

**RV COLLEGE OF ENGINEERING[®], BENGALURU-
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(Autonomous Institution Affiliated to VTU, Belagavi)

**DEPARTMENT OF COMPUTER SCIENCE AND
ENGINEERING**



Organ Donation and Procurement Management System

Mini - Project Report

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***in partial fulfillment for the requirement of 5th Semester
DBMS Laboratory Mini Project (18CS53)***

Under the Guidance of

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Academic Year 2021- 2022

RV COLLEGE OF ENGINEERING®, BENGALURU - 560059
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CERTIFICATE

Certified that the project work titled “**ORGAN DONATION AND PROCUREMENT MANAGEMENT SYSTEM**” is carried out by **Ayaz Abdulla A A(1RV19CS031)**, **B Mithra Varun(1RV19CS036)**, **Dency Narendra Patel(1RV19CS044)**, who are bonafide students of RV College of Engineering®, Bengaluru, in partial fulfillment of the curriculum requirement of 5th Semester Database Design Laboratory Mini Project during the academic year **2021-2022**. It is certified that all corrections/suggestions indicated for the internal Assessment have been incorporated in the report deposited in the departmental library. The report has been approved as it satisfies the academic requirements in all respect laboratory mini-project work prescribed by the institution.

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1

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ACKNOWLEDGEMENT

Any achievement, be it scholastic or otherwise does not depend solely on the individual efforts but on the guidance, encouragement and cooperation of intellectuals, elders and friends. A number of personalities, in their own capacities have helped me in carrying out this project work. I would like to take this opportunity to thank them all.

First and foremost, I would like to thank **Dr. Subramanya. K. N**, Principal, R.V.C.E, Bengaluru, for his moral support towards completing my project work.

I would like to thank **Dr Ramakanth Kumar P**, Head of Department, Computer Science & Engineering, R.V.C.E, Bengaluru, for his valuable suggestions and expert advice.

I deeply express my sincere gratitude to my guide Internal Guide, **Dr Pratiba D**, Assistant Professor, Department of CSE, RVCE, Bengaluru, for her able guidance, regular source of encouragement and assistance throughout this project

I thank my Parents, and all the faculty members of the Department of Computer Science & Engineering for their constant support and encouragement.

Last, but not the least, I would like to thank my peers and friends who provided me with valuable suggestions to improve my project.

Abstract:

The Organ Donation and Procurement Network Management System is a database management system that uses database technology to construct, maintain and manipulate various kinds of data about a person's donation or procurement of a particular organ. It maintains a comprehensive medical history and other critical information like blood group, age, etc of every person in the database design. In short, it maintains a database containing statistical information regarding network of organ donation and procurement of different countries.

Organ Donation and Procurement Organizations play a pivotal role in today's medical institutions. Such organizations are responsible for the evaluation and procurement of organs for organ transplantation. These organizations represent the front-line of organ procurement, having direct contact with the hospital and the family of a recently deceased donor. The work of such organizations includes to identify the best candidates for the available organs and to coordinate with the medical institutions to decide on each organ recipient. They are also responsible for educating the public to increase the awareness of and participation in the organ donation process. Also, it keeps track of all transplantation operations carried till date.

Records of donor and patients are created when a person donates or procures an organ from a Medical Institution. Records may include the following information like Personal Information, Medical History, Medical insurance, Allergies to any medicine, etc. This record serves a variety of purposes and is critical to the proper functioning of Organ Donation and Procurement Network, especially in today's complicated health care environment. These records provide statistical information regarding the number of organs needed and available at a particular point of time. It is essential for planning, evaluating and coordinating organ donation and procurement.

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GLOSSARY

DB	:	Database
DFD	:	Data Flow Diagram
ER	:	Entity Relationship
NF	:	Normal Form
SRS	:	Software Requirement Specification
SQL	:	Structured Query Language

Chapter 1

Introduction

The Organ Donation and Procurement Network Management System is a database management system that uses database technology to construct, maintain and manipulate various kinds of data about a person's donation or procurement of a particular organ. It maintains a comprehensive medical history and other critical information like blood group, age, etc of every person in the database design. In short, it maintains a database containing statistical information regarding network of organ donation and procurement of different countries.

