5.4 BLOCKCHAIN TECHNOLOGY IN HEALTHCARE: REAL-WORLD BENEFITS & SOLUTIONS

Key Takeaways

- Blockchain is gaining traction in healthcare, offering a decentralized system for secure data sharing, with applications spanning patient records, supply chain management, and clinical trials.
- The blockchain-in-healthcare market, valued at $831.54M in 2024, is expected to reach $178.91B by 2034, with the US leading the tech adoption.
- Blockchain presents impressive advantages: enhanced data security, reduced operational costs, better resource allocation, and improved patient experiences.
- The applications of blockchain in healthcare include patient data management, secure clinical trial records, automated insurance claims, personalized medicine, and IoT-based remote patient monitoring.

Blockchain technology in healthcare operations has gained new significance this year. As the medical field generates an enormous amount of data daily, it has become one of the most data-driven industries.

This information must be collected, stored, and shared among various stakeholders for purposes like reporting, analysis, collaborative research, and delivering personalized care. However, current solutions for processing data face significant challenges with security, patient privacy, and system interoperability.

Now, among other tech trends, the healthcare industry and researchers are exploring blockchain, enhanced by smart contracts, as a secure, efficient solution for data sharing. In this article, we're applying our 15-year experience in medical software development and blockchain in healthcare to show you how you can reimagine data handling within your company.

What is Blockchain in Healthcare?

Healthcare blockchain technology, a decentralized system, offers a secure way to record medical records and manage healthcare transactions. It uses cryptographic techniques to create an immutable ledger, enabling participants to exchange and preserve data without a central authority.

Healthcare organizations can verify patient identities, medical histories, and prescriptions. Patients, in turn, retain full control over their records via pharmacy apps or patient portals, granting or revoking access as needed.

With smart contracts, blockchain reduces costs and ensures transaction validity by automating processes when specific conditions are met.

The blockchain-in-healthcare market was valued at $831.54 million in 2024 and is projected to grow to $178.91B by 2034. Having held the largest market share in 2024, the US is seeing widespread EHR adoption and the growing need for secure patient data management.

Benefits of Adopting Blockchain in Medicine

Blockchain and healthcare now form a beneficial tandem with significant advantages to medical advancements, including lower costs, stronger data security, and improved patient experiences.

The tech's ability to securely encrypt sensitive information and streamline processes can address key challenges in hospital management and beyond:

- **Medical providers** can benefit from enhanced data management and security.
- **Pharmaceutical companies** gain from improved supply chain transparency.
- **Patients** have greater control over their personal health records.
- **Insurance companies** experience reduced fraud and improved claims processing efficiency.

At the same time, its efficiency supports better resource allocation and proactive responses to disease outbreaks. Now, let's take a closer look at the key benefits of blockchain in healthcare.

Enhanced Data Security

With the medical field standing among the most cyber-vulnerable sectors, the role of blockchain in healthcare is hard to underestimate. In 2024, organizations reported

over 700 healthcare data breaches to the US government, compromising more than 180 million user records.

Blockchain ensures fail-proof data protection and reliable identity verification in healthcare through its decentralized and immutable design. Information like patient records, clinical trial results, and telemedicine data is encrypted to prevent unauthorized access or tampering.

Additionally, the adoption of blockchain in medicine minimizes fraud risks by assigning unique digital identifiers to patients, payers, and providers, stored securely to prevent forgery or impersonation.

Improved Data Interoperability

Blockchain technology provides a standardized data structure and shared protocols that enhance interoperability between healthcare systems, improving care coordination and reducing data duplication.

By enabling immediate access to critical patient information across different facilities, it deals with scattered and fragmented health data (HD), which are often stored in various formats — structured or unstructured — making cross-system comparisons difficult.

As patients move between vendors or relocate, their data becomes siloed, hindering the creation of a unified view, especially in legacy healthcare systems. Blockchain for healthcare aims to accumulate data aggregation while also ensuring compliance with data protection rules

Reduced Costs

Blockchain facilitates lower operational and expenditure costs by automating administrative and reconciliation processes. Smart contracts can be pre-programmed with payment terms and conditions, triggering automatic transactions based on specific criteria. This way, you can accelerate bill settlements and smooth out transaction costs.

