Blockchain in Healthcare Industry

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Genesis Convergence is Subject Matter Expert in Blockchain and Cryptocurrency.

We offer Crypto Development/Consulting services covering solution architecture refinement, customization, integration, transformation, visualization, and analytics to uncover insights hidden within data and enhance data exploration.

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OBJECTIVE

The urgency of development in healthcare increases at incredible speed. The most important problems faced are data protection, sharing, and lack of facilities in health management. Today the need for quality health facilities is supported by innovative and newer technologies.

Blockchain would play a serious role in changing the healthcare sector. It improves healthcare organizations to provide suitable patient care and high-quality health facilities.

BLOCKCHAIN – THE FUTURE OF DECENTRALIZED MARKETPLACES

In simple terms, a blockchain is a peer-to-peer distributed ledger that stores information and keeps track of transactions.

- Each and every member of the blockchain community has its own copy of the information.
- The information is recorded subsequently into units called blocks and protected by strong cryptography, creating a chain of data.
- Changes to blocks are not permitted by the blockchain system architecture, so every action and event could be traced to its origins.
- A blockchain could store data on agreements between the parties, their credentials, transactions, and any other information presented in a digital form.
- Since this information is distributed and highly secured, any attempt at a fraudulent activity can be seen by the members of the blockchain community.
- This creates trust and transparency for any type of ecosystem that the blockchain is integrated into.

Blockchain in Action

Blockchain is a platform that ensures the integrity of the information stored and maintains interactions between the members of the ecosystem. Here's a high-level overview of the way it works:

- Each member maintains their own blockchain node with the full history of all the events and data appended to the network, including credentials, identities, certificates, etc.

- Every update to the network entails the creation of a new block at the end of the chain. A blockchain protocol dictates how these blocks are recorded, validated, and distributed.
- A consensus mechanism is employed to verify each created block where members of the blockchain network decide if it's valid to be added to the chain.
- Once a block is created and confirmed, it cannot be revoked. All entries on the blockchain are permanent and securely stored. This allows for members of the community to trace the full history of transactions and any other modifications in the7i blockchain.
- Smart contracts are a special type of agreement between the members of the network that have the conditions programmed into them, making sure that they are met before each party receives what was agreed upon. Smart contracts eliminate the need for third parties and middlemen to be involved in agreement resolution.
- Transactions in cryptocurrency play a very important part in the blockchain ecosystem, providing the incentive for all members of the community to make valuable contributions and participate in the development of the system as a whole.

These key pillars of blockchain technology lay the foundation for its uses throughout different industries, including in education. It has the potential to create a global environment where learning materials, publications, student credits, and transcripts are easily accessible. It can also introduce new and innovative ways for accountability, incentivization, and communication between teachers, students, and other participants.

HOW BLOCKCHAIN IS AFFECTING THE MEDICAL INDUSTRY

Being open and highly secure means blockchain can be applied to the medical industry in a variety of ways, leading to immensely reduced costs and new ways for patients to access healthcare.

- Combined with the compounding nature of data and innovation, futureproofing technologies can be further applied to foster an era of growth and innovation.
- Blockchain technology has the potential to transform health care, placing the patient at the center of the health care ecosystem and increasing the security, privacy, and interoperability of health data.
- This technology could provide a new model for health information exchanges (HIE) by making electronic medical records more efficient, disintermediated, and secure.

- Healthcare can be a complex and convoluted industry. The systems put in place for our health are outdated in terms of security, efficiency, and cost.

