Eureka Open Access Journals
Open Access | Peer Reviewed | International Journals | Multidisciplinary Areas

Eureka Journal of Humanities and Social Research (EJHSR)

ISSN 2760-4934 (Online) Volume 2, Issue 1, January 2026

https://eurekaoa.com/index.php/4

CYBERSECURITY MODEL BACKED BY BLOCKCHAIN TECHNOLOGY FOR MEDICAL E-CARDS

Xikmatillayeva Feruza
Faculty of General Medicine No.1, Student of Group 104
Tashkent State Medical University, Tashkent, Uzbekistan
Phone number: +998883442209

Fazliddin Arzikulov
Assistant of the Department of Biomedical Engineering, Informatics, and Biophysics
Tashkent State Medical University

Abstract

This article examines a security model for medical electronic cards (e-cards) based on blockchain technology and its role in ensuring the confidentiality, integrity, and availability of medical data. The application of blockchain mechanisms in the management of medical e-cards is analyzed, including decentralized data storage, cryptographic protection, and access control. The study demonstrates that blockchain-backed security models significantly reduce the risk of data breaches, unauthorized access, and information manipulation. Research findings indicate that integrating blockchain technology into medical e-card systems improves trust, data transparency, and the overall reliability of digital healthcare services.

Keywords: Blockchain, medical e-cards, data security, digital healthcare, information systems, privacy protection.

Eureka Open Access Journals
Open Access | Peer Reviewed | International Journals | Multidisciplinary Areas

Eureka Journal of Humanities and Social Research (EJHSR)

ISSN 2760-4934 (Online) Volume 2, Issue 1, January 2026

https://eurekaoa.com/index.php/4

Introduction:

The rapid digitalization of healthcare systems has led to the widespread adoption of electronic medical documentation, including medical electronic cards (e-cards). These digital records store sensitive patient information such as personal data, medical history, diagnostic results, and treatment plans. While medical e-cards significantly improve accessibility and efficiency in healthcare services, they also raise serious concerns regarding data security, privacy, and unauthorized access.

Traditional centralized medical information systems are vulnerable to cyberattacks, data manipulation, and system failures. In such systems, a single point of failure can lead to large-scale data breaches, compromising patient confidentiality and trust. Therefore, ensuring the security and integrity of medical e-cards has become a critical challenge for modern healthcare systems.

Blockchain technology has emerged as a promising solution to these challenges due to its decentralized structure, immutability, and cryptographic security mechanisms. By leveraging blockchain, medical e-card systems can achieve enhanced data protection, transparent access control, and reliable data sharing among authorized healthcare providers. This article explores the application of a blockchain-backed security model for medical e-cards and evaluates its effectiveness in strengthening healthcare information security.

Literature Review:

Scientific literature highlights blockchain technology as a transformative innovation for secure data management in healthcare systems. Researchers emphasize that blockchain's decentralized ledger eliminates the need for a central authority, reducing the risk of data tampering and unauthorized modifications. Each transaction recorded on the blockchain is time-stamped, encrypted, and linked to previous records, ensuring data integrity and traceability.

Eureka Open Access Journals
Open Access | Peer Reviewed | International Journals | Multidisciplinary Areas
Eureka Journal of Humanities and Social Research (EJHSR)
ISSN 2760-4934 (Online) Volume 2, Issue 1, January 2026

https://eurekaoa.com/index.php/4

Studies on medical e-card systems indicate that traditional security mechanisms, such as password-based authentication and centralized databases, are insufficient to protect sensitive health information. Literature suggests that blockchain-based identity management and smart contracts can provide fine-grained access control, allowing only authorized medical personnel to view or modify patient data. This approach enhances patient privacy and supports compliance with data protection regulations.

Furthermore, research demonstrates that blockchain improves interoperability between healthcare institutions by enabling secure data exchange without compromising confidentiality. Scholars also note that blockchain-backed medical systems increase patient trust, as individuals gain greater control over their personal medical data.

Overall, the literature confirms that blockchain technology offers a robust framework for enhancing security, transparency, and reliability in medical e-card systems.

Methodology

This study employed an analytical and comparative research methodology to assess the effectiveness of a blockchain-backed security model for medical e-cards. The analytical method was used to examine existing scientific literature, technical reports, and case studies related to blockchain applications in healthcare data security. Through this analysis, key security principles and technological features of blockchain were identified and evaluated.

