Overview Of Blockchain Technology And Its Applications In Different Disciplines

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Abstract— A chain of relevant data blocks is referred to as a blockchain technology. It is a decentralized ledger that is entirely accessible to all users and has the intriguing quality that before the information is captured there, it is continuously stored there and can't be changed. This invariant property of the blockchain is very closely aligned with the health record retention requirements that represent the need to ensure the integrity and legality of a patient's health record. An important characteristic of blockchain that is useful for healthcare applications is its decentralization. This allows the user to implement centralized, agency-independent, decentralized healthcare applications. In addition, the fact that data on the blockchain is replicated across all nodes on the network is a way for healthcare professionals, especially patients, to know how, by whom, when, and how to handle the data. More importantly, the settlement of nodes on the blockchain network does not affect the status of the ledger. Blockchain can safeguard your medical information against potential data loss, fraud, and terrorist threats like ransomware attacks since ledger information is reproduced across multiple nodes in your network. Using Blockchain technology, this research examined important data challenges confronting healthcare providers.

Keywords— Block Chain, Healthcare Organization, Pharmaceuticals, Supply Chain .

I. INTRODUCTION

Blockchain is not bitcoin as most of us think, but bitcoin does operate on a blockchain and blockchain really isn't any single thing. Blockchain is a shared repository or digital currency across computer

network nodes. It functions as a database by continuously conserving data in digital form. Keeping a trustworthy and autonomous track of transactions in cryptocurrency networks like Bitcoin represents one of the most vital areas of blockchains. The innovation of block chain technology is that it boosts confidence without the requisite for a credible third party by ensuring the security and veracity of data records [1,2].
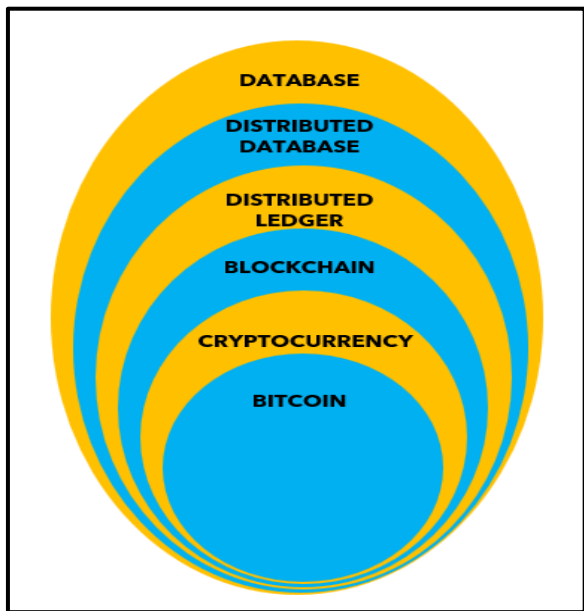

Fig 1 : Basic Structure of Bitcoin

That how data is structured is the key contrast between a traditional relational database and a blockchain. A blockchain gets data in units of chained blocks, each of which contains a collection of data [3,4].

Through a particular configuration, these participants interact with one another. Desirable therapeutic information is generated via workflows, which depend on a lot of data. It through integration of different stakeholders and the transmission of real info for improved patient care, technologies has benefited the medical community in increasing productivity at these complexes.

As a consequence, the entire network has transitioned from traditionally capturing and storing health data to electronically recording and storing it like medical health records [5]. Platform to build, including telehealth and m - health, are also mentioned. The objective of creating the app was to increase stakeholder connectivity. Presently, the sector is transitioning from physical care to digitized care.