INTRODUCTION TO A SMARTER WAY TO CREATE VALUE

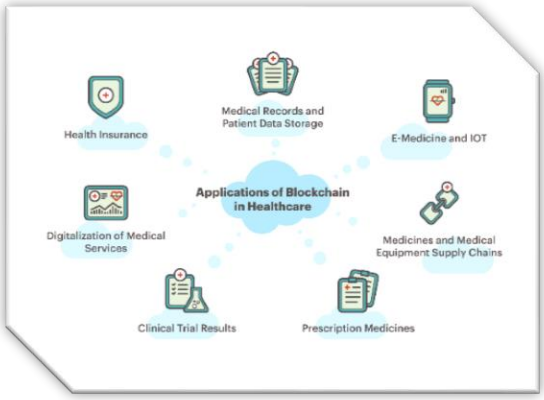
The healthcare industry (also called the medical industry or health economy) is an aggregation and integration of sectors within the economic system that provides goods and services to treat patients with curative, preventive, rehabilitative, and palliative care. It includes the generation and commercialization of goods and services lending themselves to maintaining and re-establishing health. The modern healthcare industry includes three essential branches which are services, products, and finance, and may be divided into many sectors and categories and depends on the interdisciplinary teams of trained professionals and paraprofessionals to meet the health needs of individuals and populations.

BLOCKCHAIN IN HEALTHCARE – USE CASES

Blockchain healthcare use cases are being discovered by the day, and with them, the entire healthcare system can be completely overhauled. Many healthcare and blockchain companies are currently working on or have already released blockchain-based systems to improve healthcare for both professionals and patients. By decentralizing patient health history, tracking pharmaceuticals, and improving payment options, blockchain is becoming a valuable tool for healthcare, revolutionizing the industry worldwide.

Following are some of the important use cases we will discuss in this document:

- Making Electronic Health Records More Accessible
- Cutting Costs
- Improving Medical Record Keeping
- Blockchain for Relief Efforts
- Stop Counterfeit Drugs
- Tracking Clinical Trials and Pharmaceuticals
- Enhance the Security and Control of Healthcare Transactions
- Prevent Diseases



Making Electronic Health Records More Accessible

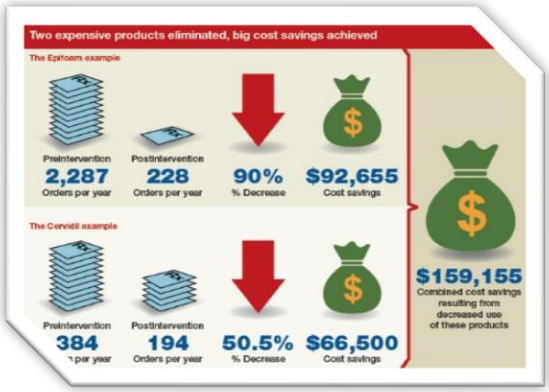
One of the most popular healthcare use cases for blockchain is patient data management.

- Medical records tend to be separated by health agencies, making it impossible to determine a patient's medical history without consulting their previous care provider.
- This process can take a significant amount of time and may often result in mistakes due to human error.
- Many companies provide this type of functionality one of them is MedRec.

- **Entities involved:** MIT Media Lab, Robert Wood Johnson Foundation
- **Project status:** MedRec 2.0 is currently being tested on databases.
- **Deployment:** Its code is open-source and currently hosted at the Israel Deaconess Medical Center. Its developers are currently hoping to further build the program and then deploy it on a network.
- **Technologies:** It was developed using the Ethereum blockchain. Ethereum uses a system called 'smart contracts' to execute scripts on the blockchain, extending bitcoin to a turing-complete language. This system of smart contracts significantly broadens the possibilities for decentralized computation using the blockchain, and it is this system that formed the backbone for the development of Medrec.
- **Website**: https://medrec.media.mit.edu/

Cutting Costs

- Cost-cutting refers to measures implemented by a company to reduce its expenses and improve profitability.
- Cost-cutting measures are typically implemented during times of financial distress for a company or during economic downturns.
- Many Companies provide this type of functionality one of them is SimplyVital.
  - **Entities involved:** SimplyVital Health
  - **Project status:** ConnectingCare is currently available for use through the SimplyVital Health website. SimplyVital Health has launched an ICO as the first of its four road map phases till Health Nexus' is eventually released in 2019.
  - **About:** SimplyVital Health has two projects running on blockchain technology. ConnectingCare, according to CTO of SimplyVital Health Lucas Hendren, "uses care coordination and financial forecasting to help providers in bundled payments get insight into what happens to patients when they leave the hospital." It is currently on the market, helping healthcare providers determine how much a patient's care will cost them when bundled with multiple organizations



