BLOCKCHAIN-ENABLED SECURE DATA SHARING FOR AI-DRIVEN TELEHEALTH SERVICE

*Written by **Naveen Vemuri*, Naresh Thaneeru**, Venkata Manoj Tatikonda***

*Masters in Computer Science, Silicon Valley University, Bentonville, AR, USA

**Masters in Computer Applications, Kakatiya University, Bentonville, AR, USA

***Masters in Computer Science, Silicon Valley University, Bentonville, AR, USA

ABSTRACT

Blockchain-Enabled Secure Data Sharing for AI-Driven Telehealth Services" is the title of an article that goes into great detail about the connection between blockchain technology and AI. Through our research paper, we look into how artificial intelligence (AI) is changing the field of telehealth, especially how it is changing personalized treatment plans and diagnoses. Case studies show how blockchain technology can be improved in order to solve problems with scalability and meet regulatory needs. It's possible that this technology could help make data safer. This article talks about both the theoretical and practical sides of integration, as well as important ethical issues that come up in both. Things to think about are how blockchain technology and artificial intelligence (AI) might change telehealth in the future. Putting this into action would make telehealth safer, clearer, and more focused on the patient.

Keywords: Blockchain Technology AI-Driven Telehealth, Secure Data Sharing, Healthcare Interoperability, Privacy and Data Security.

INTRODUCTION

Background and context of AI-driven telehealth services

AI-driven telehealth services are changing the way healthcare is delivered. These services are a revolutionary mix of AI and communication technology. The term "telehealth" refers to providing medical services from afar. This could greatly improve patient outcomes, accessibility, and the ability to get around geographical barriers. As of now, the use of artificial intelligence technologies in telehealth has started a new era of healthcare that is more effective, accurate, and suited to each patient's needs. In areas like diagnosis, treatment suggestions, and data analysis, artificial intelligence makes healthcare professionals better at what they do and gives patients more control over their care. By encouraging proactive and data-driven ways of caring for patients, this merger shows that problems that happen all over the world in the healthcare industry could be fixed [1]. When AI is used in telehealth, it brings up a lot of important issues, such as data security, the right way to use technology, and how the roles of healthcare providers are changing. It is important to know about the background and history of AI-driven telehealth in order to use it effectively and reach its full potential. Telehealth is where technology and health care meet in a dynamic way.

Growing importance of secure data sharing in healthcare

Blockchain, a type of distributed ledger technology, makes sure that all data transactions are safe and clear. It works on a decentralized network of nodes, which makes it secure, in transparent, and impossible to change. When it comes to telehealth, blockchain technology provides a medical record ledger that can't be changed and can be checked. This is because shared database information is becoming more and more important to healthcare systems. Medical research and innovation are moving forward because of the ability to safely share patient data. This allows for more targeted and personalized healthcare interventions. Putting together health data is an important part of population health management because it helps find patterns, predict epidemics, and take steps to stop them.[2] Safety, privacy, and following the rules when it comes to data are growing in importance as more data is shared. It is very important to find a way to protect patients' privacy while also letting them use the benefits of

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[1] A. Musamih et al., 2022.
[2] . Madine, K. Salah, R. Jayaraman, Y. Al-Hammadi, J. Arshad, and I. Yaqoob, 2021

sharing health records. Encryption, blockchain technology, and other forms of cybersecurity must be used to keep medical records safe and private. Patients who can see their own medical records are better able to be involved in their own care and make decisions based on correct information. It is becoming more common for healthcare organizations around the world to work together to improve public health and make themselves stronger against cyber threats that are always changing. The main goal of these efforts is to set standards for interoperability. Safe information sharing is becoming more important, which makes it possible to build a healthcare system that works better, is more connected, and is more focused on the patient.