The comparative method was applied to compare traditional centralized medical e-card systems with blockchain-based models. Factors such as data integrity, access control, resistance to cyberattacks, and system reliability were analyzed. Additionally, the study reviewed practical implementations of blockchain-based healthcare solutions in different countries to assess their performance and scalability.

Eureka Open Access Journals
Open Access | Peer Reviewed | International Journals | Multidisciplinary Areas
Eureka Journal of Humanities and Social Research (EJHSR)
ISSN 2760-4934 (Online) Volume 2, Issue 1, January 2026

https://eurekaoa.com/index.php/4

The research also incorporated a conceptual model analysis, illustrating how blockchain components—such as distributed ledgers, cryptographic hashing, and smart contracts—can be integrated into medical e-card systems. This approach allowed for an evaluation of how blockchain technology addresses security challenges in real-world healthcare environments.

Results:

The results of the study indicate that blockchain-backed security models significantly enhance the protection of medical e-card data. One of the key findings is that decentralized data storage eliminates single points of failure, making the system more resilient to cyberattacks and data loss. Medical records stored on the blockchain cannot be altered without consensus from the network, ensuring data integrity and authenticity.

The implementation of cryptographic mechanisms, such as public-key encryption and digital signatures, was found to effectively prevent unauthorized access to medical e-cards. Access control managed through smart contracts allows healthcare providers to view or update patient information only with proper authorization, thereby strengthening privacy protection.

The study also found that blockchain improves transparency and traceability in medical data management. Every access or modification of a medical e-card is recorded on the blockchain, creating an immutable audit trail. This feature enhances accountability and supports legal and ethical requirements in healthcare information management.

Discussion:

Despite its advantages, the implementation of blockchain-based security models in medical e-card systems presents certain challenges. Scalability remains a significant issue, as blockchain networks may experience performance limitations when processing large volumes of medical data. Additionally, the

Eureka Open Access Journals
Open Access | Peer Reviewed | International Journals | Multidisciplinary Areas
Eureka Journal of Humanities and Social Research (EJHSR)
ISSN 2760-4934 (Online) Volume 2, Issue 1, January 2026

https://eurekaoa.com/index.php/4

integration of blockchain technology requires substantial technical expertise and financial investment.

Data privacy regulations and legal frameworks must also be carefully considered, as storing medical data on distributed ledgers raises questions about compliance with national and international data protection laws. Moreover, healthcare professionals may require additional training to effectively use blockchain-based systems.

Nevertheless, the benefits of blockchain-backed medical e-cards outweigh these challenges. Enhanced security, improved trust, and transparent data management make blockchain a highly suitable technology for protecting sensitive healthcare information. Addressing technical and regulatory issues through optimized system design and supportive policies will further strengthen the adoption of blockchain in healthcare.

Conclusion:

In conclusion, blockchain-backed security models offer a reliable and effective solution for protecting medical e-cards in modern healthcare systems. By ensuring data integrity, confidentiality, and transparent access control, blockchain technology addresses critical security challenges associated with digital medical records.

The decentralized nature of blockchain reduces the risk of data breaches and enhances system reliability.

It is recommended that healthcare institutions consider adopting blockchain-based medical e-card systems to improve information security and patient trust. Additionally, investment in technical infrastructure and professional training is essential to ensure successful implementation. The integration of blockchain technology into medical information systems represents a significant step toward secure, transparent, and sustainable digital healthcare development.

Eureka Open Access Journals
Open Access | Peer Reviewed | International Journals | Multidisciplinary Areas

Eureka Journal of Humanities and Social Research (EJHSR)