Organ Donation and Procurement Organizations play a pivotal role in today's medical institutions. Such organizations are responsible for the evaluation and procurement of organs for organ transplantation. These organizations represent the front-line of organ procurement, having direct contact with the hospital and the family of a recently deceased donor. The work of such organizations includes to identify the best candidates for the available organs and to coordinate with the medical institutions to decide on each organ recipient. They are also responsible for educating the public to increase the awareness of and participation in the organ donation process. Also, it keeps track of all transplantation operations carried till date.

1.1 Existing System

The situation of organ wastage is the most severe in case of hearts. In a recent study conducted in January 2013, it was found that only 17% of hearts received were used by surgeons in the state of Tamil Nadu in 2012, according to Tamil Nadu organ transplant registry Convener Dr. J. Amalorpavanthan. The registry received organs from 306 brain dead patients and allotted them to different hospitals based on a waiting list. While 280 livers and 563 kidneys were retrieved for transplant, only 52 hearts and 13 lungs were harvested. The reason for the same was poor coordination among transplant surgeons causing delay in retrieval.

Organ Wastage is a major issue that can only be solved by having a proper database of all Patient and Donors in a well-formed way, that can be processed easily.

1.2 Proposed System

Records of donor and patients are created when a person donates or procures an organ from a Medical Institution. Records may include the following information like Personal Information, Medical History, Medical insurance, Allergies to any medicine, etc. This record serves a variety of purposes and is critical to the proper functioning of Organ Donation and Procurement Network, especially in today's complicated health care environment. These records provide statistical information regarding the number of organs needed and available at a particular point of time. It is essential for planning, evaluating and coordinating organ donation and procurement.

Our aim to create a solution that effectively deals with the problems of finding donors and also providing Statistical data of the transplants that can help the government to form better rules and regulations.

1.3 Relational Database Structure

MySQL database is used. Different tables will be created that will hold the data of the Organ Donor, Patient details, Name of the organization, Contact details of the donor etc. Primary Key and Foreign keys will be created wherever required. The database will be connected to the front end using Flask (Python).

1.4 Societal Concern

Open-source public API's

The application will provide real time data to third party sources with the help of API's so that it can be integrated with the existing internal tools of hospitals and other blood banks to ensure a seamless process of enquiring about the availability of the blood.

Use of ML to create a predictive model

The data from the blood banks can be analysed using different ML algorithms to predict how much blood is generally required during the specified period. This can also be used to alert the blood banks regarding certain new trends towards the use of different blood group requirements.

Chapter 2

Software Requirement specification

A software requirements specification (SRS) is a description of a software system to be developed. The software requirements specification lays out functional and non-functional requirements, and it may include a set of use cases that describe user interactions that the software must provide to the user for perfect interaction.

Software requirements specification establishes the basis for an agreement between customers and contractors or suppliers on how the software product should function (in a market-driven project, these roles may be played by the marketing and development divisions). Software requirements specification is a rigorous assessment of requirements before the more specific system design stages, and its goal is to reduce later redesign. It should also provide a realistic basis for estimating product costs, risks, and schedules.

Hardware Requirements

- Processor: Intel core i5 or any other
- RAM: minimum 1GB
- Hard Disk: 60GB or above

Software Requirements

- MYSQL Version 8
- HTML 5
- CSS
- PYTHON
- FLASK
- BOOTSTRAP
- JAVASCRIPT

Functional Requirements

1. User friendly Interface.
2. Every user has an account, registered by government certified hospital.
3. Only hospitals are allowed to request for donation or procurement transactions.
4. Government organizations will keep a watch and can approve a transplantation if all rules are satisfied.
5. Collecting statistical data through history of Transplantation Transaction.
6. Record of donor/patient information will include:
 - a. Personal Information
 - b. Medical History
 - c. Medical insurance, if any
 - d. Allergies to any medicine, if any
 - e. The need for an organ presently
 - f. Medical Insurance provided by any private or government insurers.
 - g. Address

Chapter 3

ER Diagram

ER Diagram stands for Entity Relationship Diagram, also known as ERD is a diagram that displays the relationship of entity sets stored in a database. In other words, ER diagrams help to explain the logical structure of databases. ER diagrams are created based on three basic concepts: entities, attributes and relationships.