India has begun its journey to achieve UHC in 2022 and align NHP 2017 with this goal. The Pradhan Mantri Jan Aarogya Yojana (PMJAY) ambitious, included in the Union budget 2018-2019, is part of NHP 2017 [6]. It envisions two key elements - establishment of health and wellness centers (HWC) and a national health insurance program under National Health Protection Program, recently renamed Mission Pradhan Mantri Rashtriya Swasthya Suraksha (PMRSSM) .2 UHC aims to increase accessibility Affordable medical services for all, 3 while PMRSSM aims to increase accessibility, availability and affordability of elementary, secondary and tertiary healthcare in India [7,8].
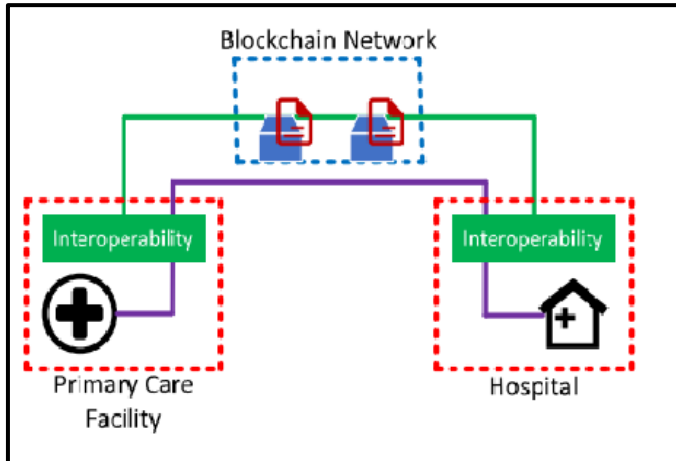
Fig. 2: Block chain in Healthcare

National Health Care Initiatives of this magnitude will need a technological solution to enable all stakeholders to create and exchange meaningful health information in a secure and timely manner on Street [9]. Implement PMJAY and achieve the goal of UHC will require connection technology for various HWs spread across the country[10]. Technology will also serve as the backbone to build an IT platform at the national level and facilitate the identification of beneficiaries, the strategy of purchasing care services, disbursing providers payments, fraud detection and monitoring NHP 2017 identifies health goals information management, for example by providing health system and basic information database federated integrated health information architecture, exchange information about the health and development of a health information network by 2025 [11,12,13].

II.   WORKING OF BLOCKCHAIN

A blockchain gathers data in units series of blocks, each of which comprises a collection of data. It is a chain of data that is made up of blocks, each of which has a specific amount of storage. When a block is full, it is sealed and connected to the block that came before it [14].

A database usually organises its data in tables, whereas a blockchain, as its name suggests, divides its data into parts (blocks) that are connected concurrently. This data format by its very nature produces an everlasting temporality of data when employed in a distributed network. A block will be set in stone and added to this timeline as quickly as it is finished. A block is given a specific timing when it is added to the chain [15].

Table : Working of Blockchain

Debits					Credits
Date	Details	Bank	Date	Details	Bank
01/10/2018	Balance B/f	1500.00	01/10/2018	Rent	400.00
03/10/2018	Mr Smith	250.00	15/10/2018	Supplies	60.00
20/10/2018	Mrs Jones	150.00	19/10/2018	Telephone	25.00
			31/10/2018	Balance c/f	1415.00
		1900.00			1900.00

chain Technology And Its Applications In

In layman's terms, Blockchain might well be characterized as an irrevocable public ledger that allows it to record transactions and track assets within a business network. Real estate, vehicles, cash, and real estate are examples of tangible assets and Intnangible assets are like intellectual property, patent, copyright, brand image). On the blockchain network, almost anything of value can be recorded and traded, lowering costs and risks for all parties [16].

In the following subsections, Blockchain working is discussed.

- **Recorded as a "block" of data, as each transaction occurs**
These agreements illustrate the transfer of a good or asset, that may be either physical or intangible. The datagram can be used to keep track of a meal delivery's heat [17].

• **Each block is associated with the ones that were and followed it.**

As an asset is relocated from one area to another or possession is changed, these blocks establish a chain of data. The transactions are securely linked to prevent altering a block or introducing a block between two existing transactions, and they confirm the precise timing and sequence of transactions.

- **Recorded as an irreversible chain:**
Each new block enhances the prior block's and the blockchain as a whole's ability to be verified. This gives the blockchain its critical immutability and renders it tamper-proof. By doing this, you and other network users may create a list of transactions that you can trust and eliminate the chance of tampering by a malicious party.

III. ELEMENTS

The goal of this survey on professional writing was to identify and organise the most practical techniques for determining.

A. Enhanced Security

No one can simply alter the characteristics of the network to their advantage because there is no longer a need for a central power. Another layer of protection is added to the system by using encryption.

