



Survey On Organ Donation Using Blockchain Technology

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Abstract: organ Donation process has remodeled the health sector. We come across many people around the world who are ready to donate their organs while alive, after death or even in situations of brain death.

Our aim with this project is to make organ donation procedure more secure and transparent using Blockchain technology. Through this project, we aim at attempting to put a limit to the unlawful access to the personal and medical details of the donor and the patient by making this procedure between the two parties (patient and donor) more secure and private. An intruder in this system wanting to get the details will not be able to make alterations secure and private. An intruder in this system wanting to get the details will not be able to make alterations or get access to the data.

1. INTRODUCTION

1.1 Organ Donation

Organ donation is an applauded act of service that saves the lives of the people under serious medical conditions or worse, in case of organ failures. Organ failures can be an outcome of various factors like cancerous infections, diseases, lifestyle or even underlying health conditions. This may result in disfunctioning of kidneys, liver, lungs, pancreas, intestines and the heart.

Any individual can become a victim of an organ failure or an organ disfunction. According to the sources available and existing statistics, the increase in this phenomenon has resulted in patients being added to organ donation/transplant waiting lists every ten minutes, thereby showing how this is a crucial procedure for innumerable people to be able to survive and lead a quality life.

Organ Donation as a concept was coined in the 1950s and ever since, it has made a life altering impact in the field of medical science, bringing about, a positive change in the lives of those in need.

To be able to donate, a donor must qualify various medical examinations and fit the criteria for the same. This requires donor to be in perfect health. A donation of one's organ must not take away his own health. Age is not a constraint in the process of organ donation as long as the individual is in optimum health and his organs are functioning intact. The loss of a donor's organ to the recipient must not become a threatening remark to his own health.

1.2 Benefits of using blockchain in organ donation

To make the process of organ donation more secure and ethical.

Priority based on criticality and first-come-first-serve.

Donor and patient authentication is done using a government document.

Non-disclosure of identity of the patient.

Secondary contact from donor's side is collected.

2 PROBLEM IDENTIFICATION

2.1 Problem Statement

Secure Organ Donation Using BlockChain Technology

2.2 Description

Blockchain technology is an advanced data based mechanism that allows transparent information sharing within a network. In the field of healthcare, blockchain system is applied to preserve and exchange the patient's data via healthcare facilities, diagnostic centers, pharmaceuticals and physicians.

This technology can identify with accuracy, the critical errors, even the menacing ones, in healthcare sector.

Security of medical details is of utmost importance to every healthcare centre. The expanding growth of the data and the interrogation of managing the same has become a topic of concern to the service providers. Hence, the use of Blockchain



in this area can assist as it makes use of immutable ledgers which is constantly updated. This implies that under no circumstance, the data can be tampered with, like in a central repository.

Blockchain reinforces decentralized consensus. This implies that every party that is a part of an association that uses blockchain must be in agreement with how verified and recorded the data will be. For an intruder to exploit this secure system and tamper with the information, he must be in full authority of the greater part of the nodes in the network parallelly and make changes in the whole blockchain associated with the information he is aiming at.

3 LITERATURE REVIEW

The paper [1] discusses The Proposed System is a web-based Application which uses FIFO approach to select an organ donor for each genuine patient requiring a transplant and if there is an emergency case then the priority is given to that patient. It provides an efficient platform for potential organ donors and those who need the organs to connect. Blockchain Technology uses digital documents which are digitally signed by the user so that they are timestamped at the time of saving the document and cannot be changed after that. It solves the issue of authenticating the same user again and again.

It

uses smart contracts and RSA algorithm

The paper [5] discusses the existing system uses the blockchain technology for developing a decentralized application that makes the organ donation process secure. Here, the principle of selecting the recipients in need of a transplant is based on a “first in first out” mechanism, unless in situations of criticality.

The paper[10] discusses the organ donation system in the United States is centralized and difficult to audit by the general public. This centralized approach may lead to data integrity issues in the future. The Organ Procurement and Transplant Network (OPTN) was built and maintained by a non-governmental organization called the United Network for Organ Sharing (UNOS) under its proprietary UNet(SM) umbrella platform. This platform is made up of proprietary closed source software and does not provide the general public easy access to the organ transplant data for auditing. This study investigates the feasibility, challenges, and advantages of a blockchain-based OPTN.

The paper [3] discusses the blockchain mechanism used is SHA-256 cryptographic calculation on the hashes which is put away on the squares. The security to blockchain is provided by the hashes as they guarantee the uprightness of the information.

The paper [2] tells us that, this is a decentralized platform for secure organ donation that will be implemented through the web portal that acts as a connecting link between the organ donor with organ recipient and is governed by a healthcare centre.

The paper [4] discusses that In today's era of digitisation, many technologies have evolved that every manual work can be digitally automatized. In the digital automatizing process, security and privacy are the most important and highly demanding aspects. Blockchain offers many features that can be used in almost every sphere of life. Features like decentralisation, transparency, privacy makes it an extremely useful technology. Therefore, by making use of all these features, several problems in healthcare sector can be solved like removing complex network of third parties and lack of traceability of transactions. This paper presents a decentralised, secure and transparent organ and tissue transplant web application (also called DApp), which not only nullifies the role of any third party involved in the organ transplantation, but also is a cost effective solution that saves the patient's from high cost of transplantation. The details and Electronic Medical Record(EMR) are hashed using the IPFS(a distributed file server), which reduces the cost of upload to a great extent.

