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Transfusion: A Blood Donation System Using Blockchain

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Abstract: Current day Blood donation systems fall short in providing the solution for real-time time transfusion of blood, where the systems deal with Information which only responsive not dynamic. Starting from donation to transfusion. In present-day situations, there is no platform for blood transfusion, where blood present in one region is requested from the different regions where blood is scarce, which may lead to the wastage of blood. Lack of transparency and proper blood quality checks have led to several cases of blood infected with a transmitted disease such as HIV, hepatitis (HVB), or hepatitis(HVC) being used for transfusion, In addition to this, this system also deals with the blood mafia problem by providing transparency. This System aims at solving the issues regarding the supply chain. The system provides a facility for the blood donation process to be transparent by tracking the blood passageway and also helps to avoid wasting blood by providing a platform for the exchange of blood between blood banks. For ease of use, a web application is also built for accessing the system.

Keywords: donation, transfusion, responsive not dynamic. scarce, transparency

I. INTRODUCTION

a. Overview

Blood plays a major role in human life as it flows via the body and carries RBC, platelets, etc. Blood Donation is always obligatory for surgeries, organ transplants, pregnancy, critical treatments like cancers, and during other various emergencies. Blood Donation saves lives, but many patients who require a donation, do not have proper access to blood. Providing safe and sufficient blood should be a part of every country's national healthcare ethics and rules. Human life needs blood every few seconds. Since the blood can't be produced, a human contribution can only meet the need for blood that can save lives. According to the WHO, a blood bank monitoring system has been interpreted by the agency in charge and dealing with health anxiety. The system is primarily used to get, store, and deal out blood and monitor the quality of the blood.

b. Purpose

The data knowledge about donors, Blood groups, and the quality of blood is a delicate topic that needs to be transparent and secret. The procedure from the starting phase of donation till the blood transfusion to the patient involves several steps, including storage and shipment; As a result, the capacity to record transaction information rapidly is required. Based on the above criteria, blockchain technology is now considered the best method for providing helpful information to blood owners, hospitals, and receivers.

c. Background

Before the transfusion of blood to the patients, the blood is collected from donors either through blood centers or from blood donation camps. Then the sample was collected from the blood in order to check for diseases, once it has been validated it is then transferred to blood banks for storage, as and when blood is requested from the patients the blood is transported from blood banks to the hospital and it is transfused to the patients.

II. PROBLEM IDENTIFICATION

a. Problem statement

According to present-day data on healthcare problems, blood has been an essential part of the treatment process for various health-related problems like surgeries, huge loss of blood of a person who has been struck by an accident, and female citizens during pregnancy time. Blood mafia has been one of the major problems that the world is facing, the

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illegal selling of blood for a large sum. The merciless gang involved in smuggling blood in some parts of India has brought loopholes to the existing blood donation system.

b. Study of Problem

A focal study was done for a period of four months in the blood bank of an Indian care hospital to record the donation related problems. Thrombocytopenia is a condition where the level of platelet count decreases. Thus, there is a requirement for transfusion of blood in the case of such patients. The smuggling of blood and other unorthodox use of blood leads to wastage where blood is considered volatile fluid required by the body for sustenance. Thus, in this case, the transparency and audit features of blood donation are required and the blood should reach the intended person with the least effort.

III. GOALS AND OBJECTIVES

- Our main aim is to keep the information of donor and receiver digitalized, transparent, and audited.
- To ensure that the patient receives safe blood.
- The existing online platform for blood donations is not transparent, so to overcome this we have used blockchain technology.
- To provide a trusted channel for donors and receivers.
- To let people, know about the availability of blood in blood banks.
- Both donor and recipient can track the blood in our system.
- The recipient knows who is the donor and can connect to them.
- Minimize the paperwork that is involved in the whole procedure of donation process.
- Avoid unnecessary third-party organizations being involved in blood donation.
- Provide a decentralized inventory of blood for ease of access to its users.
- Eradicate ill effects of Blood Mafia or smuggling of blood.
- Reduction in the following procedure for Blood Transfusion steps.