Additionally, blockchain's unique encryption enhances financial transparency, preventing billing fraud, while the use of cryptocurrencies offers payers the ability to maintain anonymity. Together, these features revamp financial operations and significantly reduce expenses.

Better Patient Control

In emergencies, medical providers often lack complete access to a patient's medical history, such as details on allergies, existing conditions, or controlled substance use. This limited visibility increases the risk of improper treatment.

Empowering patients with full ownership and control of their healthcare data within health apps can address this issue, allowing them to share relevant medical information in real-time with providers.
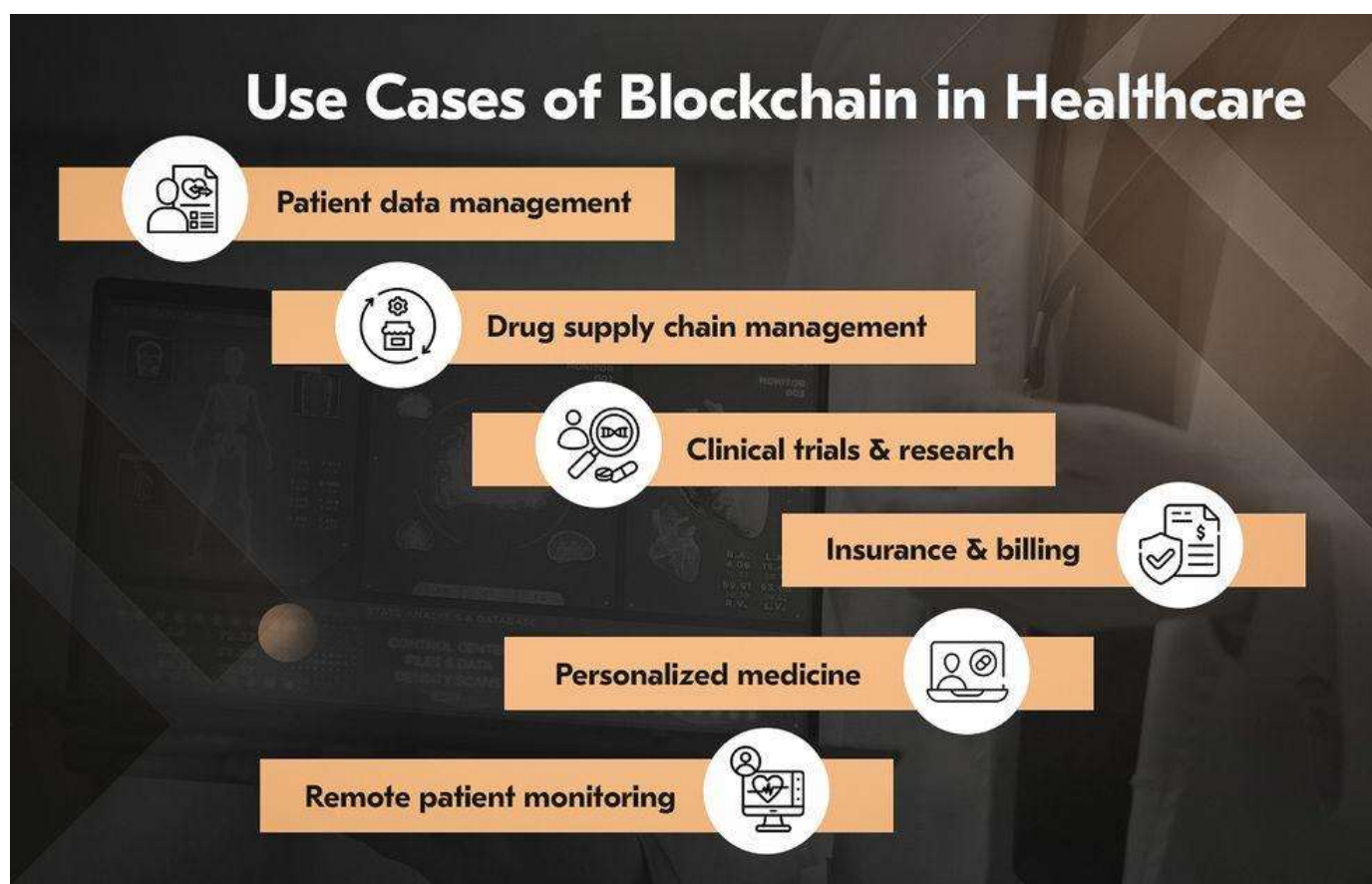
Healthcare blockchain technology gives patients the ability to manage their data, ensuring that critical information is always accessible and thus improving overall care in urgent situations.

