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Medicine Donation and Sharing Platform: For Reducing Medicine Waste

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A B S T R A C T :

Access to essential medicines can be an issue for many. A Medicine Donation and Sharing Platform aims to help connect those donating medicines to those or organisations that need them. The system will allow users to list medicines they have, request donations, manage recipients and donors and monitor the administration. Overall this will aim to help increase access to medicines, encourage responsible use of resources and reduce unnecessary waste of medicines. The system must include proper validation of medicines, expiry dates, data protection and correct pharmaceutical regulations to ensure medicines are being handled responsibly. This research will show the design of the system, key components, how it will be implemented, benefits and limitations of having a digital Medicine Donation Platform.

This research presents the design and architecture of the Medicine Donation and Sharing Platform, its key modules, implementation methodology, potential benefits, and limitations. The proposed approach highlights how digital technology can support healthcare resource sharing, promote social responsibility, and contribute to reducing medicine waste while prioritizing recipient safety.

Keywords: : Medicine Donation, Medicine Sharing, Healthcare Access, Reducing Medicine Waste, Digital Healthcare, Web Application.

INTRODUCTION

There is an increasing demand for essential medicines but also a waste problem. Many people struggle to get access to medication at an affordable price. Often there will be leftover medication within households and health care organisations that go to waste. To overcome this issue a system has been created to enable donors of medication to share their medication with those in need.

The Medicine Donation and Sharing Platform enables the sharing of eligible leftover medication with those who need it. It provides a shared online portal where users can sign up, donate their medication, search for medication and make requests. It will also provide admin functions so users can be managed, donations can be monitored and medication information can be tracked.
The system will include key features such as user sign up and login, donor management, medication list, recipient search and requests, admin monitoring, notifications and medication expiry. This will enable users to manage their donation activities effectively whilst allowing admins to monitor the platform. Medication information can be maintained to help with responsible medication management and reduce unnecessary waste.

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This research details the design and development of the Medicine Donation and Sharing Platform. It outlines the system architecture, modules, implementation method, benefits and limitations of the system. Opportunities for improvement have also been identified to help create a more efficient, accessible and responsible medication donation process.

II. AIM AND OBJECTIVE

A. Aim

The overall aim is to create an online platform, which will connect medicine donors and those needing eligible medicine. The platform will help with increasing access to medicines, reducing wasted medicines, and also promoting responsible usage of healthcare resources. The platform will provide structure to manage medicine donations, requests and administration. Medicine verification, expiry dates and safe handling will be a key focus.

B. Objectives

The objectives of the system will be:[1] To create an online platform connecting medicine donors to those in need of eligible medicine.[2] Create a medicine listing section allowing donors to enter details of their medicine, availability and expiry dates.[3] Provide a search function allowing recipients to search for available medicine and make donation requests.[4] Create a donor/recipient management section.[5] Create an administrator section to track users, medicine listing and donation requests.[6] Include verification of medicine and expiry date checking.[7] Reduce any wastage of medicine and promote efficient usage of healthcare resources.[8] Ensure correct data privacy and follow correct pharmaceutical regulations with medicine donations.

C. Achievement of Objectives

The Medicine Donation and Sharing Platform will provide structure for medicine donations between donors and recipients. The main functions will include: user management, medicine listing, donation requests and administrator tracking. This will improve coordination of donations by having a single source for information. The objectives will have to be proven by implementing the system and testing it. Medicine safety and handling will need to be correctly verified..

III. LITERATURE REVIEW

A. Medicine Donation and Healthcare Accessibility

Medicine donation schemes improve access to essential medicines within vulnerable populations. Coordination can be managed using medicine donation schemes to ensure medicines are donated appropriately. A scoping review was undertaken to investigate medicine donation schemes and solidarity pharmacies. The study found that schemes have the potential to improve healthcare equality but also showed how challenges can arise with logistics, quality, oversight and sustainability [1]. Digital tools can be implemented to help improve coordination.

B. Unused Medicine Management and Waste Reduction

Leftover and out-of-date medicines can cause problems with waste and environmental pollution. The Organisation for Economic Co-operation and Development investigated household pharmaceutical waste. They highlighted the importance of reducing pharmaceutical waste, medicine collection schemes and raising awareness in the public [2]. This study also discussed how leftover medicines can be redistributed. The medicine listing, availability and expiry features can be used based on this finding.