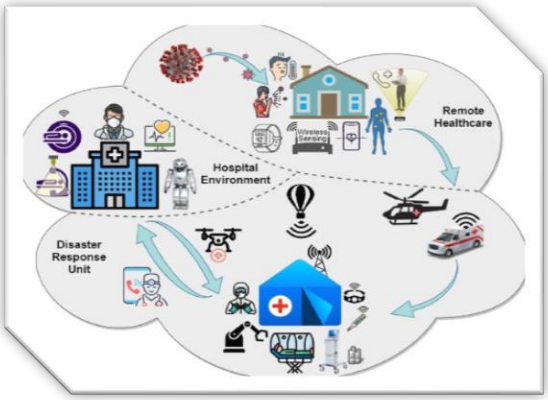
  - **Technologies:** It is based on the Health Nexus protocol. The Health Nexus protocol is open source and free to build on, which allows companies, including SVH, to build decentralized applications (standard SaaS revenue model, such as our ConnectingCare platform) that can then be marketed and sold.

Improving Medical Record Keeping

- When put to work on securing medical data, blockchain can store information in a way that is accessible to anyone on the network, completely immutable, and tamper-proof.
- Blockchain-based electronic health records would give doctors and nurses control over the flow of information from a single, trusted platform.
- Many companies provide this type of functionality one of them is phrOS site.
    - **Entities involved:** Taipei Medical University, Digital Treasury Corporation
    - **Project status:** The project is completed, and the services can be accessed through the phrOS website.
    - **About:** The Taipei Medical University Hospital and Digital Treasury Corporation (DTCO) have recently released phrOS. It aims to increase transparency between medical institutions by putting all of a patient's medical information on a blockchain. It includes images, as well as various information concerning a patient's condition. The information can be accessed by doctors and the patients themselves through a mobile app. It also increases the security of medical information through the Decentralized Ledger Technology (DLT).

    - **Technology:** Basically, they build an Operating system that is based on Blockchain Technology, and by using this operating system one can deploy its application which is already in use because no one wants a new application that's the way they build an operating system.
    - **Website:** https://phros.io/#home

Blockchain for Relief Efforts



- Using Hurricane Maria relief efforts as a point of reference, the Department of Defense (DOD) in conjunction with the Defense Logistics Agency (DLA) analyzed the potential of blockchain for future relief efforts.
- Currently, the DLA tracks logistics through centrally managed systems, which are split between multiple agencies.
- This makes it difficult for relief services to collaborate efficiently.
- A blockchain-based system would allow for data to be added and tracked through a ledger, thereby providing a live feed of multiple agencies' relief efforts.
- It can have the potential to save lives and money.
    - **Entities involved:** U.S. Department of Defense, US Defense Logistics Agency
    - **Project status:** At the moment, the DD and DLA are looking at the potential uses of blockchain technology. No further news concerning development has been reported.

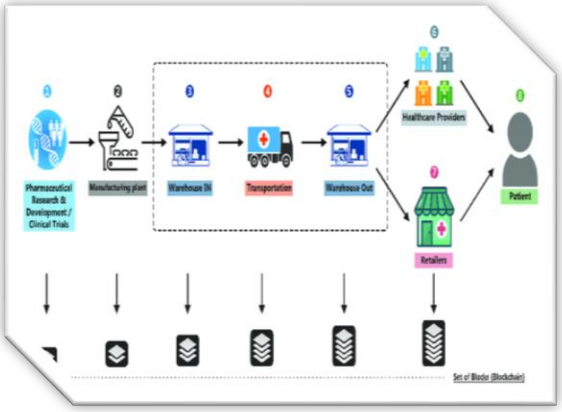
Stop Counterfeit Drugs

- It is estimated that tens of thousands of people die each year due to counterfeit drugs.
- FarmaTrust intends to end that with its blockchain. FarmaTrust's blockchain will be broken down into four different sections.
- Regulatory Compliance aids pharmaceutical companies by ensuring they are working within guidelines established by the government.
- Track and Trace use the blockchain to manage inventory wherever it goes.
- Supply Chain Visibility tracks when a medicine has been changed or altered in any way
- Consumer Confidence App allows customers to see the lifecycle of their medication.
    - **Entities involved:** FarmaTrust
    - **Project status:** An ICO has been developed, and the FarmaTrust token is now listed on Liquid.
    - **Sources:** Liquid press release, FarmaTrust progress report

