
Blockchain-Powered Healthcare Data Marketplace: Data Transactions in the Digital Health Era



The healthcare industry is experiencing a surge in the generation and accumulation of data, driven by Internet of Things technologies in medical devices and applications. This data holds immense value for enhancing healthcare services, tailoring treatments, and disease prevention through analysis. However, individual consent is crucial for its use due to ownership rights, and data collection is challenging due to its distributed nature across various medical facilities. Moreover, assessing the value of individual data is complex, making compensation difficult. To address these challenges, there's a growing need for a system facilitating secure data transactions. [Researchers published in the JAMIA journal](#) a proposal for a blockchain prototype for a healthcare data marketplace.

Empowering Healthcare Data Transactions for Integrity and Privacy

Data marketplaces are emerging as solutions, offering opportunities for companies to leverage external data for revenue generation. Traditional client-server models face limitations in terms of data integrity and security, whereas blockchain-based marketplaces ensure these aspects by serving as impartial brokers. Recent studies explore blockchain applications in healthcare, including patient participation, empowerment, data sharing, and clinical trial management. Blockchain facilitates patient-centric care decisions, secures data anonymity for research, and enables reliable data exchange between patients and healthcare providers. The "MyData" initiative explores blockchain's role in empowering patients to access their healthcare data securely from medical facilities. In summary, blockchain technology is indispensable for enhancing data integrity, accessibility, and privacy in healthcare data transactions.

A Blockchain Data Marketplace Solution

The authors developed a blockchain-based healthcare data marketplace facilitating transactions among individuals, companies, and hospitals. They utilised MySQL 8.0, JavaScript Library, Node.js, and Android to create web and mobile applications for easy access. Companies can search and transact data via web pages, while individuals consent to data transactions through a mobile app. They demonstrated the marketplace using National Health Insurance Service (NHIS) data through three transaction scenarios. The architecture includes six essentials: data standardisation, integrity/security, compensation, dynamic consent, data matching, and transaction monitoring. Individuals request their healthcare data from hospitals, which are standardised to FHIR and hashed on a blockchain. Companies request data through the marketplace, with individuals consenting via the mobile app. Approved data is anonymized, parsed, and sent to companies. The Panacea protocol, a public blockchain, ensures data integrity and ownership. The marketplace's performance was evaluated using open health examination data across three hospitals in various scenarios.

Healthcare Transactions: Performance and Security Using Blockchain

Researchers developed a web page and mobile app for a blockchain-based healthcare data marketplace and demonstrated its functionality in three scenarios. Results showed compliance with query times of 1-2 seconds, receiving times averaging 17 minutes, and processing 9.5 cases of healthcare data per minute. Previous studies mainly focused on healthcare data exchanges between hospitals and external parties. The blockchain platform Panacea was utilised for its ability to secure and encrypt sensitive healthcare data, unlike Ethereum which faces challenges with encryption and scalability. Standardising data in the FHIR format improved interoperability within the marketplace.

The marketplace acts as an intermediary for direct healthcare data transactions between individuals and companies, strengthening personal data ownership. It supports monetary compensation and customised digital healthcare services, saving time and costs for data collection. Blockchain technology reduces data forgery risks, enhancing data quality and influencing healthcare service models. Limitations include focusing only on health examination data, scalability concerns, stakeholder participation, ownership considerations, and lack of compensation standards. Despite limitations, the marketplace aims to facilitate smooth data transactions, promoting medical innovation and advancing precision medicine.

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