C. Digital Medicines Redistribution

Digital tools can be used to help make donating medicines easier to coordinate. A centralised database can be created to track what medicines are available, who is donating, who is receiving and what donations are being requested. The medicine redistribution schemes show how important it is to match up medicines. A study was undertaken looking at medicine redistribution and solidarity pharmacies in 2026. It showed how important it is to have proper oversight, monitoring and ensuring medicines are aligned with public health [1]. This can be seen with the medicine browsing, donating and partnership organisation sections.

D. Medicines Quality

Tracking expiry medicines is important for responsible management. A systematic review was undertaken looking at medicine return schemes across 15 countries. This study showed there were differences in collection methods, legislation, funding and implementation [3]. Medicine management and ease of collection is important. Within MedShare the expiry calendar and alerts can be used. However this does not ensure medicines are suitable to be redistributed they need to be checked for proper packaging, storage, integrity and if they are legally eligible.

E. Donor, Recipients and Administration

Using digital tools can help improve organisation of donations. Using a dashboard can help track donations, what medicines are available, alerts and more. Analytics can also be used to see donation trends and what type of medicines are being donated. Adding a leaderboard to community can help encourage participation. These features can be seen within MedShare. By adding these features we hope to improve the accessibility of information. However we will need to evaluate how effective these features are by looking at the data.

F. Research Gap

There has been research completed on medicine donation schemes, pharmaceutical waste and medicine return schemes. However challenges exist with coordinating donations, quality of medicines, legislation, ease of collection and monitoring [1-3]. This means there is a motivation to create a

digital tool that can bring all features together. MedShare has been designed to include medicine listing, donation requests, partnership organisation, expiry tracking and donation analytics within one web based tool. This has the potential to improve by including these features.

IV. METHODOLOGY

A. System Overview

'MedShare' is a Medicine Donor-Sharing system. It allows medicine donors to donate medicine to those who may need it. This allows users to add unwanted medicines, view medicine donations, connect to organisations and keep track of medicine donations. The system allows users to easily view and share medicines by having a dashboard, analytics, community leaderboard, notifications and expiry calendar. This is to ensure donations are easy to keep track of, to encourage people to manage their medicines properly and reduce waste of unwanted medicines.

B. Development Methodology

The 'MedShare' system can be broken down into the following components:[1]Presentation Layer – This allows the interface (Home, Donate, Browse Medicines, Connect to Organisations, Dashboard, Analytics and Community Leaderboard) to be viewed.[2]Application Layer – This manages the application by allowing users to add medicine, request donations, browse medicines and interact with others.[3]Data Layer – This stores data such as user information, medicine donations, amount of medicine, expiry dates and donation history.[4]Monitoring and Analytics – This allows users to view donation trends, types of medicines, how much users have donated, notifications and expiry dates.[5]Community and Organisations – This allows users to connect to organisations and see how much donors/ recipients have donated.

C. System Architecture

The system has been designed to have multiple layers within it. This includes the presentation layer, application layer, database layer and administrator management layer. The presentation layer will allow users to register, view available medicines and make donation requests. The application layer will handle requests from users and manage donations. The database layer will store user information, medicine information and donation information. The administrator layer will allow administrators to monitor users, medicine information and donation requests. This helps with keeping the donation process organised

D. Tools and Technologies

TABLE 1. Tools and Technologies Employed

CATEGORY	TECHNOLOGY	PURPOSE
Frontend	**HTML, CSS, JavaScript**	**User Interface and Interaction**
Backend	**Node.js, Express.js**	**Server-side logic and REST API Handling**
Database	**Mongo DB**	**Storage and retrieval of application access**
Authentication	**JSON Web Token**	**User authentication and protected access**
Medicine Management	**Medicine listing and expiry tracking**	**Managing medicine details, availability, and expiry information**
Donation Management	**Donation and request handling**	**Coordinating medicine donations and recipient requests**
Analytics	**Data visualization and charts**	**Displaying donation trends and medicine category distribution**
AI Support	**Wellness Chatbot**	**Providing supportive guidance to users**
Development Tools	**Visual Studio Code, Git, Github**	**Code development, version control, and collaboration**