Tracking Clinical Trials and Pharmaceuticals

- The primary benefits of the application of blockchain in clinical trials included
    - its ability to enable real-time decision making and robust governance
    - despite geographical divides

  - encourage recruitment
  - enhance and optimize the running of trials
  - minimize manual or repetitive tasks through the usage of smart contracts



- Using blockchain technology, location identification and time information could have been stored encrypted and tamper-proof with each scan.
- Multinational Internet of Things supply chain manufacturer Ambrosus currently offers a variety of blockchain platforms on its website.
- the company is very eager to expand its uses in the pharmaceutical industry.
- The company is currently in talks with large pharmaceutical suppliers concerning launching a pilot program utilizing their current products.
  - **Entities involved:** Ambrosus
  - **Project status:** Ambrosus has an abundance of blockchain systems currently available, however, the company is trying to adapt them to the pharma industry.
  - **Sources:** Ambrosus article

Enhance the Security and Control of Healthcare Transactions

- Through blockchain, it becomes easy to share, view, and store digital information securely.
- Furthermore, it uses cryptography encryption to protect every transaction.
- By doing so, banks can enhance their existing security and transparency levels to new heights.
- Change Healthcare develops a wide variety of products focused on payments and data management in the healthcare sector. According to their website, 92% of top U.S. health plans use their services.
  - **Entities involved:** Change Healthcare
  - **Project status:** The system is currently available through Change Healthcare's website. The company also offers other blockchain systems intended to streamline the healthcare industry.
  - **Sources:** Change Healthcare press release

Prevent Diseases

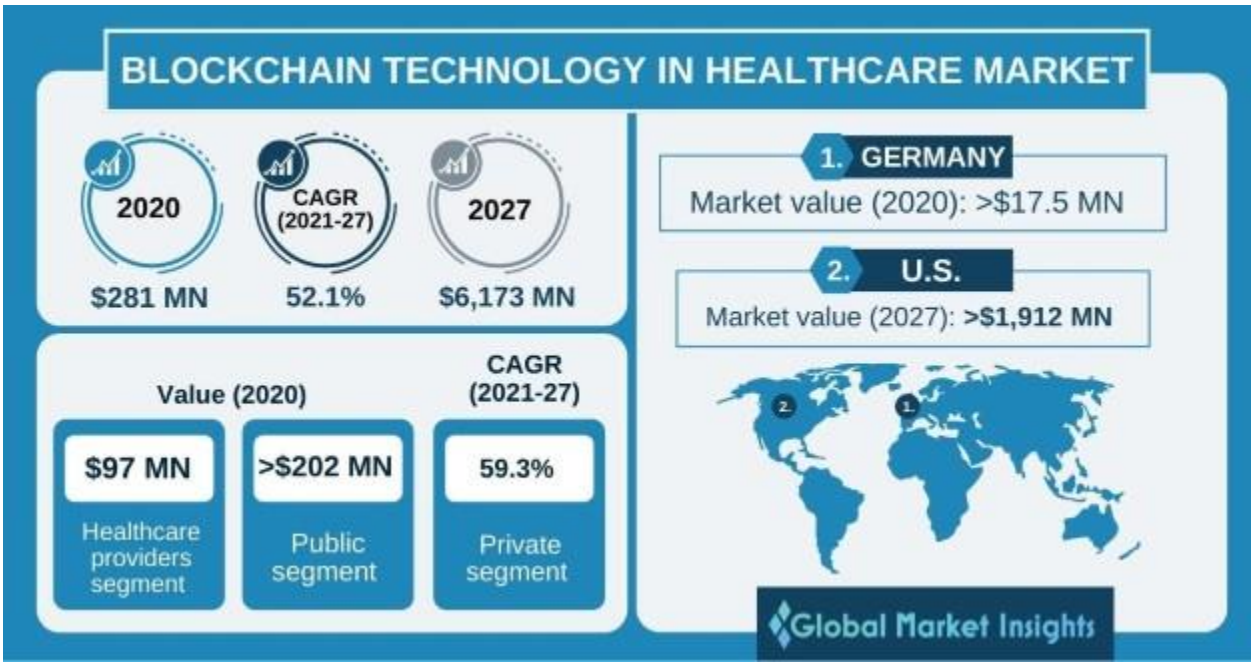
- Encouraging donations helps in providing aid to people who face medical or economic difficulties due to the spread of infectious disease. B
- Blockchain can prevent the spreading of false information regarding infectious diseases.
- Currently, the Centers for Disease Control and Prevention (CDC), the U.S. government entity, explores blockchain-related use cases for disease control.
- In particular, it's mapping out blockchain usage for timestamping of records to detect and report disease outbreaks in real-time.

