

Distributed Ledger for Medical Insurance Settlement: A Review

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Abstract -Blockchain is evolving to be a secure and reliable platform in the digital revolution of the healthcare system. The future of the healthcare system can be shaped by distributed ledger technology to incipient for patient care. By managing data in real-time updates to an encryption decentralized ledger are done to monitor and control medical information. This system presents a novel smart and secure system that restricts unauthorized persons and brings transparency to the system. When distributed ledger secures legal issues that invokes no central adjourning authority to hold the prowess.

Key Words: blockchain technology, smart contract, healthcare, distributed ledger technology, transparency

1. INTRODUCTION

Blockchain technology is stabilizing its roots in a decentralized ledger which has many applications yet to be discovered, improving security and transparency into the system. Blockchain uses smart contracts to write the data in ledgers. Smart contracts are digital contracts which cannot be changed once it's initiated on ledgers which give blockchain the power of immutability. The application of smart contracts can provide security in business sectors like the financial sector, supply chain management, food industry, energy sector, internet of things, and healthcare. [1] The Blockchain is a solution for modern and digitized systems which can transform the traditional ways.

Blockchain is a central system that acts as middleware. The database in the blockchain is distributed and in a peer-to-peer network. It shares resources in networks. The distributed data now stores in blocks that are encrypted by a key and gives a hash value, each block in the blockchain has an address of the previous block.

Originally blockchain was introduced as a mechanism to power Bitcoin but has now evolved to the point of being referred to as a decentralized ledger for many applications. Blockchain is highly efficient in providing security and handling sensitive data in systems, especially systems like healthcare, insurance, and medical research. To promote, maintain or restore the health of beneficiary healthcare systems to be inclusive of contact-based and technology-based remote monitoring services extended by constituent service providers by present studies in the healthcare system. Within this field of healthcare systems, privacy and security breaches are allegedly rising every year, with an overall 300 breaches 37 million medical records reported in 2017. Hence increasing digitization of healthcare has raised concern for secure storage, ownership, sharing of patient's health records and medical data.

2. Problem Statement

Problem: There is a leak in the traditional insurance and hospitalization system. Transparency is required to overcome the predicament; distressed patients go through. Decentralized ledgers will highlight the issues of linkage between insurance and hospitals. The linkage is required for Medi-claim settlement.

3. Literature Review

Issues in health insurance and its impact on healthcare insurance

A. Furnish fraudulent artifacts

In the health care sector, medical facilities or medical providers submitted claims to government health care plans or insurance companies were never provided and the evidence supporting that there is no correlation with patient files and medical facilities have no supporting records. Which states that the claimer has submitted fake files to make money.

These frauds may identify by reported dates. If we cross-reference those dates in a medical facility and look for any documents that the patient admitted on those dates. The evidence is more to be found in sparse.

Well, forgery documents are not stand-alone claimable. Fraud medical providers also need witnesses to assert the documents. When a patient is unconscious about the claims, medical facilities tell that patients have blurred memories about the medical records. In claimed documents, the medical facility added the predicament that elderly people die before examining the records.

B. Third Party Administrator (TPA)

Outsourcing many administrator functions healthcare insurance providers use Third Party Administrator. Administrator functions like premium billing. The involvement of third parties' administrators compromises the integrity of the organization. The investment done by stakeholders is highly vulnerable and must not compromise the integrity. Third-Party Administrators most likely might possess ill intentions that can negotiate the stakes, loosening the integrity of organizations. [2].

C. Highest Claim Ratio

One of the challenging issues for all Healthcare providers in the High Claim Ratio. According to IBAI public sector and private sector general insurers are in neck-to-neck competition for the settling of claims. Among the public sector general insurers, despite the number of claims filed is more than 2.5 million in FY19, the claims settlement ratio was 84 percent for all the state-owned general insurers. [3]

Claims Settlement Ratio =
Sum of Total number of claims settled for quarters 1, 2, 3 and 4
Total Claims available for processing for the year ending March 31st, 2019

Higher the Claims Settlement Ratio, better is an insurance company in terms of the measured ratio

PUBLIC SECTOR GENERAL INSURERS					
RANK	INSURER	CLAIMS SETTLEMENT RATIO			NO. OF CLAIMS AVAILABLE FOR PROCESSING
		For the year ended March 31, 2019	For the year ended March 31, 2018	For the qtr ended September 30, 2018	
1	New India	92.44%	93.06%	70.97%	54,59,068
2	Oriental Insurance	90.13%	87.65%	46.65%	56,33,511
3	National Insurance	85.43%	72.57%	45.39%	25,31,045
4	United India	84.45%	75.69%	55.35%	66,52,619