E. System Modules

The Medicine Donation & Sharing Platform has been designed to include the following modules;[1] Login – Allows users to access the features of the system.[2] Donate – Allows users to add medicine donations. Users can enter what medicine they have available.[3] Browse Medicines – Allows users to view medicine donations. It shows what type of medicine they are, if they are available, their expiry date, description and if they can request or donate.[4] Connect to Organisations – Allows users to view organisations they can contact. They can also contact them via email or phone.[5] Dashboard – Allows users to view donation history, receive notifications, view achievements, their wishlist and more.[6] Analytics – Allows users to view donation trends and types of medicine.[7] Leaderboard – Allows users to view how much the community has donated. It shows how much donors/recipients have donated and achievements based on streaks.[8] Expiry – Allows users to view expiry dates using a calendar. They can also view expiry notifications.[9] Notifications – Allows users to view updates on medicine donations.

F. Data Flow

When a user visits the MedShare platform they can log in. If they are a donor they can go to the donate section. They can enter details about the medicine they have available to donate. This will then be added to the browse section. Users can then view the details of the medicine, how much there is, if it is available and expiry date. Depending on what options are available they can request the medicine or organise a donation with an organisation. The dashboard will show donation history and notifications. The analytics will show donation trends and types of medicine. The expiry calendar will help users keep track of expiry dates.

G. System Diagrams

The system can be shown using a system architecture diagram, use case diagram and data flow diagram. The system architecture diagram shows how users can interact with the donation interface, manage medicine, store data, view analytics and manage the admin. The use case diagram shows the activities available to donors, recipients and admins. The data flow diagram shows how data flows from adding/viewing medicine to requesting donations, monitoring and managing records. This helps to explain how the MedShare system is organised and how the main components interact.

V. RESULT AND DISCUSSION

A. Observation

The MedShare prototype provides a web-based platform designed to connect medicine donors with individuals and organizations in need of eligible medicines. The system includes medicine donation and browsing interfaces, partner organization details, a user dashboard, analytics, a community leaderboard, and a medicine expiry calendar. Users can view available medicines, check details such as quantity, category, quality, and expiry information, and initiate donation or request-related actions. The dashboard presents donation-related information, achievements, notifications, and expiry alerts. The analytics module provides visual representations of donation trends and medicine category distribution. These features demonstrate the platform's potential to support medicine redistribution, improve donation coordination, and reduce medicine wastage. However, medicines must be verified for eligibility, quality, and expiry, and all redistribution must comply with applicable regulations.

