

Rudhira - The Blood Donation Network

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Abstract—The absence of a centralized blood donation system has perpetuated a global blood shortage. Despite technological advancements, traditional blood collection methods persist, necessitating an innovative approach. The system aims to offer an integrated platform for efficient oversight of blood donation activities, benefiting blood banks, hospitals, and donors alike. Through this solution, we endeavor to address the pressing need for streamlined and technologically advanced blood donation management.

Index Terms— Blood Bank, Manage Database, Online Blood Donation, Online Blood Requesting, Patients.

I. INTRODUCTION

Blood, vital for human survival, necessitates a well-organized approach in India's healthcare system. The existing Blood Donation strategy faces complexities, including insufficient infrastructure and financial resources. The decentralized management further compounds issues, leading to corruption in the blood banking system. To address this, the implementation of a comprehensive blood bank system is imperative. This system promises benefits such as streamlined record-keeping and simplified blood request processes, offering a significant improvement over the time-consuming manual methods currently in place. Our motivation behind selecting this topic was the following statistics: As per 2021 measurements, the request and supply proportion was 1.46 vs 1.25 crore units. Every two seconds, somebody in India needs blood. It is estimated that over 12,000 people kick the bucket each day in India due to the non-availability of blood. [14] The nation requires a yearly normal of 14.6 million blood units and reliably faces a shortage of 1 million units. [15] While one pint (375 ml) of blood can save three lives, about 6 lakh liters of blood is wasted as per last year. [16] Imagine streamlining the process, connecting donors and receivers seamlessly, and making a real difference in times of need. By addressing existing challenges, prioritizing user privacy, and ensuring long-term sustainability, our app could become a powerful tool for good, bringing people together and saving countless lives. We have conducted a survey of interested donors in our batch for a brief clarity about how to tackle the variety and enhance the system.

II. LITERATURE SURVEY

The prevailing blood bank storage relies on file-based systems, leading to cumbersome data management. This approach hinders efficient processing of information related to blood, donors, and recipients. Referenced research papers emphasize the importance of automating blood bank systems, optimizing inventory management, and

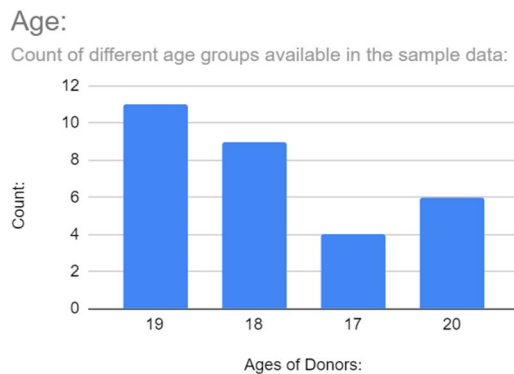


Fig 1.1. It represents the age group from 18 and above in taken survey

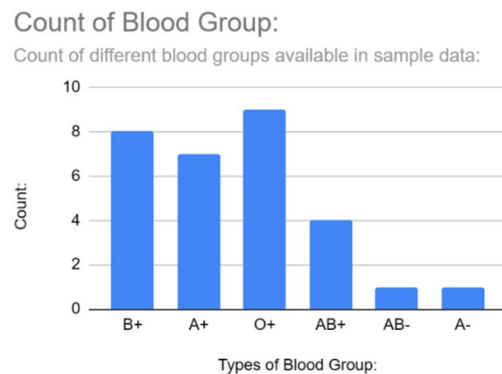


Fig 1.2. It represents the blood group scarcity and the majority in taken survey

leveraging technology to streamline processes. The overarching goal is to enhance efficiency, reduce wastage, and elevate the overall effectiveness of blood bank operations.

In the Blood Bank Management System by Vedant Satpute [2] they propose a new blood bank management system that is based on a distributed database architecture and uses a variety of technologies, including artificial intelligence, to automate tasks and improve decision-making. The paper found that the proposed blood bank management system can significantly improve the efficiency and productivity of blood banks.

The paper titled “A Mobile-Based Blood Bank Management System” [3] proposes a mobile-based blood bank management system that is designed to automate tasks, reduce errors, and improve communication. The paper found that the mobile-based blood bank management system can significantly improve the efficiency and productivity of blood banks.

The paper titled “Blood Bank System using Database Security”[5]The paper reviews to to create an online donation system using database security and encryption. To secure the information of the donor. In “A study on Blood Bank Management System” by A. Clemen Teena, K. Shankar, S. Kanaman.[8]a new blood bank management system that is based on a distributed database architecture and uses a variety of technologies, including artificial intelligence, to automate tasks and improve decision-making. The paper found that the proposed blood bank management system can significantly improve the efficiency and productivity of blood banks.