Increased Transparency

Secure supply chain tracking is essential for drug traceability to prevent the distribution of counterfeit or illicit drugs, which can compromise treatment safety, lead to addiction, or cause fatal side effects.

Blockchain presents solutions by securely recording and tracing the composition, chronology, and identification of substances in an immutable ledger. As a result, medical businesses can ensure transparency and secure handling of controlled substances, addressing illegal production and transport effectively.

Modern Applications of Blockchain in Healthcare

Healthcare providers from all over the globe use blockchain technology to address data security issues and streamline the pharmaceutical supply chain. Having

analyzed the market's top applications, we've compiled the most disruptive blockchain applications in healthcare below.

Patient Data Management: Securing EHRs

One of the first and foremost ways of how blockchain is used in healthcare operations lies in efficient electronic health record systems to transport and manage patient data. Also, one must ensure it's accessible only to authorized parties and protected from breaches.

It can be a solution like Akiri, a network-as-a-service platform for the healthcare industry, which enables businesses to share patient records securely without storing sensitive information. By integrating AI and machine learning in EHRs, such blockchain healthcare applications enhance the accuracy and speed of data verification while sticking to compliance with data privacy regulations.

This technology is already in use by major hospitals, medical networks, and leading institutions like Mount Sinai Health System.

Drug Supply Chain Management: Ensuring Authenticity

With rising concerns over counterfeit drugs and the need for transparent supply chain processes, companies need to employ blockchain in healthcare to track the authenticity and journey of drugs from production to delivery.

This way, The MediLedger Project, in collaboration with giants like Pfizer, prevents fraud by securely verifying drug handling throughout the supply chain, ensuring quality and safety for patients.

Clinical Trials and Research: Transparent Trial Results

Research stands among the most popular applications of blockchain in healthcare today. With the growing need of transparent recording of clinical trial results, it's crucial to promote integrity across data-sharing departments.

For example, Embleema's platform integrates blockchain to securely store and share trial end-data, allowing patients to digitally consent to participate in trials while keeping their medical data secure.

Often coupled with medical AI algorithms, such solutions examine broad datasets to find patterns and predict patient responses, speeding up drug development. In some cases, chatbots help patients navigate the trial process, answering questions and guiding them through consent and data-sharing procedures.

Insurance and Billing: Automated Claims & Fraud Detection

Blockchain automates claims processing and detection of fraudulent activities, contributing to better accuracy of billing. The use of smart contracts allows for the automated settlement of claims once predefined conditions are met.

That's why Hashed Health adopted blockchain: by automating administrative tasks, the company reduces the time and cost associated with insurance claims. Here, AI and machine learning are used to identify billing errors and fraud in real-time, which helps create a proactive strategy in medical businesses.

Personalized Medicine

Personalization often comes as a priority when it comes to healthcare blockchain use cases. With accurately processed and compiled patient data, blockchain algorithms enable tailored treatments. Usually, it happens based on an individual's genetic information, medical history, and lifestyle, leading to more effective care plans.

Patientory's blockchain platform facilitates the secure management of patient information, including genetic data, which is essential for personalized medicine. Some hospitals, such as Mayo Clinic, also derive relevant insights for custom plans from their medical kiosks, where patients access and update their health records.