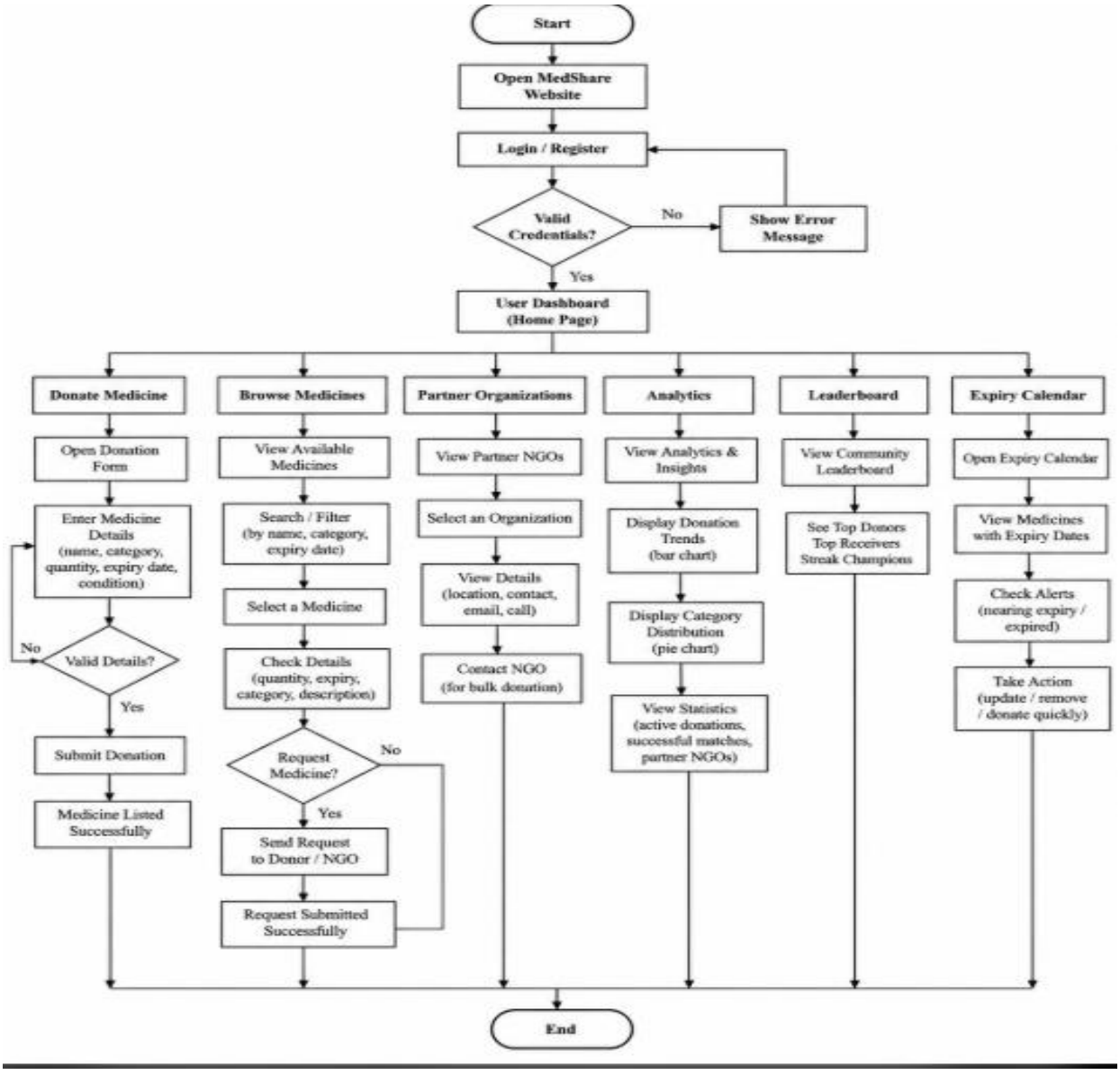
B. Test Results

TABLE II. Functional Test case Result

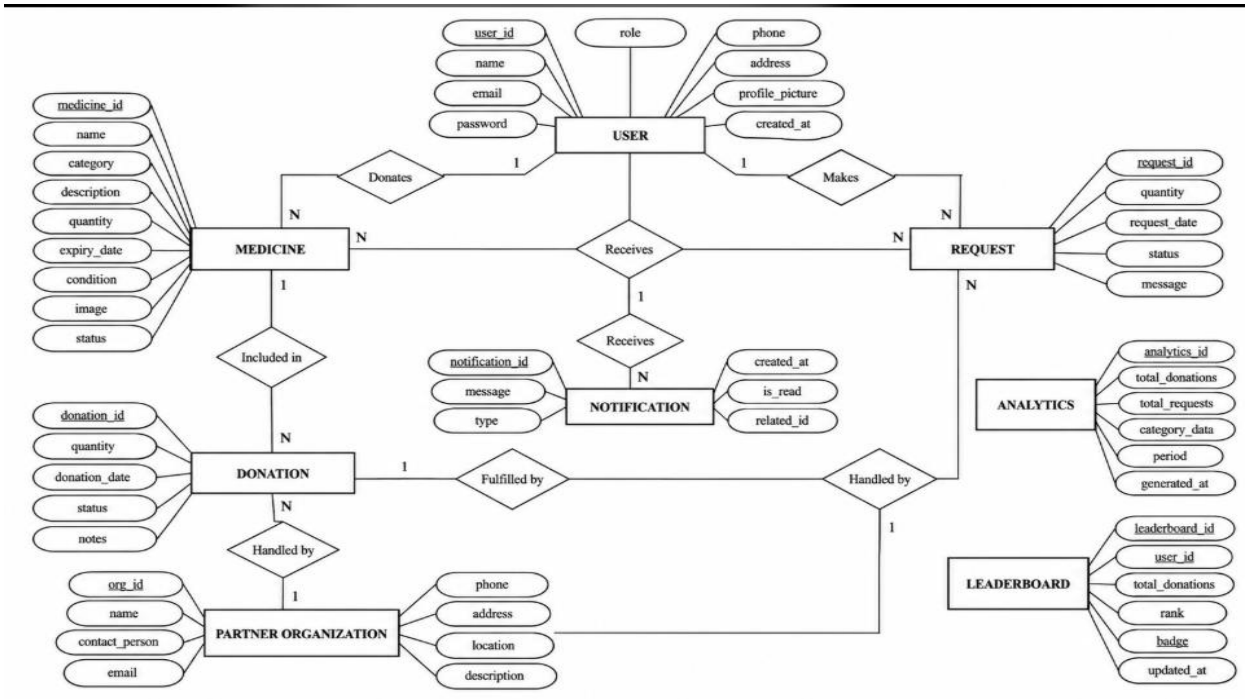
Test ID	Module	Test Scenario	Expected result	Status
01	Registration	Open the register page	Registration form displayed	Interface shown
02	Login	Open Login Page	Login form displayed	Interface shown
03	Medicine Donation	Open the donation interface	Medicine donation form displayed	Interface shown
04	Medicine Browsing	Open the browse medicines page	Available medicine listings and their details are displayed	Verified
05	Donation Request	Select a medicine and intiate a request	The system provides the appropriate request or donation action	Verified
06	Partner organizations	Open the partner organizations page	Organization details and available contact options are displayed	Verified
07	User Dashboard	Open the dashboard	Donation-related information, achievements, and notifications are displayed	Verified