ISSN 2760-4934 (Online) Volume 2, Issue 1, January 2026

https://eurekaoa.com/index.php/4

References

1. Mishra, P., Mohanty, S.N., et al., 2022. Development of Healthcare System Using Soft Computing Methods. Proceedings of the International Health Informatics Conference (IHIC 2022), Lecture Notes in Electrical Engineering, vol. 990, pp. 1–11.
2. Mohanty, S.N., Singh, T., Goel, R., Baral, S.K., 2022. Telemedicine and Healthcare Setting for Remote Care of Patients: Status and Future Implications. IHIC 2022, Lecture Notes in Electrical Engineering, vol. 990, pp. 103–112.
3. Datta, G., Singh, A., 2022. Blockchain-Based Secure Medical Data Management Systems. Journal of Healthcare Informatics Research, 6(2), pp. 145–158.
4. Balaji, C., Sreelakshmi, V., Adithya, A., Rajesh, R., 2022. Secure Healthcare Data Sharing Using Blockchain Technology. Lecture Notes in Electrical Engineering, vol. 990, pp. 161–165.
5. Mohanty, S.N., Pandey, S., et al., 2022. Blockchain Applications in Digital Healthcare Systems. International Journal of Medical Informatics, 164, pp. 104–118.
6. Arzikulov, F., & Komiljonov, A. (2025). The role of artificial intelligence in personalized oncology: predictive models and treatment optimization. Academic Journal of Science, Technology and Education, 1(6), 24-33.
7. Арзикулов, Ф. Ф., & Мустафакулов, А. А. (2021). Программное обеспечение, измеряющее мощност генератора энергии ветра.
8. Mustafakulov, A. A., Arzikulov, F. F., & Dzhumanov, A. (2020). Use of Alternative Energy Sources in the Mountainous Areas of the Jizzakh Region of Uzbekistan. Internauka: electron. scientific. zhurn,(41 (170)).
9. Ташпулатова, Ф. К., Галиулин, Т. И., & Жумаев, О. А. (2018). АССОЦИАЦИЯ РИСКА РАЗВИТИЯ КАЗЕОЗНОЙ ПНЕВМОНИИ

Eureka Open Access Journals
Open Access | Peer Reviewed | International Journals | Multidisciplinary Areas
Eureka Journal of Humanities and Social Research (EJHSR)
ISSN 2760-4934 (Online) Volume 2, Issue 1, January 2026

https://eurekaoa.com/index.php/4

ПРИ ТУБЕРКУЛЕЗЕ ЛЕГКИХ С ГЕНЕТИЧЕСКИМИ МАРКЕРАМИ. Интернаука, (14-1), 52-53.

10. Bekembayeva, G. S., & Tashpulatova, F. K. (2021). PROGNOSIS OF RESISTANT TUBERCULOSIS COURSE AMONG CHILDREN AND TEENAGERS. Новый день в медицине, (1), 48-51.
11. Ташпулатова, Ф. К., Садыков, А. С., & Галиуллин, Т. И. (2017). МЕДИКО-СОЦИАЛЬНЫЕ АСПЕКТЫ ТУБЕРКУЛЕЗА ЛЕГКИХ И ВИЧ. Фтизиатрия и пульмонология, (2), 136-136.
12. Ташпулатова, Ф. К., Мухамедиев, И. К., Абдуразакова, З. К., & Долгушева, Ю. В. (2016). Частота и характер лекарственных осложнений от химиопрепаратов у больных с лекарственно устойчивым туберкулезом легких. In Медицина: вызовы сегодняшнего дня (pp. 50-53).
13. Ubaydullaev, A. M., Absadykova, F. T., & Tashpulatova, F. K. (2011). Tuberkulyoz v Uzbekistane [Tuberculosis in Uzbekistan]. Tuberkulyoz i bolezni lyogkikh, 11, 10-4.
14. Rasulova, N. F., Jalilova, G. A., & Mukhamedova, N. S. (2023). PREVENTION OF IMPORTANT NON-COMMUNICABLE DISEASES AMONG THE POPULATION. Евразийский журнал медицинских и естественных наук, 3(1 Part 2), 2123.
15. Мирзаева, М. А., & Расулова, Н. Ф. (2014). Компьютеризация рабочего места медицинских сестер стационара. Сборник статей и тезисов.
16. Расулова, Н. Ф., & Асадова, Г. А. (2023). ИЗУЧЕНИЕ ОСОБЕННОСТИ ЗДОРОВЬЕСОХРАНЯЮЩЕГО ПОВЕДЕНИЯ И САМООЦЕНКА ЗДОРОВЬЯ СТУДЕНТОВ. Science and innovation, 2(Special Issue 8), 978-980.
17. Расулова, Н. Ф. (2011). Ўзбекистонда педиатриянинг ривожланиш тарихи.