“Using Machine Learning to Improve Blood Bank Management” by S. A. Patil, S. S. Patil, and S. J. Patil[10]proposes a machine learning-based system to improve blood bank management. The system uses machine learning to predict blood demand and to identify blood donors who are likely to donate blood. The system can help blood banks ensure that they have enough blood on hand to meet the needs of their patients and to reduce blood waste.

In “Blood Gift and Life Saver: Blood Gift App” by Anish Hamlin M R; Albert Mayan J [13] an app is introduced to facilitate blood donation. Users can request blood or register as donors, and the app uses GPS to locate nearby donors, fostering a convenient and efficient blood donation process. The OTP system is also added to verify by the donor and once donated by it, the same donor gets restricted from the list for the next 3 months.

The aforementioned research papers collectively address themes of blood bank management, donor recruitment, and hospital donation process automation.

Advantages: Research explores diverse ways to improve blood bank management: data security (2022), efficiency & AI (2023), machine learning for optimized distribution (2023), and mobile apps for accessibility and communication (2022). These advancements pave the way for further innovation in this vital field.

However, limitations exist, including limited focus on specific user needs, lack of detailed information on data and methodology, and limited real-world testing data. Additionally, concerns regarding scalability, multilingual support, and integration with existing healthcare systems warrant further exploration. Addressing these points in future research will pave the way for even more impactful and user-centric blood bank management applications. Research offers exciting advancements for blood bank management, including data security, AI-powered efficiency, and mobile communication. However, challenges remain like limited user focus, unclear methodology, and lack of real-world testing data. Future research needs to address scalability, multilingual support, and integration with existing systems for a more impactful and user-friendly future.

Our objective is to safeguard donor information, bolster donor security, and meticulously manage blood bags to prevent misuse or wastage.

III. METHODOLOGY / EXPERIMENTAL

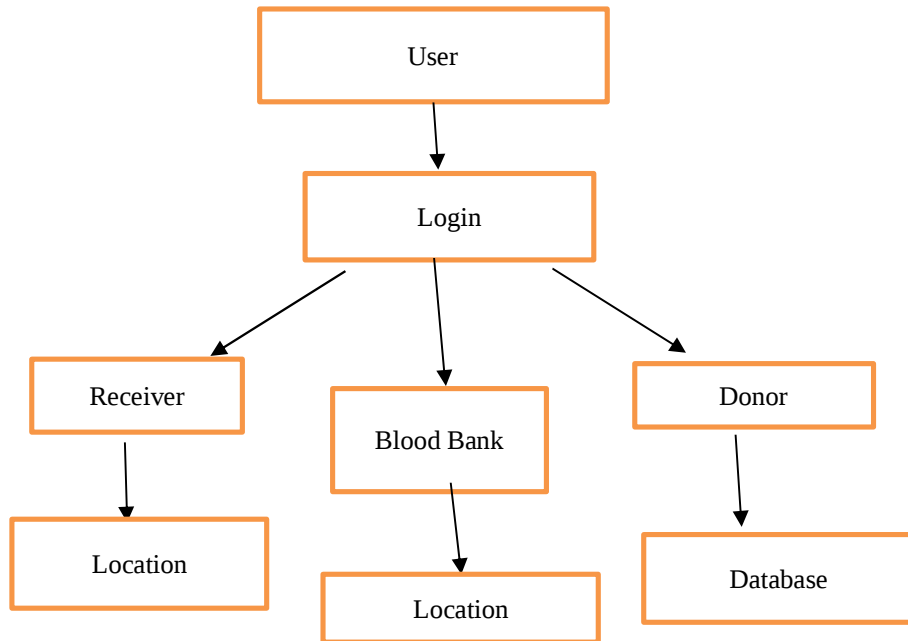


Fig 1.3. The flow of Rudhira App

Rudhira is the app where each user finds his/her solution related to blood donation or blood receiving problems. It was developed with the view that even basic smartphone users can interact with the app efficiently. The Google Maps Android SDK and Places API provide seamless maps and location services, helping users find nearby blood banks and donors. Rudhira's user interface leverages either Cursor Adapter to efficiently manage and display this vital data. Finally, SQLiteOpenHelper establishes and manages the vital SQLite database behind the scenes.