- For that purpose, CDC teamed up with IBM to create a surveillance system for public agencies that will gather and accumulate data about patients and prescriptions effectively.

BLOCKCHAIN TECHNOLOGY IN HEALTHCARE

Market Analysis

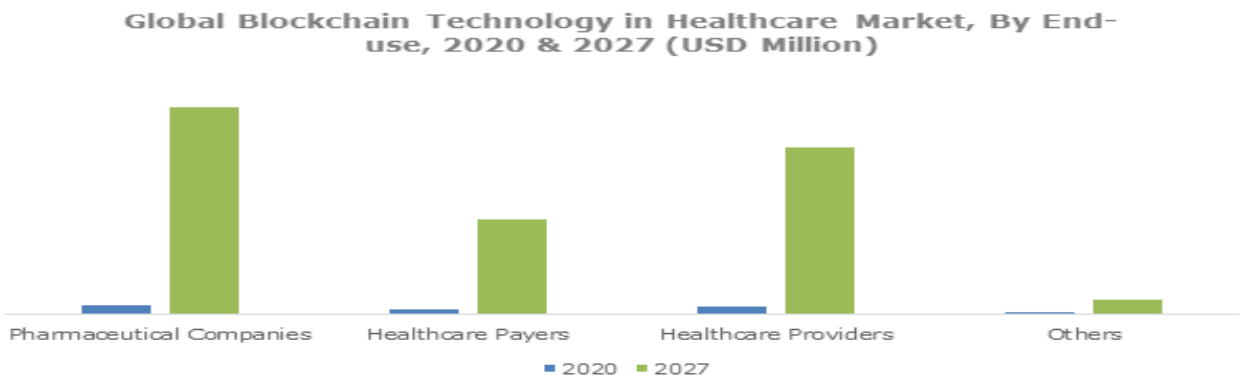
- **Blockchain Technology in the Healthcare Market** size valued at USD 281 million in 2020 and is estimated to witness over 52.1% CAGR from 2021 to 2027. Increased application of the Internet of Things (IoT) in healthcare is anticipated to augment the demand for blockchain technology in healthcare.