LARGE PRIVATE SECTOR GENERAL INSURERS					
RANK	INSURER	CLAIMS SETTLEMENT RATIO			NO. OF CLAIMS AVAILABLE FOR PROCESSING
		For the year ended March 31, 2019	For the year ended March 31, 2018	For the qtr ended September 30, 2018	
1	IFFCO Tokio	92.66%	90.69%	64.01%	9,29,589
2	HDFC ERGO	90.32%	81.25%	67.29%	20,69,142
3	Bajaj Allianz	88.35%	85.70%	59.47%	27,89,992
4	Royal Sundaram	86.79%	87.14%	70.79%	4,67,728
5	Tata AIG	85.99%	84.65%	63.29%	10,83,129
6	Universal Sampo	82.68%	79.59%	77.61%	1,67,241
7	ICICI Lombard	79.98%	79.55%	64.38%	17,88,734
8	SBI General	76.20%	72.23%	53.75%	2,83,195
9	Reliance	74.96%	76.67%	39.98%	19,48,028
10	Cholamandalam	70.31%	68.97%	41.79%	2,71,595

Source: IBAI Claims Handbook 2020

Fig -1 Claims Settlement Ratio [4]

In the private sector, insurers like IFFCO Tokio, HDFC ERGO, Bajaj Allianz, Royal Sundaram, and Tata AIG had a claims settlement ratio above 85 percent. The health insurer handled 7,00,596 claims and settled almost 93 percent.

D. Lethal harm to patients

In the healthcare system over treating the patients with unnecessary procedures or services by physicians. Those decisions can be deadly for patients. Another unnecessary procedure is that too many medical tests can lead to a risk of misdiagnosing or over diagnosing a disease, which can lead to frolicking with the patient's health. An anomaly can be found by over diagnosis, for diseases like cancerous cells – deliberately or mistakenly – that draw immediate medical attention.

Some cancer diseases relapse without any chemotherapy or radiation.

In some cases, healthcare fraud can lead to death and suffering. In recent studies a healthcare provider sentenced to 10 years for providing false information in Medicare, misleading patient's data, and many more total worth of USD 20 million. [5] In this crime, two patients died as a result of a false radiology report produced by an X-ray company.

E. Patient

Many accidents do not require medical attention, but customers take advantage of those medical claims and falsify the information provided in the wrong document to get the benefit of medical claims. The other category in this type of fraud is in this sector is by falsifying the accident itself or in other words staged accidents which are hard to differentiate.

F. Falsifying medical Expenses

If a patient holds medical insurance. Patients will submit mendacious documentation that is not approved by the hospital.

G. Misrepresenting operating days

Doctors in the Healthcare system are also responsible for frauds in the healthcare system. Frauds are conducted.

H. Hospital

Hospital oversees medical producers. Hospitals may charge or prescribe those treatments which are not necessary. To make money. The patient also must undergo these treatments because of a lack of transparency.

This type of fraud causes money problems, as well as patients, are torn in this process.

I. Insurance Company

The most common frauds committed in the healthcare sector are because of lack of awareness and lack of transparency. The Insurance Company takes advantage of these two key points because of lack of awareness in patient Insurance companies decline those reports or documents which can be covered in the insurance and change the contract in their favor.

4. Architecture

A. Ethereum

The smart contract is expressed in Ethereum. Smart contracts are digital contracts in a solidity programming language to write the data on the blockchain. Once the contract has been deployed, it can never be changed and the data write on the blockchain will be stored in the form of a block where each block will be encrypted and has the address of the previous block. The encrypted data will generate the unique hash value each time when the block is uploaded.

B. React Application

React is a UI framework from JavaScript. In this project React is used for GUI and it is connected to Web3.js, which will interact with Blockchain. In this project is React is utilized for the information from client, forms are displayed on browser to fill the information which can transmitted to Blockchain. React is a user interface framework which will provide user GUI to interact with blockchain. The framework and blockchain will be connected using web3.js.

C. Ganache

The ganache will generate accounts to maintain the account and wallet balance. Each transaction block will appear on Ganache.