From Fig1.3. we get the knowledge , As the app is opened by the user, it will ask to log in or to sign up (if new). Once logged in the user is asked if he/she belongs to which of the following domains- receiver, donor, or blood banks. By selecting a receiver, it will land on the page with a list of registered donors in nearby areas and a GPS search option for each address. In the case of blood banks, the page shows the nearby available blood donation centres and a GPS search option for each address. While the Donor option is selected the users are taken to the page of registering their details like name, age, blood group, phone number, address, and previous medical history to our data which is saved to an SQLite database. This page also has the option to delete, add, and edit existing records by just entering the required fields. This page also has a view all button which shows a list of all registered donors in the database with their details.

IV. RESULTS AND DISCUSSIONS

The primary responsibilities of a blood bank include blood collection, blood quality control and supply management, and blood and blood component distribution to hospitals in the network. One of the blood bank's key responsibilities is blood distribution. Blood distribution plays an important role in the blood supply chain, and if the blood bank can deliver blood supply according to its demand, patients' lives are saved. Our mission is to create an online blood supply chain management system. The system was created to address this issue. The app will reduce wait times, which might be critical, and also improve access in hard-to-reach areas. The app is also efficient as it enhances the accessibility to both donors and receivers. The app gives the user easy access to choose all three domains – receiver, donor, and blood bank on the same platform. That makes it time-efficient. Users can also search the required address given in its nearby list which can be further tracked by GPS system making it more efficient. The data saved in our database can be also modified at any time anywhere. It also

reduces the number of forms to be filled in by the user while requesting or donating blood. The app also eases the work of the blood bank employees and helps maintain a paperless record which is stored at central locations to reduce operating costs. It also ensures the scalability of the whole blood bank operations to different places with internet access. This makes the system more robust and keeps it away from the errors of the manual book and paper system. The app also has its limitations. It is purely based on the number of users the app has, the more the better. It also poses a language barrier as the app is only available in English. Also, the prerequisites for using the app are that the person must know how to use a smartphone and also aware of the app. However, the development of Rudhira is a necessary step towards a future with no blood shortages. Apps like these will be a driving force towards the goals of a better India. It will have a positive impact on the healthcare situation of India as it will seamlessly tie into the digital ecosystem of the near future.

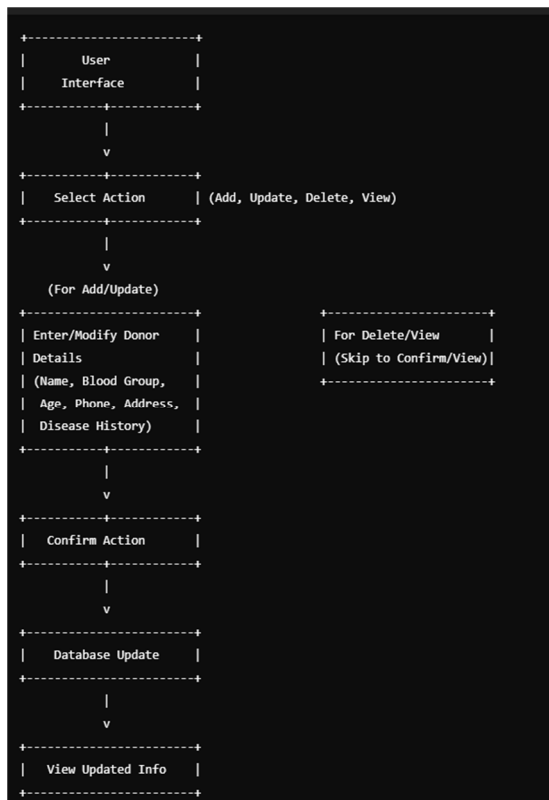


Fig 1.4. The flowchart showing Database implementation

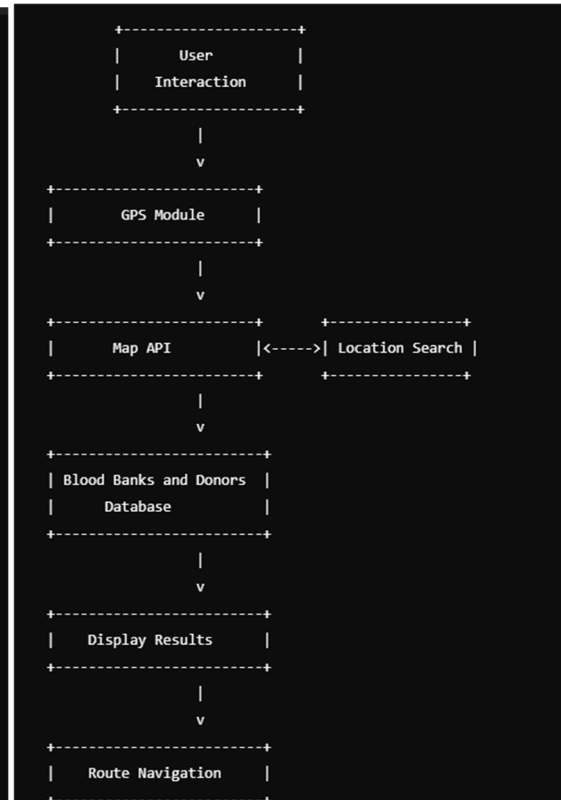


Fig 1.5. The flowchart shows the GPS implemented in the app to find locations of blood banks and donors easily