IV. METHODOLOGY

This Application is created to make blood donation transparent, decentralized, and audited. It helps us to know whether the donated blood reaches the needy and also donate blood as per request so that there is no wastage and miss-usage of blood. In the initial stages of the Blood donation process through the interface, the donor registers for the donation process, once the registration gets completed the donor will be redirected to the dashboard, where he can search for nearby blood donation camps.

The donor donates the blood in a blood camp. Each unit of donated blood is assigned with QR code with encrypted information about the donor. The function of Donors is to donate and track blood. The Donor is rewarded with tokens which can later be redeemed, the amount of token awarded depends on the usage of blood by the recipient and also depends on the level of blood requirement based on the emergency.

The Donor is provided with a certificate to verify credibility. Then the blood unit from a donor is transferred to the blood bank where the inventory holds the details of the donors and recipients. Donated blood is sent to Blood Inspection Centre (BIC), where the donated blood is tested. The test results are sent to the blood bank. The blood bank stores the digital ledger records in National Health Records (NHR) Database.

Hospitals can fetch the information from the NHR database and place a request for specific blood under emergency. The unit blood is transported to the Hospital, upon receiving the information from patients, thus, hospitals update the info, and finally, they transfuse the blood to the patients. Information depends on whether blood was received by patients or stored for future use.

a. Proposed solution for the system

1. Blockchain and web3

Blockchain technology work by using a peer-to-peer network to create an immutable ledger of transactions. These transactions are then verified and stored by an ever-growing network of computers. Each node (computer) in the network stores a copy of the ledger, and the ledger is updated whenever a transaction is made. This makes it virtually impossible for hackers to tamper with the data.

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Furthermore, the technology is also used to create smart contracts, self-executing agreements between two parties that are enforced without needing a third party. This makes the technology ideal for a variety of applications, such as in the financial services, healthcare, government, and supply chain industries.

Web 3.0: It is a World Wide Web feature for public blockchain, it incorporates blockchain terminologies. It can also be stated as a decentralized online ecosystem based on blockchain. It provides features like scale-ability, security, and other functionalities.

b. Implementation Details

Initially, the end users of the blood donation system i.e., Donors, Blood banks, and Patients, use our web platform consisting of many endpoints each when the transaction details updated in the system are immediately stored in the interplanetary file system networks(IPFS). Which can be later used by the distributed ledger, each unit transaction is considered to have a nonce value. The donor can create his wallet via meta mask and all these transactions are executed under the web3 ecosystem. For the Blockchain purpose, we use Ethereum and other cloud-based services, and each end user can be considered as a node or a block, its transaction is irreversible.

In the presentation Layer, to view the web components we use virtual DOM using react, with the backend services being Node JS, and Express JS and the database is MongoDB. The user can request our query for the IPFS to get the transaction details. A ledger is a mutually agreed document that is digitally signed by each individual party involved in the transaction.

1. Features of Blockchain

- Decentralized - In brief, Decentralization adds transparency to the system.
- Immutability - The immutability of Blockchain technology is what makes it secure and reliable. It means that once a transaction is added to the ledger, it cannot be changed or reversed. This makes it impossible for hackers to tamper with the ledger and thus makes the system secure from cyber attacks.
- Enhanced Security - It is impossible to change the data on all the nodes in the network, making it impossible to tamper with the data.
- Distributed ledgers - The ledger will be updated once the new block is verified by all other nodes. The public ledger is a secure system as it is cryptographically secured and distributed among nodes. It also provides a transparent mechanism for transactions and records. The records on the ledger are also immutable and cannot be tampered with. This makes sure that no one can alter or delete the records. All the transactions are time-stamped and stored in a secure manner. The entire system is secure and highly reliable.