Market Report Coverage

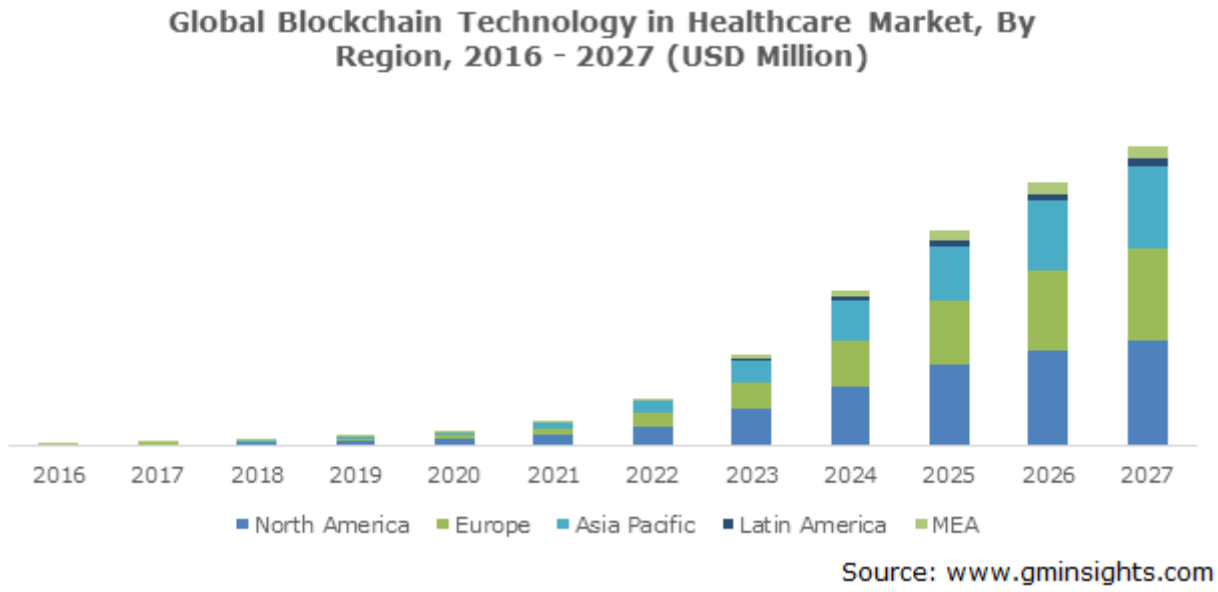
Report Coverage	Details
Base Year:	2020
Market Size in 2020:	281.0 Million (USD)
Forecast Period:	2021 to 2027
Forecast Period 2021 to 2027 CAGR:	52.1%
2027 Value Projection:	6,173.7 Million (USD)
Historical Data for:	2016 to 2020
No. of Pages:	120
Tables, Charts & Figures:	197
Segments covered:	Type, Application, End-use, and Region
Growth Drivers:	• Increasing risk of counterfeit drugs • Growing incidence of medical data breaches • Increasing application of Internet of Things (IoT) in healthcare • Cost-savings in several healthcare applications • Rising need to store and secure medical data
Pitfalls & Challenges:	• Lack of technical infrastructure in developing countries • Lack of skilled professionals • Absence of necessary regulatory norms • Lack of awareness and trust

Market Revenue



Source: www.gminsights.com

North America blockchain technology in the healthcare market



COMPANIES WORKING ON HEALTHCARE BLOCKCHAIN TECHNOLOGY

- Akiri
- BurstIQ
- Factom
- MedicalChain
- ProCredEx
- Avaneer
- SimplyVital Health
- RoboMed
- Embleema
- Chronicled

Akiri

- **Industry:** Big data
- **Location:** Foster City, CA Blockchain
- **Application:** Akiri operates a network-as-a-service optimized specifically for the healthcare industry, helping protect patient health data when transporting it. The Akiri system does not store data of any kind, it operates as both a network and a protocol to set policies and configure data layers while verifying the sources and destinations of data in real-time.

- **Real-life impact:** Akiri ensures that healthcare data remains secured and shareable with only the parties authorized for access at the moments when they need it.

BurstIQ

- **Industry:** Big Data, Cybersecurity, Software
- **Location:** Colorado Springs, Colorado
- **What they do:** BurstIQ's platform helps healthcare companies safely and securely manage massive amounts of patient data. Its blockchain technology enables the safekeeping, sale, sharing, or license of data while maintaining strict compliance with HIPAA rules.
- **Blockchain application:** The company uses blockchain to improve the way medical data is shared and used.
- **Real-life impact:** Because BurstIQ's platform includes complete and up-to-date information about patients' health and healthcare activity, it could help to root out the abuse of opioids or other prescription drugs.

Factom

- **Industry:** IT, Enterprise Software
- **Location:** Austin, Texas
- **What they do:** Factom creates products that help the healthcare industry securely store digital records on the company's blockchain platform that's accessible only by hospitals and healthcare administrators. Physical papers can be equipped with special Factom security chips that hold information about a patient and stored as private data that is accessible only by authorized people.
- **Blockchain application:** Factom employs blockchain technology to securely store digital health records.
- **Real-life impact:** In June of 2018, Factom got a grant of nearly $200,000 from the U.S. Department of Homeland Security to beta-test a platform aimed at integrating secure data from Border Patrol cameras and sensors to better understand the impacts of blockchain in "a realistic field environment."

