Cite this paper

Das, S.R., Jhanjhi, N.Z., Asirvatham, D., Ashfaq, F., Abdulhussain, Z.N. (2023).
Proposing a Model to Enhance the IoMT-Based EHR Storage System Security. In:
Peng, S.L., Jhanjhi, N.Z., Pal, S., Amsaad, F. (eds) Proceedings of 3rd International
Conference on Mathematical Modeling and Computational Science. ICMMCS
2023. Advances in Intelligent Systems and Computing, vol 1450. Springer,
Singapore. https://doi.org/10.1007/978-981-99-3611-3_42

[.RIS](#)  [.ENW](#)  [.BIB](#) 

DOI	Published	Publisher Name
https://doi.org/10.1007/978-981-99-3611-3_42	29 August 2023	Springer, Singapore
Print ISBN	Online ISBN	eBook Packages
978-981-99-3610-6	978-981-99-3611-3	Intelligent Technologies and Robotics Intelligent Technologies and Robotics (R0)