In our project 6 main entities were identified as follows:

1. User
2. Patient
3. Donor
4. Organ Available
5. Organization
6. Doctor

Their respective attributes are shown in the ER diagram and relationships between different entities are clearly identified and illustrated.

The relationships identified are:

1. donates – act of donation of organ from donor
2. procures – act of procuring organ by patient
3. organ donated - The organ donated by an donor, which is then stored in Organ_available table.
4. Attended By -The transplantation performed by doctor – procuring an organ from a donor and transplanting it to the patient by surgery.
5. Registers - Donor is registered in which organization
6. Works in – The organization where the doctor works.
7. Headed By – The organization is headed by which person

Chapter 4

Detailed Design

A data flow diagram (DFD) maps out the flow of information for any process or system. They can be used to analyze an existing system or model a new one.

4.1 DFD Level 0

DFD Level 0 is also called a Context Diagram. It's a basic overview of the whole system or process being analyzed or modeled. It's designed to be an at-a-glance view, showing the system as a single high-level process, with its relationship to external entities.

Three main entities were identified - Employee/admin, User/Patient and Donor. Their data flow diagram with the system is shown in the diagram below.

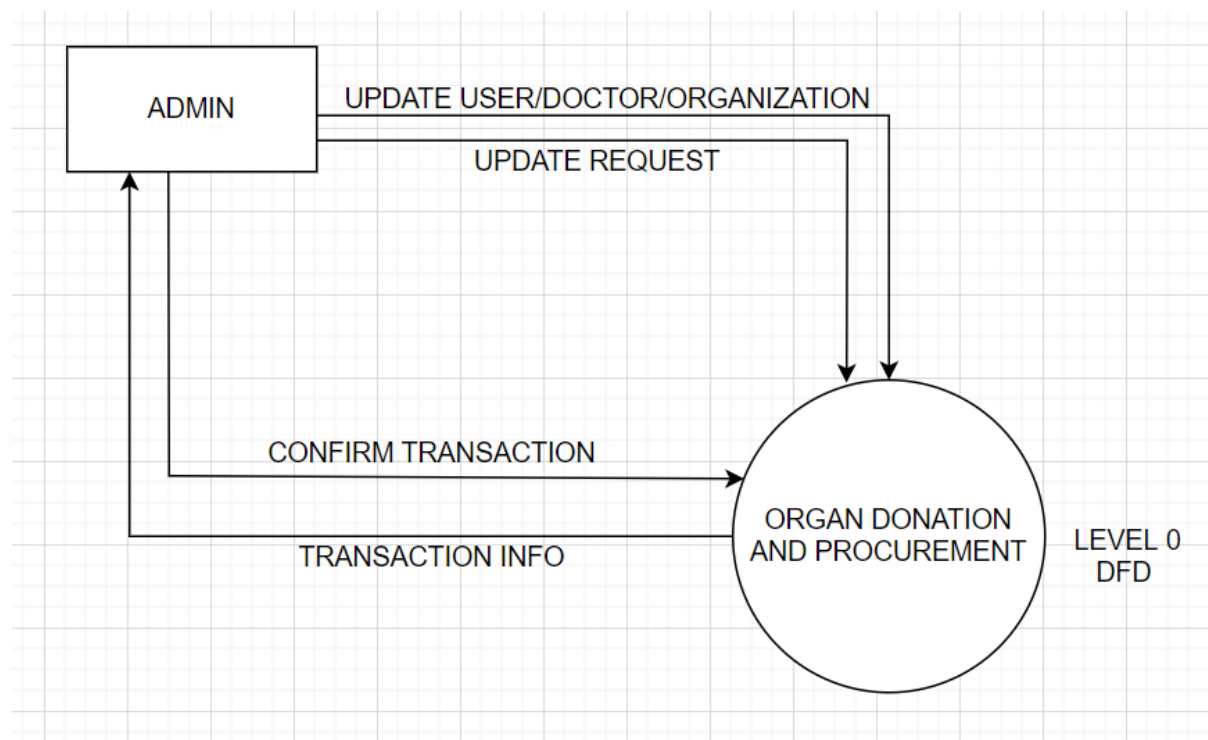


Fig 4.1.1 : Data Flow Diagram-0

4.2 DFD Level 1

DFD Level 1 provides a more detailed breakout of pieces of the Context Level Diagram. It highlights the main functions carried out by the system, as we break down the high-level process of the Context Diagram into its subprocesses.

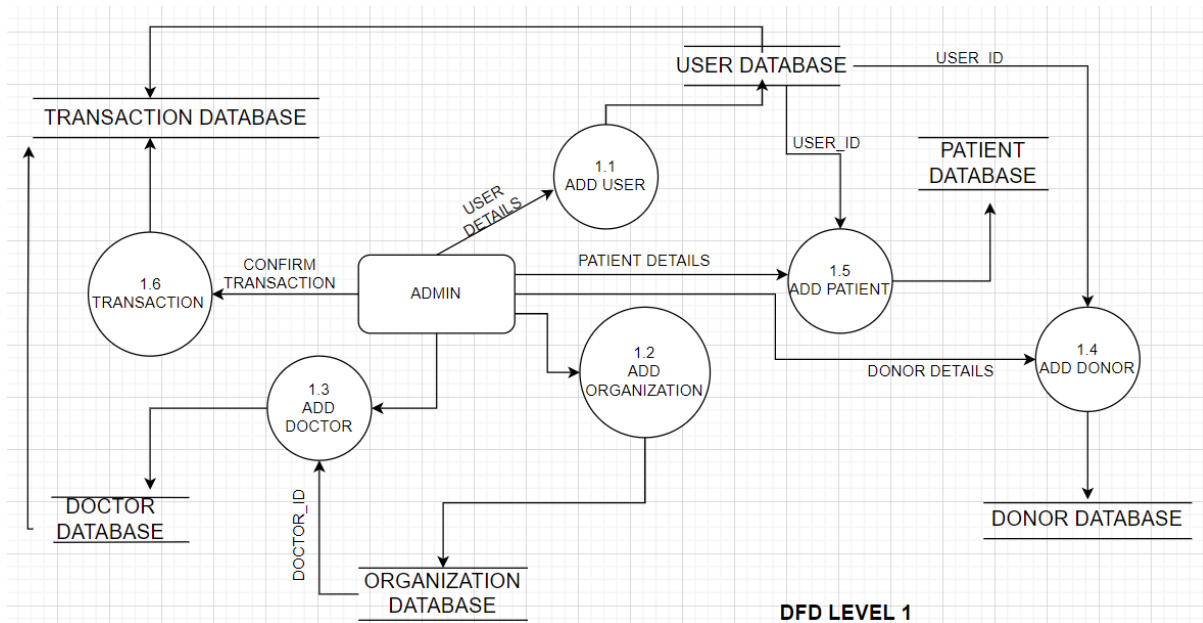


Fig 4.2.1 : Data Flow Diagram-1

Chapter 5

Relational Schema and Normalization

5.1 Entity Relationship Mapping

ER diagrams can be mapped to relational schema. This helps in identifying the primary keys, foreign keys etc. which enables us to maintain a proper database state at all times. This helps avoid violations of constraints like referential integrity constraints, null constraints etc.

The ER to relational mapping for the above depicted ER is shown below in figure 4.

Here, each schema is shown with a number of attributes along with their primary keys (underlined attributes). The foreign keys are also depicted here, by arrows.