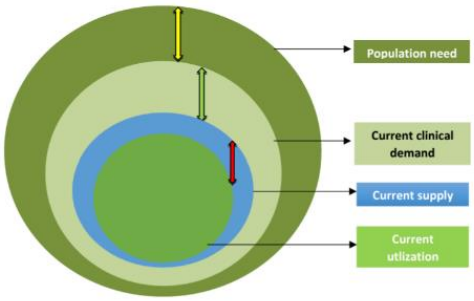

Figure 1 The Population need, demand, and supply utilization replated to blood.

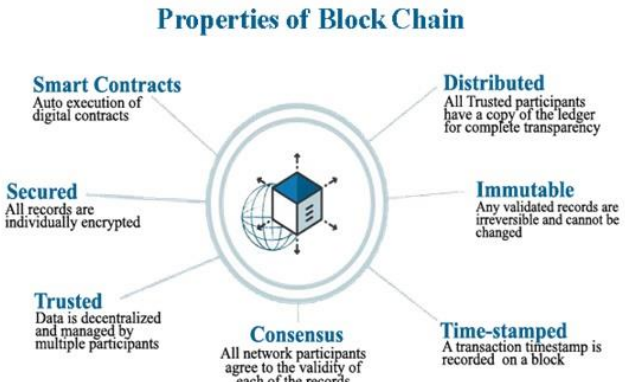

Figure 2 Properties of Blockchain.

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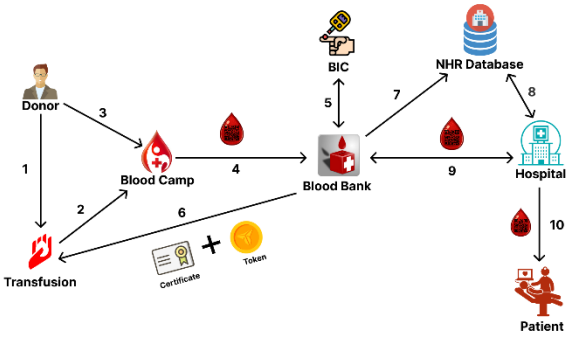

Figure 3 Blood Transfusion process architecture.

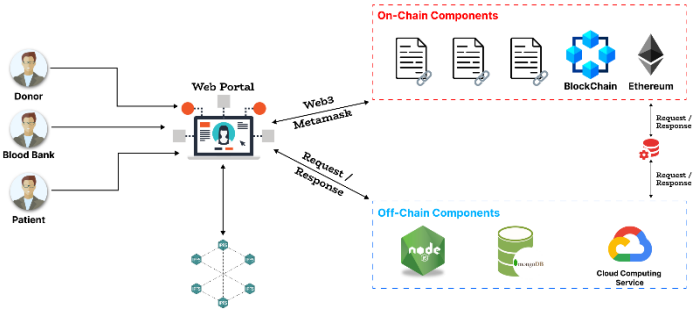

Figure 4 Framework for application

V. FACTS AND FIGURES

If we take a look at the facts and figures related to blood donation we can arrive at the conclusion that statistics help us in identifying the areas of improvement from the system's point of view. The below table shows the facts and figures related to the blood donation scenario in India. The represented figures and tables are from the official body: National AIDS Control Organization(NACO) The above consensus was made by NACO in the year 2018. As shown insight can be derived that blood transfusion is a major requirement for people under surgery, leukemia, and other diseases. Thus it is suggested to increase the level of blood in the blood banks.

VI. APPLICATIONS

- Blood transfusion helps in providing blood when it is required in emergency cases like accidents, surgery, pregnancy, etc.
- This interface is helpful in finding suitable blood donors, who can accept the blood request posts in their nearby location. Our system provides a transparent communication channel between donors and receivers.
- Our application verifies the donor if they are compatible to donate if so, then only the blood is donated.
- Our system prevents a patient from being injected with affected blood which is not healthy.
- We encourage people to donate by providing certificates and rewards for blood donation.
- Our system provides information about the availability of blood in a blood bank.
- The involvement of third-party organizations can be minimized. Our system tests the blood and there is integrity between the sample donors and recipient.
- Provide Quick processing and reduce manpower.