D. Metamask

Simple extension to keep track of accounts and wallet balance from user interface

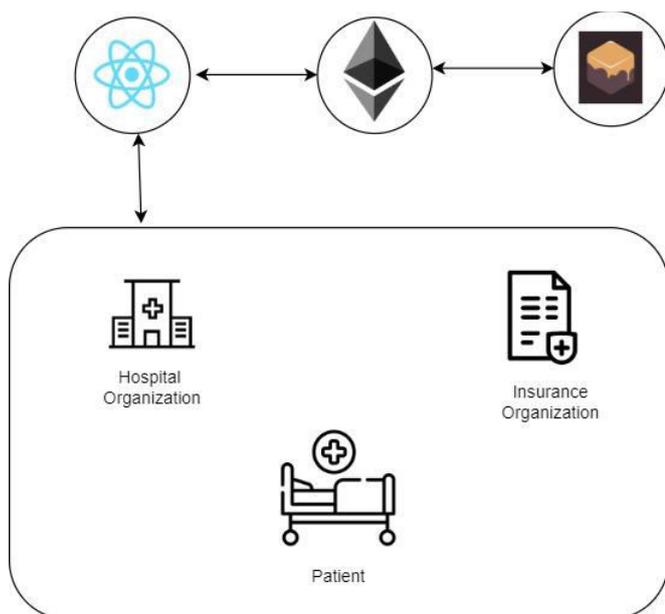


Fig -2: Architecture

5. Proposed System

A. Mapping Ethereum Address to Stakeholders

The stakeholders in this decentralized gateway will be attached to the blockchain. This itself brings transparency into the system. All the stakeholders involving Insurance companies, Hospitals, and Patients connected to the decentralized ledger will eliminate the risk of tampering with data and expose clear distinct transparency.

B. Patient Register Insurance Proposal

The patient in the system has a unique account address and wallet, from which the patient will be able to track all the activity from the system. To get the benefit of Insurance, the Patient will enroll a suitable Insurance from the Insurance company and the company will register the patient's address with that insurance with other basic information.

C. Admitted to Hospital

If the patient is admitted to a hospital that has medical insurance and account address. The hospital will verify the authenticity of the patient by registering as admitted in the hospital and send a receipt to the Insurance company to verify the account.

D. Account Verification

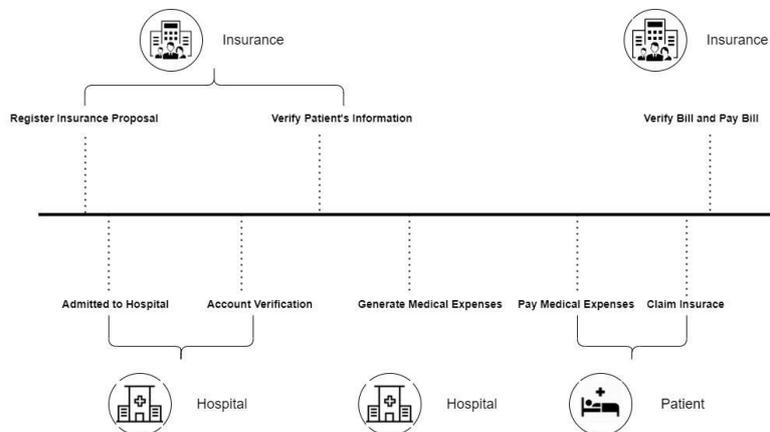
If the Insurance company receives a receipt of an admitted patient from the hospital. The company will verify the data and share the authenticity of the data with the hospital.

E. Medical Expenses

As the account is verified the hospital will generate a bill of hospitalization and send a tax invoice to the patient. If the patient is holding tokens to pay the bill. Hospitals will generate the receipt. Which can be claimed as Insurance.

F. Claimable Insurance

After the patient claims the bill Insurance company will verify the bill and see if the bill can be covered by the insurance and if that bill falls under the insurance. Then the insurance company will pay the bill and Ether will transfer it to the



patient's account.

Fig -3: Implementation Phase

6. Conclusion

This paper is an idea proposal system that closely focuses on issues currently in the world. The prepaid system is necessary as it will not only eliminate the fraudulent insurance companies but will also help the patients in need. The real need is when there is a problem. The system can be further developed based on our idea and a change can be brought into society. The paper closely highlights the current system of insurance companies as well as non-transparency between hospitals and insurance companies. The proposed system as we believe will be a paramount approach towards a change in society.

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