[6] discusses about Individuals suffering from kidney failure today face significant challenges to obtain a transplant. They are placed on a waiting list in hope that a kidney from a deceased donor is a transplant match However, they do have another option: a living donor; someone they know, family or friend, willing to give them a kidney. Unfortunately, these people may not be a transplant match, however there is a solution called “Kidney exchange” or “Kidney Paired Donation”. In these programs, if two mismatched pairs (living donor and kidney recipient) can be grouped together to become transplant match, both kidney failure patients can receive a kidney. While a great solution, these programs have a significant pitfall. They are limited in terms of geographical scope.

The paper [8], it aims to develop a model to store information in an electronic medical record (EMR) for the management of transplant patients. The model for storing donor information must be designed to allow clinicians to access donor information from the transplant recipient's record and to allow donor data to be stored without needlessly proliferating



new Logical Observation Identifier Names and Codes (LOINC) codes for already-coded laboratory tests. Information required to manage transplant patients requires the use of a donor's medical information while caring for the transplant patient. Three strategies were considered: (1) link the transplant patient's EMR to the donor's EMR; (2) use pre-coordinated observation identifiers (i.e., LOINC codes with *ADONOR specified in the system axes) to identify donor data stored in the model that allows donor information to be stored in the transplant patient's record by allowing the "source" of the data (donor) and the "name" of the result (e.g., blood type) to be post-coordinated in the transplant patient's EMR

The paper [7] discusses the health services where E-government applications, Tele-Medicine and Artificial Intelligence are reviewed and the effects of the sharing of the data about patients and diseases among health sector parties with the Blockchain Technology through smart contracts have been investigated. The theoretical framework of blockchain technology has been investigated within the existing framework and the applications of countries such as Estonia, Sweden, and the U.S.A, who use Blockchain Technology in the health sector have been analyzed and their effects on the costs of health services were evaluated.

4 METHODOLOGY

4.1 Our Proposed System

The block chain network is the backbone of our proposed solution. It serves as the basis for recording the Transactions and events permanently to ensure accountability and data provenance. The developed smart contracts must be deployed on the block chain to ensure they are accessible at all times. However, it would not be ideal to deploy them on the main network during the testing phase. The proposed system is built on a private block chain, to which validation nodes and only authorized participants are added. The implementation of our proposed solution is mainly twofold: organ donation and organ transplantation

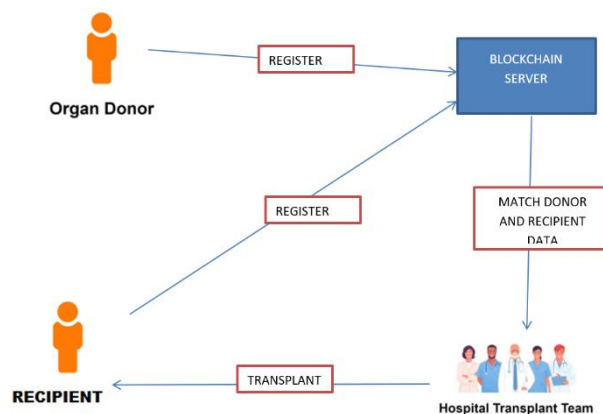


Fig 4.1

- Donor and recipient registers to the application
- Donor updates the organ details to be donated in the blockchain
- Recipient updates organ to be received in the blockchain
- Bloodgroup of the donor and recipient for the same organ is matched and displayed to admin.
- Admin approves for organ donation between donor and recipient.

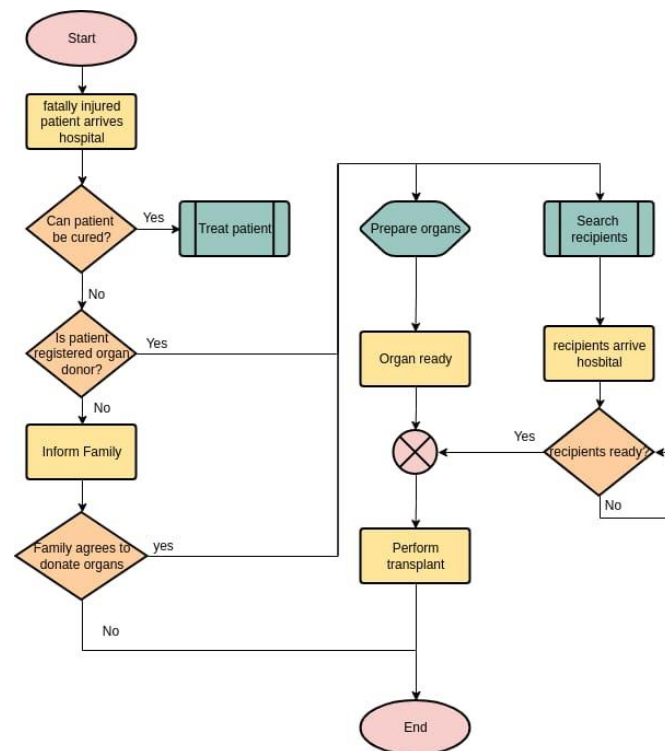


Fig 4.2

5 CONCLUSION

In non-blockchain-based processes, various approaches and tools are utilized to come up with solutions that enhance organ donation, transplantation management, and the matching process. Earlier, they developed a multi-agent software platform to represent the information workflow model among donor hospitals, regulators, and recipient hospitals. This platform optimizes the pre-transplantation tasks, which can improve the process efficiency. In addition, it allows storing potential donor information and improves direct communication among all participants in the organ transplantation process. An information workflow was simulated using the developed platform, and it was estimated that the saved time might be between three to five hours.

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