**Remote Patient Monitoring: Securing IoT Devices**
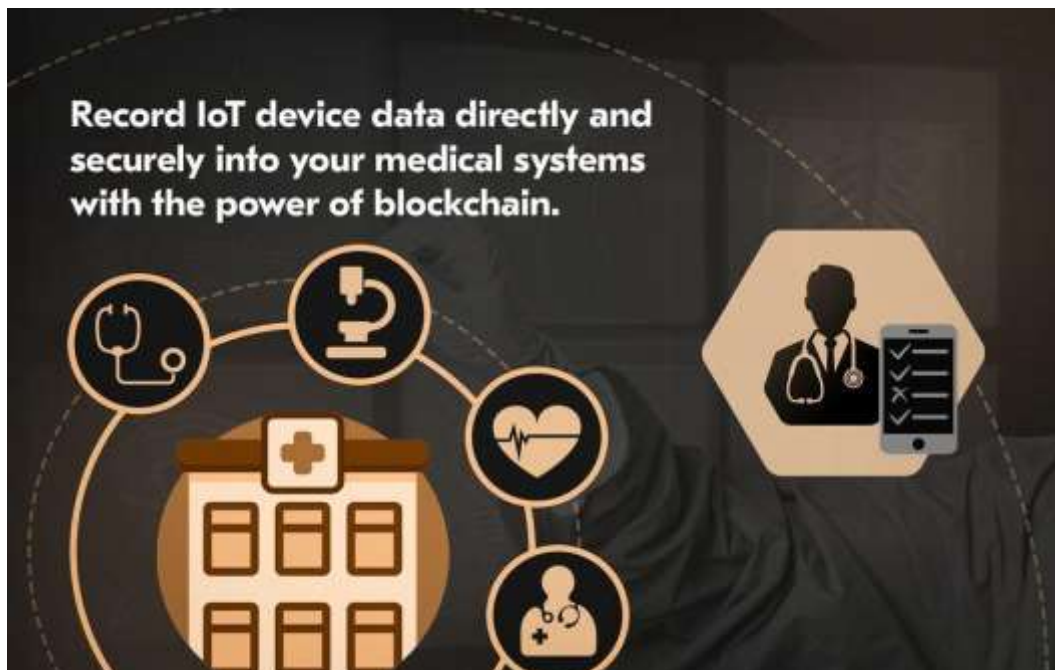
The IoT and blockchain technology in healthcare go hand in hand, as hospitals are actively using wearable health monitors and remote patient monitoring tools that collect continuous streams of health data.

The rapid rise in the number of vulnerable devices has made distributed denial of service (DDoS) attacks a significant security threat in the healthcare sector.

Medtronic's solutions integrate IoT devices for remote monitoring of cardiac patients, where blockchain ensures secure allocation of patient data with healthcare providers. As an example, the Cleveland Clinic uses these devices to monitor heart patients, providing real-time data that can help predict cardiac events.

Challenges of Implementing Blockchain in Healthcare
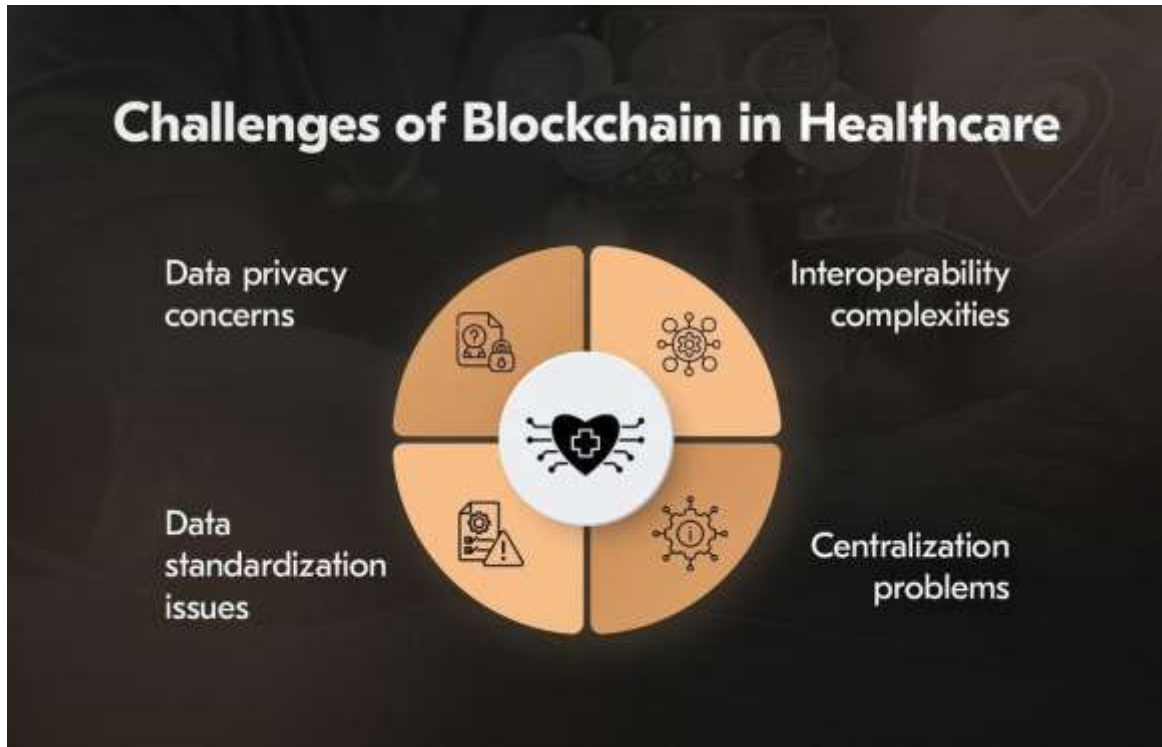
Blockchain benefits in healthcare, as impressive as they are, come with various challenges in terms of adoption and integration. Key issues include data privacy, interoperability, standardization, and centralization.