B. Distributed Ledgers

All other key stakeholders are accountable for maintaining the ledger on the network. To assure better outcomes, this divides computational resources among machines.

C. Consensus

Consensus algorithms are the lifeblood of every blockchain. At the core of this system are these algorithms work intelligently to built architecture. Each blockchain has a consensus protocol that aids in network decision-making.

D. Faster Settlements

In comparison to conventional financial systems, blockchain offers quicker settlement. Users can transfer money somewhat more quickly in this way, which ultimately saves a lot of time.

E. Smart Contacts

Smart contracts are a collection of instructions that are constantly carried out and stored on the blockchain to speed up transactions. Corporate bond assignment terms, such as how much money must be paid for travel insurance, can all be specified by smart contracts.

F. Decentralized Technology

The network is decentralized, which means it has no governing body or a single person managing the framework. Instead, a group or nodes maintain the network, making it decentralized.

IV. BLOCKCHAIN BENEFITS IN HEA:THCARE

These are some areas where blockchain can help in managing identity:
- Demographics/Vital Stats
- Consent (e.g., clinical trials)
- Credentialing & Licensing
- Supplier Place of Origin

With identity management here it's the talk about patient identity in particular, some of the demographic information, vital statistics information things that don't necessarily change on a regular basis. So certainly, people may move around at some frequency in their lives, but by and large when someone moves, they have that address for a little while. One of the things with identity management that blockchain can help us with is if we're keeping that type of information connected to a blockchain as opposed to living inside different systems and we're going to reference that information. Then there is a very-very high possibility that we can change it in one place and then we could reference it everywhere.

So, think of all the times that you go somewhere, and someone needs you to verify your address every single place currently that has your address living in it especially from a healthcare perspective, if you move that must be changed in every single system. So, having to provide the same information over and over again in a healthcare space is one of the most frustrating things that patients experience myself

included, so it would be great if we could just update our address in one place every time we move and it would just automatically go throughout the system [18].

The other one that we're actually seeing some movement on already is with clinical trials, so absolutely the people that are running the trial definitely know that the patient is in there but one of the things that can be helpful is if that information is on an immutable record and it's in a blockchain that can be accessed from a transactional perspective. Then other areas within the health organization can easily sort of interact, with that once it's in place and determine whether an individual's in a clinical trial or not. So, the consent for the clinical trial and the details of the clinical trial sort of what it is, when it runs, if there's medications attached to it, all that type of information could live transactionally on a blockchain.

Similar to the way we're identifying patients with their demographics we could also identify providers with credentialing and licensing information, so there are licensing bodies outside of the organization. The "All India Institute of Medical Sciences", New Delhi for example there are different nursing licensure bodies that are out there, so it would be great if the information could be accessed and information could sort of be referenced and flow back and forth to identify who has their license, what their license is, when it expires, what their credentials are good for, do they have admit privileges. All that type of stuff it isn't something that's changing on a regular basis it is something that is the same piece of information that is utilized by many other systems in many different areas within a healthcare organization and blockchain is a great option for that one as well.
We also can use identity management from a supplier perspective identifying supplier information who the vendors are, what the contact information is, where they're physically located, what products they sell that type of things.

V. ROLE OF BLOCKCHAIN IN MEDICAL RECORDS

These are some areas where blockchain can help in managing medical records:

- Patient History Detail
- Encounters/Visit Information
- Medication Lists
- IoT and Remote Monitoring

medical records just like we don't like updating our address a million different times in a million different places, within the health system itself it is also very unlikely that our medical history is going to change. So, one of the other things that gets asked on a very frequent basis is surgical history for example and I myself had some surgeries as a child and absolutely don't remember what year they were in and find it very difficult to bring up the name of the actual surgery off the top of my head. So, if that's living in an immutable record, that somehow health organizations or providers can access and sort of lookup in a reliable sort of unchanging secure way that would be very very helpful [19].

Our encounter and visit information, in this the first things that happens when a patient portal is actually set up is patients are given access to their visit history, which tells them every time they interacted with that particular health system. Well, if we look at blockchain and if we can figure out how to get things onto the blockchain so that we have a network that can access it and sort of read or reference or securely obtain data from there then we can keep an entire record of our visit history and in our encounter data on there, not necessarily from just one organization but from multiple organizations. So wouldn't it be great if we had all of our special data, our emergency department visits and all of the visits from our primary care physician all in one place. If we are on some long-standing medications or if we're taking particular vitamins that we take on a regular basis sort of maintaining that type of stuff in a blockchain, then it's easy to access is another potential use of this technology.