08	**Analytics**	**Open the analytics Page**	**Donation trends and category distribution charts are displayed**	**Verified**
09	**Expiry Monitoring**	**Open the medicine expiry calendar**	**Medicine expiry information is presented in the calendar**	**Verified**
10	**Community Leaderboard**	**Open the leaderboard page**	**Donor, receiver, and streak rankings are displayed**	**Verified**

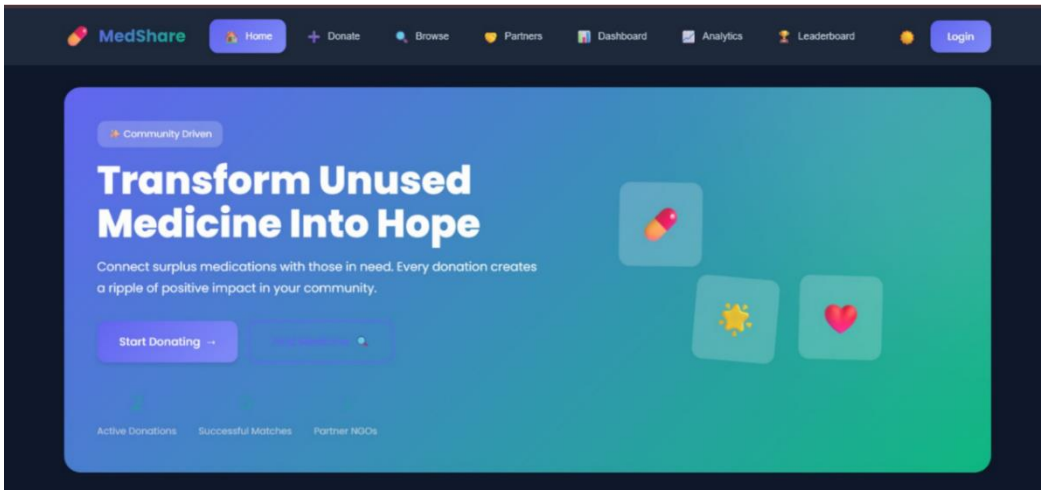
Flow Chart Diagram (DFD):



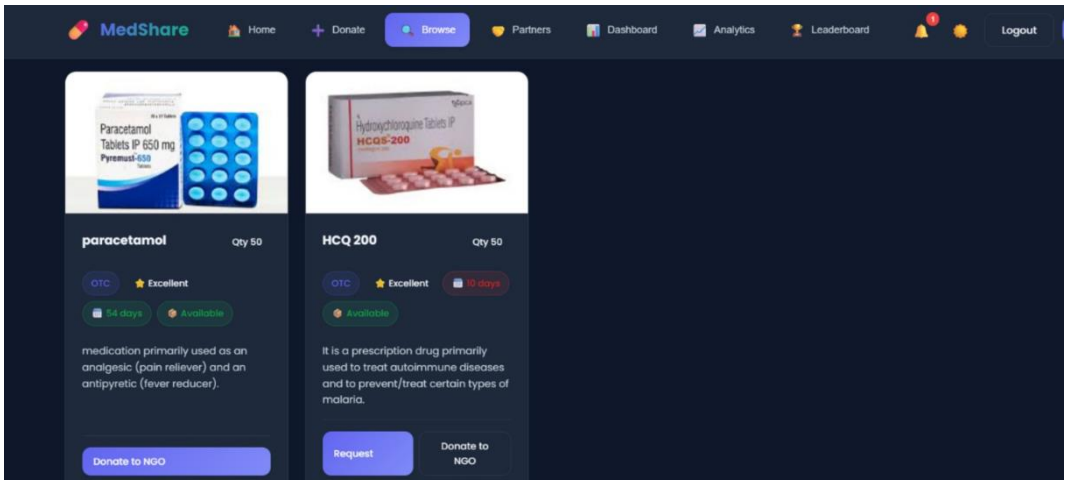
ER Diagram :