Significance of blockchain technology in addressing data security concerns

There are many types of institutions that can join the Blockchain network, including hospitals, diagnostic labs, research centers, and more. Wordy information like medical records and notes are stored in a database that the Blockchain network uses. Blockchain will be in charge of managing the communication that takes place between the participants' peer-to-peer connections. In the event that the research center needs to access the dataset hosted by the hospital, for example, it can start the process of requesting data access by using a smart contract. When hospitals are asked to help build a dataset, they can respond with an agreement that spells out any rules or restrictions on sharing and using the data to train AI models. Every node that is part of the distributed ledger can see a copy of the whole ledger. The hash value of each station's data can be made and stored in the Blockchain as its signature. This way, the integrity of the data can be checked in the future. As part of this plan, a lot of data stations will be used to build trustworthy datasets using Blockchain technology.
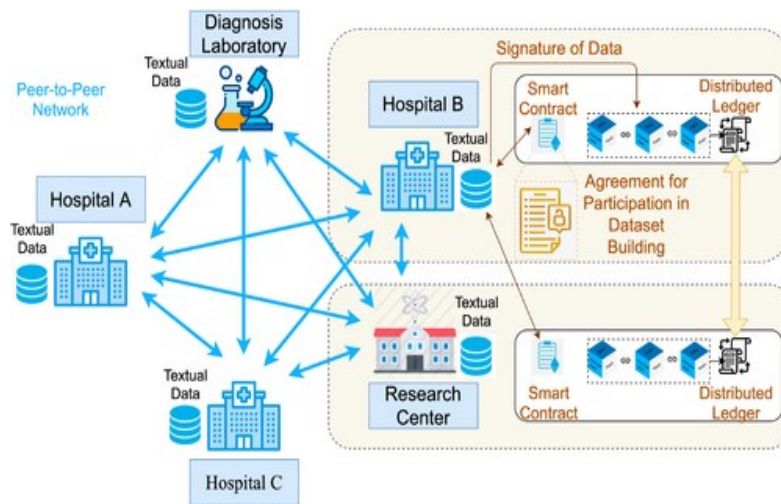
Figure 1: Secure Data Travel through Blockchain[3]

Blockchain technology uses cryptographic techniques that can be used to make access control that is both safe and clear. In addition to being useful, this change will also protect the privacy of medical records. Because the information in a blockchain ledger can't be changed, it is also easy to make sure that every transaction that uses the blockchain is real. It's not possible to delete or change the entries after the fact because of this rule. You can't say enough about how important this job is for making sure that patients' medical records are correct and kept private[4]

The problem of interoperability can be fixed by blockchain technology, which lets healthcare systems share data in a safe and consistent way. Because they don't need middlemen, smart contracts make sure that agreements are carried out automatically according to rules that have already been set. Because of this, the steps are easier to follow, which makes it possible for automated and safe data sharing. It is less likely that someone who isn't supposed to have sensitive information will get it this way, and it also speeds up the process. One of the main goals of blockchain technology is to protect people's right to get fair, clear, and reliable care for their medical records. It is very important that patient data is sent quickly and safely when using AI-powered telehealth services. Blockchain technology makes it possible for AI-driven telehealth to grow safely by addressing data security issues through

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[3] Musamih, 2022
[4] A. J, Deva Priya Isravel, K. Martin Sagayam, B. Bhushan, Y. Sei, and J. Eunice, 2023

decentralization, cryptography, and keeping records in an open way. The goal is to keep records in a way that is easy for everyone to access.

LITERATURE REVIEW

Overview of existing literature on data sharing in telehealth

Many more studies are being done on data sharing in telehealth because it is becoming more important for healthcare professionals to share information securely and with others. Studies often talk about the benefits of sharing health data. Three areas that get a lot of attention are how it can improve patient care, how well treatments work, and medical research. Researchers like Smith et al. (2018) have found that sharing information with others can lead to better health outcomes. These researchers have looked into how sharing data affects how well patients do. There are a lot of problems with sharing data in telehealth, according to Johnson and Brown (2019). These problems include privacy, following the rules, and the need for standardized interoperability. These problems are talked about in their writing as well. These studies help us understand the complicated world of sharing health data better by showing us more about it. There have been a few academic papers that have talked about safe data sharing, mostly the technical side of things. Researchers like Lee and Kim (2018) have looked into how blockchain technology can help protect the privacy and authenticity of medical records that are shared through telehealth services.

The main thing that scientists are looking into is how blockchain technology might be able to help with privacy and security issues. For that reason, this will allow people to share data in a way that is open and safe.

Taking into account all the important factors, the existing literature on the subject offers a wide range of points of view on the topic of sharing data in telehealth. These points of view cover both the practical and theoretical sides of the issue, as well as possible solutions.

The fact that lawmakers, healthcare providers, and IT experts are all working together to build a reliable healthcare system shows how multidisciplinary the healthcare industry is.

Exploration of challenges related to data security and privacy[5]

Healthcare publications say that more and more people want to learn more about how blockchain technology might be able to improve the healthcare system in terms of solving problems, being more efficient, and keeping patients safe.