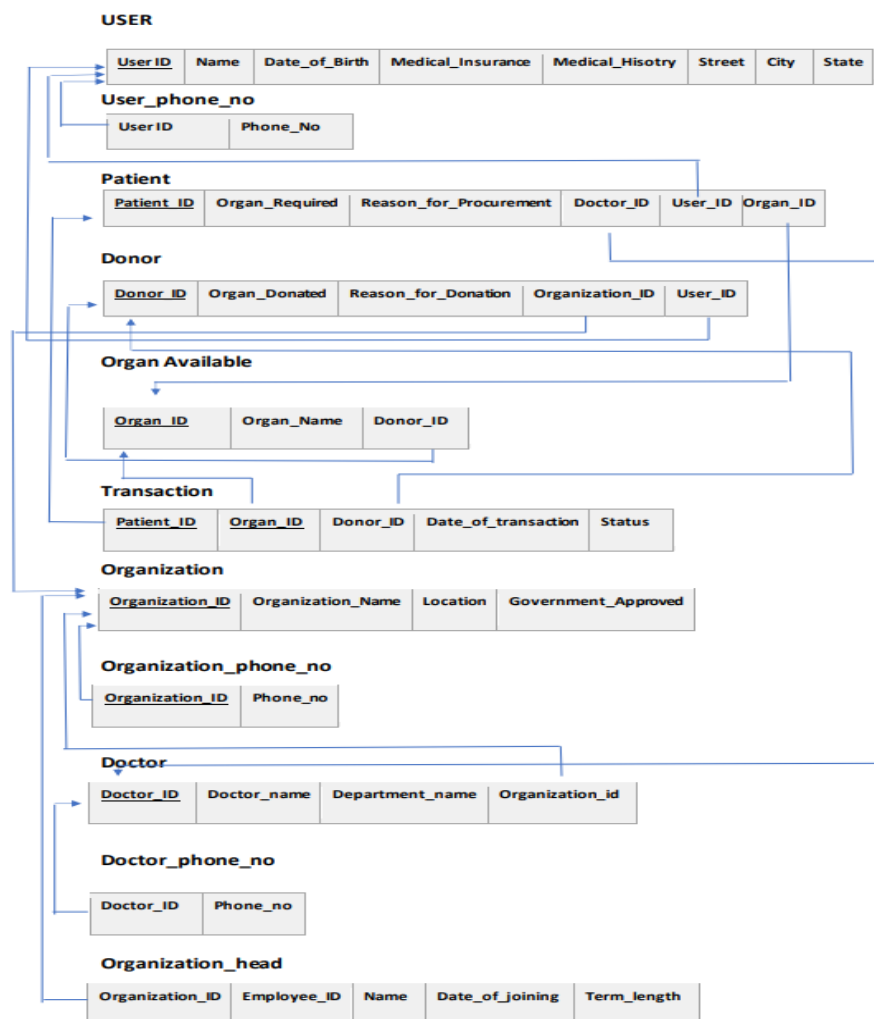


Fig 5.1.1 : Relational mapping

5.2 Normalization

Normalization is the process of minimizing redundancy from a relation or set of relations.

Redundancy in relation may cause insertion, deletion and updation anomalies.

5.2.1 The functional dependencies

User Schema

- $\text{User_id} \rightarrow \text{Name}$
- $\text{User_id} \rightarrow \text{date_of_birth}$
- $\text{User_id} \rightarrow \text{medical_insurance}$
- $\text{User_id} \rightarrow \text{medical_history}$
- $\text{User_id} \rightarrow \text{street}$
- $\text{User_id} \rightarrow \text{city}$
- $\text{User_id} \rightarrow \text{state}$

User_phone_no Schema

- $\text{User_id} \rightarrow \text{phone_no}$

Patient schema

- $\text{Pateint_id} \rightarrow \text{organ_required}$
- $\text{Pateint_id} \rightarrow \text{reason_for_procurement}$
- $\text{Pateint_id} \rightarrow \text{Doctor_id}$
- $\text{Pateint_id} \rightarrow \text{user_id}$
- $\text{Pateint_id} \rightarrow \text{organ_id}$