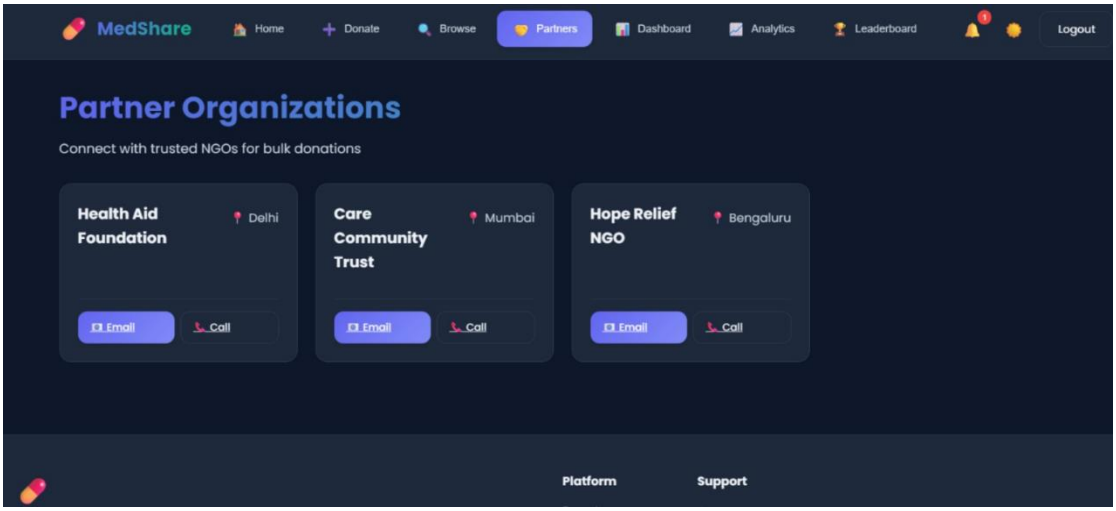
Med Share Home Page:



Medicine Donation Interface:



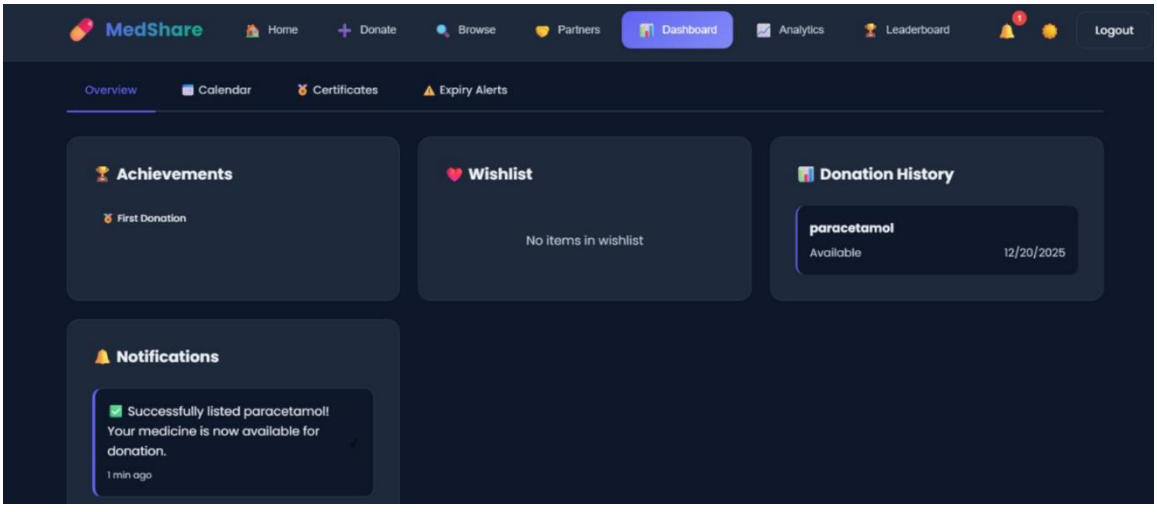
Partner Organization page:



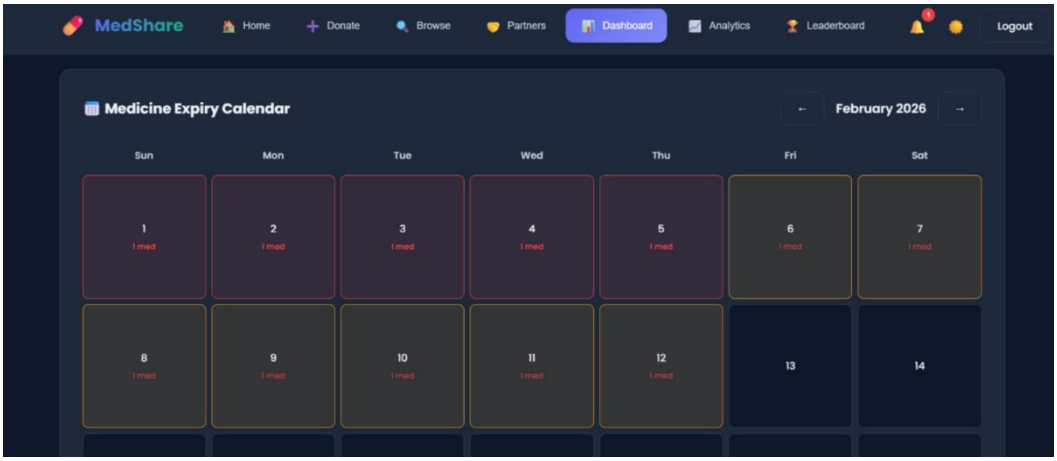
Analytics and Insights Dashboard:



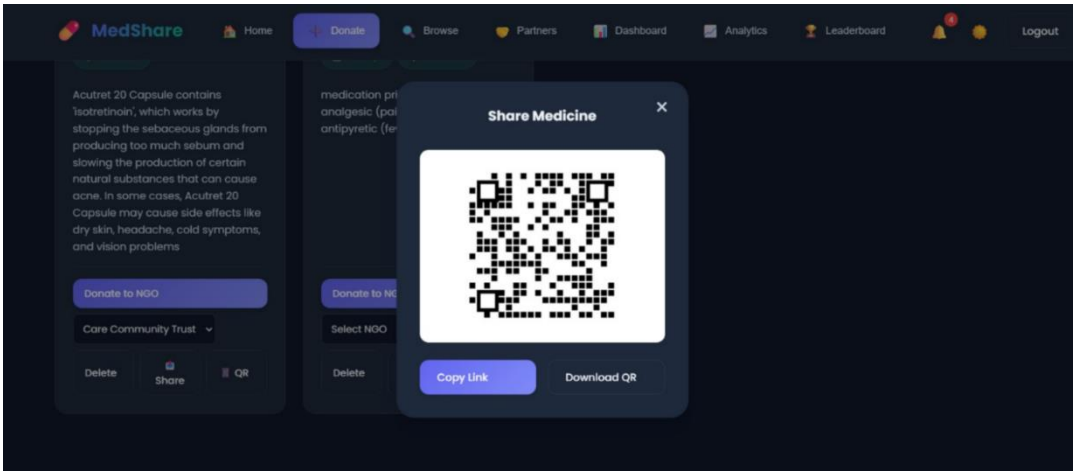
Medicine dashboard:



Medicine Expiry Calendar:



QR-Code generator :



C. Discussion :

The MedShare prototype has been created to allow medicine donations to be managed, medicines to be browsed, partner organisations to be coordinated, and expirations to be tracked. There are features to allow users to browse medicine donations, view medicine details, submit donation requests, and view partner organisation details. The analytics can be used to track donations, and what types of medicine there are. The user dashboard and community leaderboard can be used to view donation activities. The expiry calendar allows users to see what medicines are due to expire. This will help coordinate donor and recipient, but the success will rely upon accurate data management, medicine validation, user engagement, and following regulations around medicine donations. Testing will need to occur to ensure the system works and is usable, reliable, and effective.