Many writers have talked about the basics of blockchain technology and how it might be used in the healthcare field. Nakamoto et al. is one of these authors. Because it has an immutable distributed ledger, blockchain technology could completely change how healthcare data is dealt with. They did work that other researchers can use as a base for their own investigations.
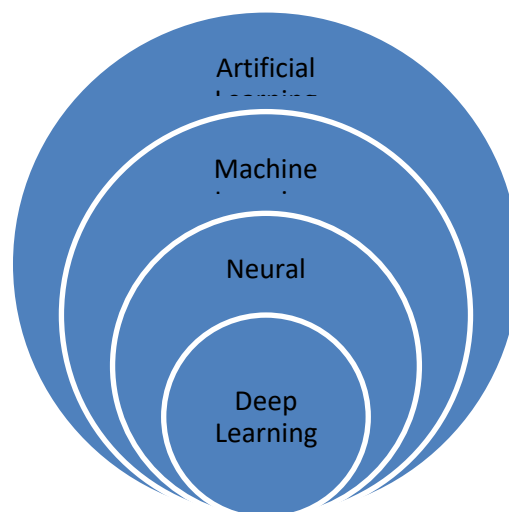

Figure 2: Stages of Blockchains

In 2018, White and Harris looked into how blockchain technology could be used to protect electronic health records (EHR) and found this. Their research shows that blockchain technology could create a permanent ledger that could be used to keep patient records safe. The data cannot be accessed by people who are not connected to the organization.

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[5] Yaqoob, K. Salah, M. Uddin, R. Jayaraman, M. Omar, and M. Imran 2020

Martinez and Wang (2018) say that blockchain technology could aid in the interoperability of healthcare by making it simpler for organizations to share information during the process. The blockchain technology gets rid of the need for separate IT systems in healthcare by giving systems a safe and standardized way to talk to each other.

A study by Johnson and Lee in 2022 looked into how blockchain smart contracts might be able to be used to make healthcare operations safer and more automated. After doing research, they found that self-executing contracts could make administration easier, make things clearer, and make sure that healthcare transactions are done correctly.

The role that blockchain technology plays in managing pharmaceutical supply chains is being studied by Kim, Smith (2022), and a few other people. Through their work, they showed how blockchain technology can improve patient safety and regulatory compliance by making it easier to track medications, lowering the number of fake medicines, and making sure that medicines are real [6]. Graph Blockchain for telehealth data [7]
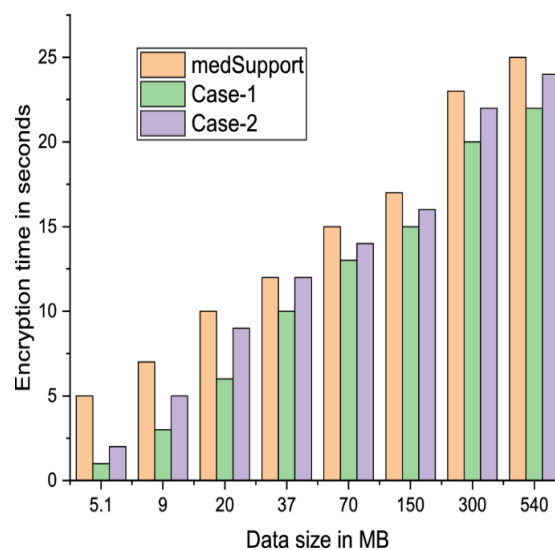

Figure 3: Graph Blockchain for telehealth data [8]

Literature talks about blockchain-based uses in healthcare, such as keeping patient data safe, boosting interoperability, automating processes, and making sure the integrity of the

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[6] Villarreal, J. Garcia-Alonso, E. Moguel, and J. A. H. Alegria
[7] Narendra Kumar Dewangan and Preeti Chandrakar, 2023
[8] Narendra Kumar Dewangan and Preeti Chandrakar, 2023

pharmaceutical supply chain. Researchers are always looking for new ways to use blockchain technology to make healthcare better because it changes all the time.

Explanation of key blockchain principles

Blockchain is distributed, open, and safe thanks to a number of basic principles. Here are some important blockchain ideas:

Chain is a group of computers that are not connected to each other, called nodes. Without central control, the system can handle failures in a single entity better.

Records can't be changed once they are added to the blockchain. With immutability, all records of transactions are kept forever and can't be changed.

To add a block to the blockchain, every member of the network has to agree to it. Consensus algorithms, such as Proof of Work and Proof of Stake, make sure that transactions are real and stop people from messing with the system.