VII. LITERATURE SURVEY

PROJECT	PROPOSED WORKS	REVIEW
Short SMS service by Madhu Krishna and S Nagaraju.	Access the blood via message service.	Ease of access to services.
Automated Online blood bank database by Mohammad Arif, S Sreevas, K. Nafseer, and R Rahul	Contact donor via Toll-free number	It can contact only donors not Blood banks.
Benefits of management Information system in blood banks by Dr. Sharad Maheswari and Vikas Kulshreeshtha.	Compare all existing blood banks.	Talks only about advantages.
MBE: A life-saving application by RamKant Gawande, Narendra Guptha, and Nikhil Thengadi	To link all donors and help to control the blood transfusion process.	The data is divided according to different areas
Blood donation and life Saver: Blood donation app by Anish Hamlin M R and Albert Mayan.	Log in to the app and get information on blood donors.	Use GIS for users to log in and can see details of all donors at a time.

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VIII. CONCLUSION

The proposed blockchain-based blood donation management system provides a secure and transparent solution to trace the origin of the blood in a decentralized manner. The developed smart contracts are robust and secure enough against major security vulnerabilities and attacks. The future work includes deploying and testing the solution on the real Ethereum network and building an end-to-end decentralized application. Furthermore, violation monitoring will be added to further enhance the security of the blood cold supply chain.

REFERENCES

[1] Edirisinghe, L. (2020). Annual Report - 2018.[online] Nbts.health.gov.lk. Available at: http://www.nbts.health.gov.lk /index.php/publication/2018-01-22-08-43-21 [Accessed 18 Feb. 2020]. [2] Tyke, Identity Management with Blockchain: The Definitive Guide (2020 Update). [online]https://tykn.tech/identity-managementblockchain/.Available at: https://tykn.tech/[Accessed 20 Feb.2020].

[3] Perera, L. (2020). Veins: A Lifesaver In The Making? | README. [online] README. Available at: https://www.readme.lk/veins-blooddonor-app/ [Accessed 7 Feb. 2020].

[4] Dialog.lk. (2020). dialog nuts sms blood 7777 services. [online] Available at: https://www.dialog.lk/about/responsibility/outreachcr/network-of-life/dialog-nbts-sms-blood-7777-service/ [Accessed 7 Feb. 2020].

[5] Mathew, R. (2020). Organ Donation Decentralized Application Using Blockchain Technology - IEEE Conference Publication. [online] Ieeexplore.ieee.org. Available at: https://ieeexplore.ieee.org/abstract/document/8769459 [Accessed 17 Feb. 2020].

[6] Pacheco, D. (2020). Characterizing Organ Donation Awareness from Social Media - IEEE Conference Publication. [online] Ieeexplore.ieee.org. Available at: https://ieeexplore.ieee.org/document/7930122 [Accessed 17 Feb. 2020].

[7] Alandjani, G. (2020). Blockchain-based auditable medical transaction scheme for organ transplant services. [online] https://www.3ciencias.com/. Available at: http://dx.doi.org/10.17993/3ctecno.2019 [Accessed 18 Feb. 2020].

[8] Xiaochu, Y. (2014). Population-based projections of blood supply and demand, China, 2017–2036. [online] World Health organization. Available at: https://www.who.int/bulletin/volumes/98/1/19- 233361/en/ [Accessed 14 Feb. 2020].

[9] Ubeyratne,R. (2020). What You Need to Know About Organ Donation in Sri Lanka | Pulse. [online] Pulse. Available at: http://www.pulse.lk/everythingelse/what-you-need-to-know-aboutorgan-donation-in-sri-lanka/ [Accessed 18 Feb. 2020].