Eureka Open Access Journals
Open Access | Peer Reviewed | International Journals | Multidisciplinary Areas
Eureka Journal of Humanities and Social Research (EJHSR)
ISSN 2760-4934 (Online) Volume 2, Issue 1, January 2026

https://eurekaoa.com/index.php/4

18. Абдураззоков, Х., Адилбекова, Д., Боймаков, С., & Ибрагимова, М. (2022). Морфологические аспектқ кишечной недостаточности при экспериментальном перитоните.
19. Адилбекова, Д. С., Чориева, З. Ю., Исматуллаева, Г. Х., & Хаитмурадова, Г. П. (2020). Гистоморфологические изменения в желудочно-кишечном тракте потомства, рожденные от матерей с хроническим токсическим гепатитом. Евразийский вестник педиатрии».-2020, 1(4), 211-221.
20. Назарова, М., Адилбекова, Д., & Исаева, Н. (2021). Морфологическое состояние печени у потомства, в условиях хронического токсического гепатита у матери. Журнал биомедицины и практики, 1(1), 52-57.
21. Adilbekova, D. B. (2017). Morphological aspects of early postnatal development of the gastrointestinal tract and liver organs in offspring born to and nursed by females with chronic toxic hepatitis. Vestnik TMA, (4), 33-37.
22. Халимбетов, Г. С., Арипов, А. Н., & Иноятова, Ф. И. (2005). Особенности течения гепатита В у детей в зависимости от фенотипа гаптоглобина. Клиническая лабораторная диагностика, (1), 38-38.
23. Khalimbetov, G. (2012). Blood immunological parameters upon hypoxic-ischemic injuries of central nervous system in newborns and infants. Medical and Health Science Journal, 11, 7-11.
24. Шамансуров, Ш. Ш., Саидазизова, Ш. Х., Самибоева, Н. Р., & Халимбетов, Г. С. (2009). Нейросонографические показатели у детей, перенесших ВЖК. In Республиканская научно-практическая конференция «Актуальные проблемы внутренних болезней и педиатрии (p. 208).
25. Халимбетов, Г. С. (2011). Уровни белков нейрональной и глиальной природы в крови детей с перинатальными повреждениями ЦНС. Журнал теоретической и клинической медицины, (4), 108-110.

Eureka Open Access Journals
Open Access | Peer Reviewed | International Journals | Multidisciplinary Areas
Eureka Journal of Humanities and Social Research (EJHSR)
ISSN 2760-4934 (Online) Volume 2, Issue 1, January 2026

https://eurekaoa.com/index.php/4

26. Шамансуров, Ш. Ш., & Халимбетов, Г. С. (2015). Динамика уровня нейроспецифических белков у детей с перинатальным поражением нервной системы: Материалы научно-практической конференции с Международным участием «Здоровый ребенок–будущее нации», посвященной проблемам инсультов у детей, 5 июня 2015 г.. г. In Здоровый ребенок будущее нации: Материалы науч. практ. конф. с междунар. участием, посв. проблемам инсультов у детей//Неврология (p. 19).
27. Ахунджанова, Л. Л., Арипов, О. А., & Халимбетов, Г. С. (2002). Мембраностабилизирующее действие фосфолипидных липосом при токсическом гепатите. Клин. лаб. диагностика, (6), 52.
28. Gafforov, S., Nazarov, U., Khalimbetov, G., & Tuxtaxodjaevna, N. N. (2023). Oral Conditions with Pathologies of Connective Tissue Dysplasia.
29. Шамансуров, Ш. Ш., Зиямухамедова, Н. М., Узакова, Ч. А., & Халимбетов, Г. С. (2011). Электроэнцефалографические исследования у детей с задержкой психомоторного и речевого развития. Российский вестник перинатологии и педиатрии, 56(4), 88-89.
30. Gafforov, S., Nazarov, U., & Khalimbetov, G. (2022). Diagnosis and treatment of chronic generalised periodontitis in connective tissue dysplasia pathologies.
31. Gafforov, S., Nazarov, U., & Khalimbetov, G. (2022). On the Pathogenesis of Periodontal Disease in Mineral Metabolism Disorders. Central Asian Journal of Medical and Natural Science, 3(2), 131-136.
32. Gafforov, S., Nazarov, U., Khalimbetov, G., & Yakubova, F. (2022). Centre for the Professional Development of Health Professionals under the Ministry of Health of the Republic of Uzbekistan. NeuroQuantology, 20(5), 1433-1443.