It's essential that you're not only aware of them but know how to address them the right way to ensure compliance and achieve effective implementation. Here are the common roadblocks and solutions you might encounter with blockchain.

Data Privacy

Public blockchains are inherently transparent, allowing anyone to view transaction details. In healthcare, this transparency clashes with the need for confidentiality in patient data. HIPAA mandates stringent privacy measures, making public blockchains unsuitable for sensitive medical information.

Solution

Blockchain healthcare solutions that incorporate cryptographic techniques, such as zero-knowledge proofs, can further enhance privacy while maintaining compliance.

Low-code platforms can help develop tailored private blockchain solutions with faster time to market, reducing complexity, and ensuring HIPAA alignment.

Interoperability

The healthcare ecosystem includes diverse stakeholders, such as hospitals, insurers, and pharmacies, each using separate systems and private blockchains. Ensuring these systems communicate seamlessly is vital for efficient data exchange.

Solution

Savvy developers use universal data formats and communication protocols can bridge interoperability gaps. Middleware solutions and APIs facilitate integration, while SaaS-based models allow for scalable, cost-effective solutions. Reengineering existing software into blockchain-compatible systems can be the right move to enhance collaboration.

Data Standardization

When implementing blockchain in the healthcare industry, consistent data formats and terminologies are essential for meaningful data exchange. Achieving this across multiple private blockchains used by different organizations remains challenging.

Solution

Advanced web development practices employ industry-wide frameworks like FHIR (Fast Healthcare Interoperability Resources) for data consistency. Blockchain platforms with built-in support for these standards can simplify data sharing.

Centralization Concerns

While private blockchains offer greater control, questions about data ownership and centralization arise. HIPAA mandates clear accountability and transparency in data governance.

Solution

Decentralized governance models within private blockchains can address ownership concerns. In addition, smart contracts will enforce data access rules and accountability. SaaS apps with built-in governance features can also ensure compliance while reducing deployment costs.

Why Choose Acropolium?

Acropolium combines extensive experience with cutting-edge expertise to deliver scalable, HIPAA-compliant healthcare software. Our ISO-certified processes and focus on blockchain technology enable us to meet the industry's highest standards for security and reliability.

Understanding the eternal potential of blockchain, we develop solutions tailored for error-free patient record management.

Our commitment to compliance and innovation ensures clients achieve their goals while maintaining strict adherence to regulatory requirements. And here's one of our own healthcare blockchain use cases:

Blockchain-Powered EHR Development

Our healthcare client approached Acropolium to create a secure and transparent electronic health records (EHR) platform leveraging blockchain technology.

- We designed and implemented a blockchain-driven EHR system featuring advanced encryption, smart contracts, and decentralized data storage.
- The solution achieved seamless interoperability with existing healthcare systems, enabling efficient data sharing and integration.
- The user-friendly interface enhanced adoption rates and satisfaction.
- Simultaneously, rigorous compliance with HIPAA regulations ensured the highest standards of patient data security and privacy.

Delivered within tight deadlines, the system set a new benchmark for secure EHR management.

Final Thoughts

Despite the challenges, blockchain in healthcare presents a viable opportunity to advance industry operations. Its potential advances include reduced costs through streamlined data exchange and the facilitation of patient-centered care.

However, achieving these outcomes will require coordinated efforts among healthcare leaders, payers, and government entities, along with a collective willingness to embrace innovative risks.

And Acropolium is here to be your guide in the world of blockchain. We offer a flexible subscription-based cooperation model where your budget and business goals lead the way.