From Fig 1.4. The donor details management system in the app allows users to add, update, delete, and view donor information. The user selects the desired action through the app interface. For adding or updating, the user enters or modifies details such as name, blood group, age, phone number, address, and disease history. The app prompts the user to confirm the action and then updates the database accordingly. For deleting or viewing, the user either confirms the deletion or directly views the donor details. The system ensures that donor information is accurately managed and easily accessible.

From 1.5. The GPS system in the app helps users locate blood banks and donors efficiently. The user initiates a search through the app, which activates the GPS module to determine their current location. This location data is sent to a Map API like Google Maps for handling and searching nearby blood banks and donors. The app then queries its database to find relevant matches based on the search criteria. The results are displayed on the app's map interface, allowing the user to see nearby options. Finally, the app provides route navigation to guide the user from their current location to the selected blood bank or donor.

V. CONCLUSION

The Blood Bank Management System incorporates advanced security measures through the implementation of OTP (One-Time Password) generation during sign-in and login processes, significantly enhancing the overall

security of the system. This ensures that only authorized users have access, thereby safeguarding sensitive data. In addition to robust security protocols, the system is equipped with powerful analytics and reporting capabilities, enabling the generation of insightful reports on blood donation trends and inventory levels. These reports provide valuable information for strategic planning and operational efficiency, ensuring that blood supplies are managed effectively and shortages are anticipated and addressed promptly.

Furthermore, the integration of IoT (Internet of Things) devices plays a crucial role in maintaining the quality of blood samples. These devices continuously monitor critical parameters such as temperature and humidity levels, ensuring that blood samples are stored under optimal conditions to prevent spoilage. This real-time monitoring is essential for maintaining the integrity and usability of the blood supply. The app also aims to update stored data regularly to minimize inconvenience to donors and increase the accuracy of the information, thereby providing recipients with the most required and suitable findings. The system includes a feature that restricts donors from donating again within a three-month period following their most recent donation, ensuring the safety and health of the donors and optimizing the availability of fresh blood supplies.

In addition to these technical advancements, the Blood Bank Management System leverages the power of social media platforms through dedicated apps. This integration helps to raise awareness about blood donation and the essential services provided by blood banks, encouraging more people to participate in donation drives. The app also utilizes Artificial Intelligence (AI) and Machine Learning (ML) technologies to predict trends in blood demand and organize region-specific campaigns to prevent blood shortages. By analyzing historical data and current trends, the system can forecast future needs and plan accordingly, ensuring that blood supplies are always adequate.

The app also optimizes the transportation of blood units between different blood banks, predicting the best routes to ensure timely deliveries and minimize waste. This logistical optimization is crucial for maintaining a steady and reliable blood supply chain, especially during emergencies when time is of the essence. By ensuring efficient distribution, the system helps to reduce wastage and improve the availability of blood where it is needed most.

Blood Bank Management is an essential tool for automating the entire blood donation and administration process, thereby improving efficiency, reducing costs, and minimizing human error. A comprehensive blood unit consists of three primary sources: blood donors, blood banks, and hospitals. It is imperative to develop a system that seamlessly integrates these three units into a cohesive network. This integrated system should maintain a comprehensive database that records all blood units available in hospitals and blood banks, as well as details of all registered donors. While some systems are designed to cater exclusively to donors or blood banks, an effective blood unit management system must encompass donors, blood banks, and hospitals to function optimally.

The study aims to develop a mobile-based application with a tracking system to address the urgent need for blood, improve communication between hospitals and donors, and help find the nearest blood donors during emergencies using GPS technology. The application is designed to integrate recipients, donors, and blood banks onto a single platform, utilizing an SQLite database and GPS tracking system. To achieve this, it is necessary to create a system that integrates all three units—donors, blood banks, and hospitals—into one comprehensive system, maintaining a detailed database of every blood unit in hospitals and blood banks, as well as all donors willing to donate blood.

By incorporating these features, the Blood Bank Management System aims to revolutionize the blood donation process, making it more efficient, secure, and user-friendly. The integration of advanced technologies and real-time data management ensures that the system can respond swiftly to changing needs and emergencies, ultimately saving more lives through timely and efficient blood supply management.

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