

Smart Blood Donor System

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Abstract- Technological advancements have made tremendous changes in various fields, and processes have been rendered more effective, now smoothened. The introduction of computerized systems into blood bank administration is important in ongoing streamlining of operations. To satisfy the demand, specialized software was developed for keeping records of current and former donors for future reference. The smart blood donation management system is a total processing system of blood donations, management, and distribution. The system is involved by connecting donors, hospitals, and blood banks-this makes blood accessible to patients when needed, and it also optimizes operation effectiveness. System functionality includes an easy way of blood donation, tracking blood donation history, and real-time management of inventory. Registered donors have access to the user-friendly web interface to schedule blood donation appointments, to access their donation history, and to remind future appointments with them. Blood inventories in hospitals and blood banks are properly tracked, requirements per blood type are monitored, and alerts are raised on demand for specific blood type. The system also contains the complete database of donors, useful for kicks like disaster management or mass blood donation awareness.

Keywords- Blood Donation, Blood Inventory Tracking, Real-Time Monitoring, Hospital Integration, Donation Campaigns, Automated Alerts.a

I. INTRODUCTION

While blood donation is vital in saving lives, blood donation, inventory, and distribution are all difficult to manage efficiently. The Smart Blood Donation Management System bridges this gap via a digital platform that helps streamline the entire blood donation process. All the actors involved in the blood donation process, such as donors, hospitals, and blood banks, are able to interconnect and create a seamless flow of blood supply. Donors can register, schedule appointments, track their donation history, and get reminders about upcoming donations. Hospitals and blood banks can have real-time monitoring of their blood inventory, get alerts in case of critical shortages, and manage their requests for blood more efficiently. With this system, access is made easier, operations are made more efficient, and blood is guaranteed to be available when and

where it is needed the most, thus protecting more lives.

II. LITERATURE SURVEY

This paper analyzed the necessity of a Centralized Blood Donation Management System (CBDMS) to streamline blood donating processes in Saudi Arabia. The system integrates IT solutions to facilitate donor registration, minimize donor waiting time, and maximize efficiency. The blood transfusion services generally work in isolation, and this paper proposes a digital centralized approach to enhance donation management [1]. The study introduces a blood donation application based on Android technology, connecting donors to recipients on real-time basis. The app uses GPS tracking to locate nearby donors and the Haversine algorithm to

calculate distance. The app also embeds authentication capabilities to cross-check donor medical histories, thereby providing safe blood donation and an automated way to ascertain donor availability status [2]. The authors present a mobile application for blood donation in the Philippines as a way to close the communication gaps between the blood banks, donors, and recipients. This will enable users to schedule donations, manage the requests for blood, and locate the nearest blood banks. It establishes the need for such digital solutions to ease access to blood services, especially during emergencies [3]. This paper describes the development of a GPS-based blood donor tracking system for the real-time searching of nearby donors. The application incorporates an automated donor queuing system that sequentially sends alerts to donors until one donor responds. OTP verification is also used to add a layer of security, while donor details will be temporarily erased for three months after the donation to comply with donation regulations [4]. The research presented here discusses the implementation of data mining in enhancing safety and efficiency in blood donation. The paper elaborates on the insights offered by

machine learning models like logistic regression in analyzing donor reactions, predicting adverse effects, and contributing to donor safety and security. DonorHART™, a software tool for tracking and analyzing donor responses, is introduced, giving insights that can further enhance safety in blood donation centers [5]

In this paper, existing blood bank systems are assessed and an improved framework is recommended as a way of enhancing donor-recipient connectivity. Cloud-based blood inventory management is advanced as a solution necessary for better tracking of blood availability and diminished inefficiency in current manual or desktop-based systems [6]. An Alternative Study Like the Other Mobile based Blood Donation Application, an Android Application Whereby Donors and Recipients are Connected Automatically through GPS Based Real-time Monitoring of the Location of the Donor and Automated Response Mechanism for Donors. This would ensure Faster Response in Cases of Emergencies [7]. This research presents Life Share, a

blockchain system that guarantees secure blood and organ donation management. LifeShare employs Ethereum Smart Contracts (ESCs) for donor authentication and applies K-Nearest Neighbor (KNN) machine learning to find the optimum donor-recipient matches based on locations. This system also predicts future blood demand on the basis of linear regression in a systematic manner to manage blood inventory [8]. The study focuses on integrating data warehouses into blood donation management for the information analysis of historical donation trends and optimization of future donation

campaigns. It presents the Philanthropy Score (PS) concept that will promote blood donations by bestowing points upon enticing participation within a recognition-based system [9]. The present study investigates a new computational method for non-invasive detection of blood loss using pulse oximetry. This study proposes a variable frequency complex demodulation (VFCDM) algorithm to enable early detection of blood volume loss by analyzing amplitude modulation of heart rate (AMHR). The findings indicate that AMHR is more sensitive to blood loss than traditional vital signs such as heart rate (HR) and blood pressure (BP). The experiments were conducted with a 900ml blood withdrawal, and the observations could be beneficial for monitoring intraoperative and trauma care [10].

III. IMPLEMENTATION



Fig 1: Donor Registration

This is a web application of Blood Donor Management System which is still under construction. The Donors Registration module collects user input data regarding items such as Registration Number, Name, Username, Password,

Blood Group, Gender, Date of Birth, and Contact Number. The User Interface is in blood design, and it has a navigational bar to different types of users. It may also have several severe security issues, such as storing passwords in plain text and not input validating.