MedicalChain

- **Industry:** Electronic Health Records, Medical
- **Location:** London, England

- **What they do:** Medicalchain's blockchain maintains the integrity of health records while establishing a single point of truth. Doctors, hospitals, and laboratories can all request patient information that has a record of the origin and protects the patient's identity from outside sources.
- **Blockchain application:** Medicalchain's blockchain-based platform maintains a record of the origin and protects patient identity.
- **Real-life impact:** In May of 2018, Medicalchain announced the release of MyClinic.com. A telemedicine platform, MyClinic enables patients to consult with their doctors via video and pay for those consultations with "MedTokens."

ProCredEx

- **Industry:** Big data
- **Location:** Tampa, FL
- **Blockchain application:** ProCredEx has created a distributed ledger of healthcare credentials data that boosts complex dataset efficiency by rendering the data immutable and permanently traceable, allowing data to be curated to meet unique organizational requirements and shared with authorized partners.
- **Real-life impact:** The platform uses proprietary validation engines and restricts memberships to only vetted and approved organizations so health systems can rapidly acquire verified credentials and promote patient safety and care quality.

Avaneer Health

- **Industry:** Big data
- **Blockchain application:** Avaneer is a new company backed by Aetna, Anthem, and Cleveland Clinic that is dedicated to using blockchain technology to improve healthcare efficiency, utilizing a public ledger to support better claims processing, and secure healthcare data exchanges and keep provider directories maintained and up to date.
- **Real-life impact:** The Avaneer network takes a forward-looking approach to keep healthcare data secure and readily available to authorized care providers.

RoboMed

- **Industry:** Blockchain, Medicine
- **Location:** Moscow, Russia
- **What they do:** Robomed combines AI and blockchain to offer patients a single point of care. The company deploys chatbots, wearable diagnostic tools, and telemedicine sessions to gather patient information and share it with the patient's medical team. Robomeds Panacea platform engages patients into smart contracts that incentivize and lead them down the path to better health.
- **Blockchain application:** Robomed uses blockchain to securely gather patient information and share it with a patient's healthcare providers.
- **Real-life impact:** The Taipei Medical University Hospital recently implemented blockchain technology, including Robomed's network, to store and share medical records more securely.

Embleema

- **Industry:** Pharmaceutical development
- **Location:** New York, NY
- **Blockchain application:** Embleema is a virtual trial and regulatory analytics platform designed to fast-track drug development. Users are recruited to digitally consent to secure, untampered medical data collection, which is then stored on Embleema's blockchain and analyzed.
- **Real-life impact:** Embleema's platform allows patients to assist in speeding up treatment availability and improving safety, all through the company's Virtual Studies Suite.

Chronicled

- **Industry:** Blockchain, Supply Chain Management
- **Location:** San Francisco, California
- **What they do:** Chronicled builds blockchain networks that demonstrate chain-of-custody. The networks help pharma companies make sure their medicines arrive efficiently, and they enable law enforcement to review any suspicious activity — like drug trafficking. In 2017, Chronicled created the Mediledger Project, a ledger system dedicated to the safety, privacy, and efficiency of medical supply chains.
- **Blockchain application:** Chronicle'd blockchain network is used to ensure the safe arrival and detailed review of drug shipments.
- **Real-life impact:** According to the company, results from Chronicled's recent MediLedger Project prove that its blockchain-based system "is capable of acting as the interoperable system for the pharmaceutical supply chain" and "can meet the data privacy requirements of the pharmaceutical industry itself."

CONCLUSION

Blockchain technology has numerous use cases in the healthcare industry, and with growing popularity, we may even expect more upcoming use cases in the future. To solve the significant problems this industry faces, it is essential to bring about a change and improve the quality of healthcare services being given out. Blockchain technology appears to be a suitable solution for the same. With proper implementation and robust applications, blockchain technology can be the savior the healthcare industry is looking for.

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