It will be helpful especially for older patients if there's a reliable immutable source where the information can live and consistently be referenced by anyone, then it will be great.

Finally, from a records perspective the internet of things and remote monitoring, blockchain seems very attractive mostly because of its security and privacy and its ability to be accessed and have data entered from anywhere but depends on how everything is set up and how it's structured can have a huge sort of impact on this one.

VI. BLOCKCHAIN BENEFITS IN PHARMACEUTICAL

Some areas where blockchain can help in managing pharmaceuticals industry.
  ➢ Authenticity and Component Validity
  ➢ Transport conditions (e.g., cold chain tracking)
  ➢ Place of origin / place of manufacture

Like me most of the people don't realize the use of blockchain in pharmaceutical space until we started looking deep into it. So, as one move medications sort of around the world there's a very strong desire to make sure that the medication is authentic and that all its ingredient, components are exactly what they're supposed to be. So, blockchain can help with that especially when it's being passed between different organizations or different pharma companies. Then, the other thing with pharmaceuticals and medical devices is some of them require cold chain transport which means that they need to be transported from point A to the supplier point B, then to the end point like hospital or clinic without too much fluctuation in their temperature. So, after looking at covid vaccines for example right now we know that some of them require cold storage in order for them to be transported, we don't want them to melt along the way and want to be able to track what the temperature is as we go through the different steps, blockchain can assist with that and it can provide the complete record in a very secure format so there's a number of companies in the pharmaceutical space that have already set up [20].

VII. BLOCKCHAIN BENEFITS IN SUPPLY CHAIN

Some areas where blockchain can help in managing supply chain.
- ➢ Supplier Management
  - ▪ Identification
  - ▪ Agreement details
- ➢ Track and Trace
- ➢ Purchase order and account payable

Along a similar line supply chain in general, pieces can be taken form what have been mentioned in the other use case areas for supply chain and put them together. So, certainly keeping track of things from their place of origin or manufacture to their point of delivery is something that blockchain can do in the general supply area. There's also the identification of the supplier's sort of who they're, who the vendors are, whether they're certified or not, whether their licensing exists to operate in certain areas depending on what it they're selling, certificates that may be associated with some of the supplies that one is obtaining. Blockchains that have smart contracts embedded can also assist in the supply chain world when it comes to some of the purchase order and accounts payable. So, there are group purchasing organizations that are leveraged by hospitals on a frequent basis where the hospital or provider group or clinic entity will make a purchase from a group purchasing organization and that organization is then going to call out to the supplier to have something delivered and it looks like a triangle. Take an , you go to the GPO the GPO goes to the supplier the supplier delivers to you and payment in that pathway can get a little confusing and it currently takes quite a bit of time and quite a bit of human intervention, so one of the things that blockchain can help with that is if smart contracts are in place they look to take away the middleman and to actually have the technologies just take care of that for us. So, some of those automation processes with accounts payable and with the delivery tracking and things like that would be very helpful in supply chain.

VIII. BLOCKCHAIN BENEFITS IN HEALTH INSURANCE

Some areas where blockchain can help in managing health Insurance.
- ➢ Access to Records
- ➢ Coverage Eligibility Checks
- ➢ Claims Processing
  - ▪ Automate identity and coverage details
  - ▪ Improve payment turnaround times.

Citizens will be able to manage their privacy as well public health insurance system claims and will benefit transparent and cashless blockchain processing request. This will ensure that the requested time settlement and manual processes involving some stakeholders are eliminated by facilitating cooperation between all stakeholders through an integrated system. Along with citizenship records, this will also reduce amount of misrepresentation in determining submissions repeated false statements, false patient identities or fake health records. This will also ensure that real claims are always receive treatment and take timely intervention measures in case of grievances.

CONCLUSION

Future studies may include full-body photos to find answers to questions. Some Video dataset could be taken to detect human emotion with various other Machine Learning and Deep Learning algorithms so that results could be improved.

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