Fig 2: Blood bank Availability

The image represents the Blood Bank Module in a Blood Donor Management System. The Blood Bank Inventory Management System has been designed with a view to an efficient blood bank implementation. It contains a structured database that displays Bank ID, Blood Bank Name, Address, City, Contact Number, and Email ID. This module enables users to look up blood banks, register donors, and process blood requests, making it more accessible to the users.

The stack is keeping to a web-based architecture, probably leveraging brainchild database connections to mine and manage retrieved data. Future iterations may also include real-time blood stock updates, role-based access control, and data encryption for secure communication.



Fig 3: Donor's Details

The figure shows Blood Donor Management System's Donor Details View Module being one between a few where the user can the blood donors by their blood group and the area they live in now. The system fetches donor information from a database and reflects details like User ID, Name, Gender, Address, City, Blood Group, and Phone Number.

This feature allows patients or medical personnel to quickly find compatible donors in times of emergencies to donate blood. There is probably a database query mechanism at the back for filtering results, and future improvements may include data privacy measures, role-based access control (RBAC), and real-time tracking of donor availability to make this system more efficient and secure.



Fig 4: Blood Group Search

Here, Figure 4 depicts the workings of the Donor Search Module of the Blood Donor Management System, which can search for blood donors based on users entering a blood group and location.

The system retrieves necessary donor details from a database, with fields such as User ID, Name, Gender, Address, City, Blood Group, and Phone Number. Such functionality allows hospitals or patients or emergency caseworkers to locate compatible donors in a quick manner. However, concerns about data security arise since the display of phone numbers is public. For improvements, future possibilities include adding privacy protection, authentication for people requesting the service, and updating in real-time whether a donor is available in order to boost the reliability and security of the system.

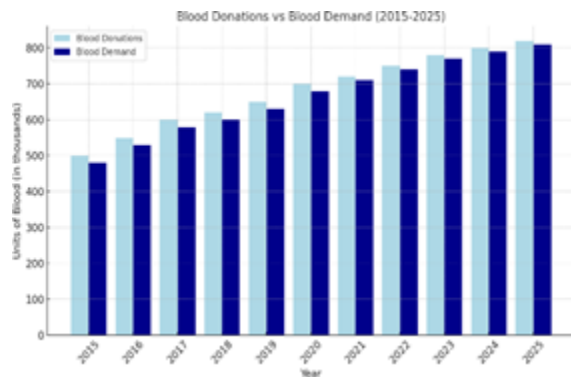


Fig 5: Survey of last 10 years of Blood Donation

The bar graph compares blood donations and blood demands from the year 2015 to the year 2025 to illustrate its trends of supply and requirement dynamics. The light blue bars show the total units of blood donated, while the dark blue bars show the specific demand for blood units, all measured in thousands. The overall stock and trend indicate an ever- increasing rising flow of both, thus denoting an increase in blood transfusion dependency in medical treatment. Continuous need of blood donation, even though it by increments increases adds more cause for the third kind of area input into storage, such as incorporating newer techniques of donor recruitment, optimizing management practices in blood banks, and then inventory control systems as necessary. The visualization focuses on the most critical aspects of data-driven forecast and resource allocation as two of the most essential prerequisites for blood balance against medical exigencies.

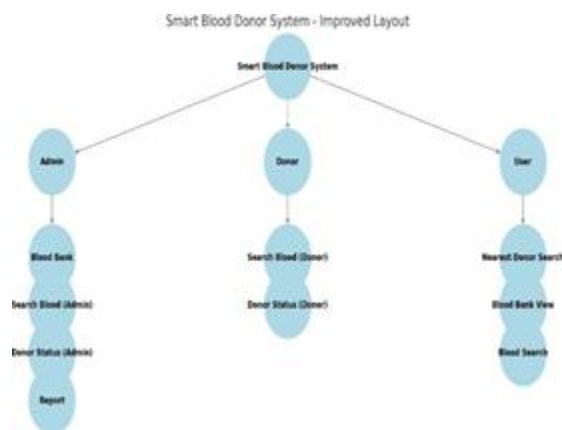


Fig 6: System Architecture

The Smart Blood Donor System consists of three main modules, namely, Admin, Donor, and User-orientated toward a central system, which deals with all flows of data and user interactions. In Admin blood bank management, the administrator is able to search available blood, track donor status, and generate reports for analysis. In the case of Donor, a donor can search for available blood, check eligibility to donate, and view information about his past donations. In User, one can search for the nearest blood donors, see blood bank inventories, and search for specific blood types. On the technical side of the system, it has a database layer that stores data on donors and blood inventory, an API layer allowing seamless communication between the modules, and a user interface that allows easy access to these tools. This architecture allows for the real-time tracking of blood donation and other processes, offering interactive search capabilities and faster decision-making. These enhancements improve the overall blood donation process.

IV. CONCLUSION & FUTURE

Enhancement

Indeed, science has brought inventions to such an extent that they tend to be used to simplify even the most complicated processes like emergency blood delivery. The web application proposed will support efficient communication and coordination of hospitals, blood donors, and blood banks so that they can quickly facilitate blood availability for emergencies. Donors will be able to locate those needing blood nearby, and hospitals will synchronize their records. Keeping up-to-date and well-maintained databases is mandatory for their proper functioning and requires periodic consistency checks. Dynamic and feasible, the application was developed in Visual Studio. Future improvements can enhance the user experience and function, making it even more efficient and visually eye-catching.

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