Using cryptographic hash functions, blockchain creates unique, fixed-size copies of data. Each hash joins the block before it to make a chain. All changed data would get a new hash, which would let the network know that something was wrong. By letting everyone know everything, we can trust each other and keep our promises.[9]

Specific applications of blockchain in securing health data

Block chain technology can be used in many ways to solve important problems related to privacy, authenticity, and compatibility. One use for this technology is to keep private health information safe. The following are some of the most important uses:

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[9] Saranya and A. Murugan, 2022

Blockchain technology makes it possible to keep an electronic health record ledger that is both spread out and can't be changed. Secure block recording makes it possible for patient data, treatment history, and diagnostic information to be kept forever. This information can only be seen by a certain group of people.

Blockchain technology can be used to create a safe and trustworthy decentralized identity management system. Patients can be involved in managing their own health records as long as they give permission for certain people to access their information. This change makes it even less likely that someone will steal your identity or get into your medical records without your permission.

Better interoperability is made possible by blockchain technology, which provides a safe and standardized way for medical records to be shared across many platforms. The exchange of data is easier with smart contracts, which makes it safer and more reliable. This is why this feature exists. When used in the healthcare system, smart contracts can be helpful for everyone, including payers, providers, and other groups and individuals.

Because blockchain technology is used, it is easier and faster to keep an eye on and check data from clinical trials. When researchers use this method, they can be sure that the results of their tests will be recorded correctly, which gives them peace of mind. This openness not only stops people from changing data, but it also builds trust between the people who are taking part and the organizations that are in charge of regulation.

Blockchain technology keeps a permanent record of each drug's path from the company that makes it to the store that sells it to the person who uses it. This is done to ensure the integrity of the supply chains for pharmaceuticals. This makes patients safer by lowering the chance that they will get fake medicines and making sure that the medicines they do get are real.

Strategies to overcome obstacles and ensure effective integration

Before a company uses blockchain technology, it needs to look at its needs, its current systems, and how it already uses blockchain technology. It is very important to make a detailed plan

with clear goals, due dates, and anticipated outcomes of the integration. Legal experts, IT experts, and end users all need to be involved in engaging stakeholders. All parties must agree with blockchain solutions in order for them to work [10].

It's also important to run campaigns to raise awareness and teach people inside and outside the company. People can better understand blockchain technology and its benefits if we clear up common misunderstandings about it. A proof of concept (PoC) lets an organization test the use of blockchain in a controlled setting before putting it into action.

For interoperability, we encourage businesses to join efforts to make blockchains work with each other across industries. All blockchain networks will be able to talk to each other more easily if everyone works together, which will make the ecosystem stronger. To stay in line with all the rules and laws that apply, you need to talk to and work with your lawyers all the time to understand and adapt to the changing regulatory environments.

To fix the privacy problems with blockchain data, we need secure multiparty computation or zero-knowledge proofs. To be scalable, a blockchain protocol must be chosen or made early on in the project's life cycle that can handle the number of transactions that are expected. Interfaces that are easy to use are being made so that end users and administrators can interact with blockchain more easily and quickly [11]

When sustainability is a factor, consensus mechanisms tend to favour green actions. When you use proof-of-stake or delegated proof-of-stake instead of proof-of-work, the blockchain network has less of an effect on the environment.

CONCLUSION

Finally, the look into "Blockchain-Enabled Secure Data Sharing for AI-Driven Telehealth Services" shows how the healthcare field is changing how it uses technology. Blockchain and

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[10] Ashfaque Shaikh, Numan Shaikh, Yash Narvekar, Saniya Farzin, and Muzzakir Siddique, 2023
[11] Kaushik and A. Kumar, 2022

AI could make it easier to share telehealth data. The basics of blockchain were talked about, and the importance of its role in data security, privacy, and interoperability was emphasized [12].

Adding blockchain is a smart way to improve telehealth services, which are getting better thanks to AI's personalized treatment plans, predictive analytics, and diagnostics. As examples, smart contracts can be used to control who can access what, manage identities decentralized, and store data safely. These case studies show that AI and blockchain have worked well in a number of different fields.

But there are some problems with using blockchain to share information. You need to be very careful when dealing with ethical issues like who owns data and privacy, as well as regulatory issues. The strategies can help businesses use these game-changing technologies and deal with problems that come up. All of these strategies, from involving stakeholders to improving all the time, stress how important it is to take a broad and adaptable approach.

The world of AI-powered telehealth isn't very clear, but AI and blockchain technology could help make services safer, more open, and more focused on the patient. Even though there will be problems, these ideas and strategies will help shape the future of sharing healthcare data by combining new ideas with moral concerns. If these technologies are made with morality and flexibility in mind, they could change the way healthcare providers and patients use telehealth services.

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[12] Kaushik and A. Kumar, 2023

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