D. Limitations:

There are some limitations to the MedShare project. Medicine details will be based on the information provided by the user, and inaccurate information may be provided on how much medicine there is, the condition of the medicine, and expiry date. There will need to be proper validation processes in place to ensure that the medicine can be donated. Donor, recipient, and partner organisation engagement will be needed for the system to be useful. If there is not enough donation data then the analytics will not be very useful. The system will need to be tested to ensure that it is secure, private, able to handle requests, and expiry alerts. It should not be used as a replacement for assessing whether or not a medicine is suitable.

E. Future Enhancements:

Automatic medicine expiry alerts could be introduced. There could also be improvements to medicine validation, and search/filtering functionality. Machine learning methods could be used to categorise medicine listings, and identify listings that may be incomplete/inconsistent (once validated). The system could also have location-based functionality to match donors with nearby suitable recipients and partner organisations. Other improvements could include secure notification systems, QR tracking for medicines, multiple languages, better analytics, and better accessibility. The usability, security, speed, and reliability of handling donation requests will need to be tested. This could improve the usability of the platform, and help to redistribute medicines more efficiently.

VI. AI-Based Drug-Related Message Detection and Wellness Integration

A. Medicine Listing and Donation

This allows users to provide details of medicines they have to donate. The medicine listing will show relevant information such as the name, type, amount, condition, and expiry date. This will help potential recipients know what is available. The donation process should have validation in place to ensure all necessary fields have been completed. Validation should also be in place to ensure only eligible medicines can be redistributed.

B. Medicine Browsing and Request

This allows users to browse medicine listings. Search/filter functionality can be used to find specific medicines based on relevant information. Once a suitable listing has been found the user can click the request button. Tracking requests will help with communication between donors and recipients. Whether the request is completed will depend on the process in place.

C. *Partner Organisation*

This provides details of organisations that may be able to help with medicine donations. Users can view organisation details, and what contact details are available (email/phone). This can help coordinate donations with organisations. In the future this could be improved by having validated organisation details, and a structured process for coordinating donations. Request status can also be tracked.

D. Analytics and Dashboard

This provides visual analytics on donations. The donation trends graph shows what has happened during the shown time period. The category distribution graph shows how many medicines there are in each category. The dashboard allows users to view relevant activities, achievements, notifications, and donations. This can help users understand what is happening on the platform however it will only be useful if the data is accurate.

E. Medicine Expiry & Community

The expiry calendar provides a visual overview of medicine expiry. This helps users to see what dates need to be noted. If expiry alerts have been implemented this can help users review their medicine listings. The community leaderboard shows donation rankings/achievements. This should only be used to compliment medicine validation, and ensuring safe handling.

F. Benefits & Considerations

Integrating donation management, medicine browsing, partner organisation details, analytics, and expiry tracking means that medicine donations can be coordinated in one place. By making medicine listings easier to find, and donation information easier to view, MedShare aims to reduce waste of medicines unnecessarily. However accurate records, secure access, validation, and following regulations will be needed for this to be successful. This will need to be evaluated in the future to ensure it works correctly, has a good user experience, is secure, and improves donation coordination.

VII. CONCLUSION

The MedShare Medicine Donation and Sharing Platform is a website that allows donors of medicines to connect with people/organisations looking to donate. This includes donation management, browsing medicines, requesting donations, partner organisation details, analytics, user dashboards, community leader boards and expiry tracking. Overall this platform helps to make donations easier to manage, information about medicines easily accessible and reduces waste.

The analytics dashboard provides a visual representation of donation trends and medication categories. The expiry calendar helps track when medicines are expiring. The partner organisation can help communication and cooperation between parties. This shows how a centralised digital platform can help organise medicine donations.

MedShare relies on correct medicine information, proper functioning, correct verification processes, secure data and correct adherence to the rules around medicine donations. More testing will be required to ensure this is a usable, reliable platform. In the future this could include improvements such as automatic alerts for expiries, better verification of medicines, location based matching and enhanced analytics. Overall this platform aims to help redistribute medicines responsibly and reduce waste.

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