Donor schema

- $\text{Donor_id} \rightarrow \text{organ_donated}$
- $\text{Donor_id} \rightarrow \text{reason_for_donation}$
- $\text{Donor_id} \rightarrow \text{organization_id}$
- $\text{Donor_id} \rightarrow \text{user_id}$

Organ available schema

- $\text{Organ_id} \rightarrow \text{organ_name}$
- $\text{Organ_id} \rightarrow \text{donor_id}$

Transaction schema

- $\text{Patient_id} + \text{organ_id} \rightarrow \text{donor_id}$
- $\text{Patient_id} + \text{organ_id} \rightarrow \text{date_of_transaction}$

- Patient_id + organ_id \rightarrow status

Organization schema

- Organization_id \rightarrow organization_name
- Organization_id \rightarrow Location
- Organization_id \rightarrow government_approved

Organization_phone_no schema

- Organization_id \rightarrow phone_no

Doctor schema

- Doctor_id \rightarrow doctor_name
- Doctor_id \rightarrow department_name
- Doctor_id \rightarrow organization_id

Doctor_phone_no schema

- Doctor_id \rightarrow phone_no

Organization_head schema

- Organization_id \rightarrow employee_id
- Organization_id \rightarrow name
- Organization_id \rightarrow date_of_joining
- Organization_id \rightarrow term_length

5.2.2 First Normal Form - 1NF

The schemas are in 1NF as there are no multivalued attributes.

5.2.3 Second Normal Form - 2NF

The schemas are in 2NF as, in every schema, each and every non-prime attribute is fully functionally dependent on the primary key of that schema.

5.2.4 Third Normal Form - 3NF

The schemas are in 3NF form since there exists no transitive dependency. All the functional dependencies of the form $X \rightarrow Y$ exist such that Y is a prime attribute or X is super key.

Chapter 6

Conclusion & Future Enhancement

Thus we have successfully implemented organ donation database management which helps us in centralizing the data used for managing the tasks performed in an organ donation we have successfully implemented various functionalities of mysql and php and created the fully functional database management system for organ donation.

Future Enhancement

It is not possible to develop an application that makes all the requirements of the user. User requirements keep on changing. So, some of the future enhancements that can be done to this system are:

- As the technology emerges, it is possible to upgrade the application and can be adaptable to desired environment.
- Another great feature would be integrating the current project with a blood management system as both are quit related.
- We can also applicable this to Oracle and MySQL instead of SQL Server.
- Based on the future security issues, security can be improved using encryption and decryption techniques.
- We can also provide administrative tools like Backup, Replication and Linked Server.

Chapter 7:

References:

- [1] <https://cdn.jsdelivr.net/npm/bootstrap@5.1.3/dist/css/bootstrap.min.css>
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- [3] Elmasri and Navathe ,”Fundamentals of Database Systems”, Elmasri and Navathe, 7th Edition, 2016, Pearson Education, ISBN-13: 978-0-13-397077-7.
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- [5] Kunal Kumar, S.K. Azad, Database normalization design pattern , 4th IEEE Uttar Pradesh Section International Conference on Electrical, Computer and Electronics (UPCON), 11 January 2018

Appendix:

Screenshots

The screenshot shows a web browser window with the address bar displaying "127.0.0.1:5000". The browser's address bar includes icons for Apps, Gmail, YouTube, and Maps, and a "Reading list" button. The page features a circular logo on the left with the letters "RV" and the text "Rajawadee Vajiravudh" around it. The main heading is "Organ Donation and Procurement Management System". Below the heading is a login form with the following elements:

- Username:** A text input field with the placeholder "Enter username".
- Password:** A text input field with the placeholder "Password".
- Show Password:** A checkbox labeled "Show Password".
- Submit:** A blue button labeled "Submit".

Fig A.1: Login page

The screenshot shows the same web browser window as Fig A.1, but the address bar now displays "127.0.0.1:5000/login". The page has a dark header bar with "HOME" on the left and "Hi admin! Logout" on the right. The main heading is "Organ Donation and Procurement Management System". Below the heading is a list of links:

- User
- Search
- Add
- Update
- Remove
- Statistics

Fig A.2: Home page

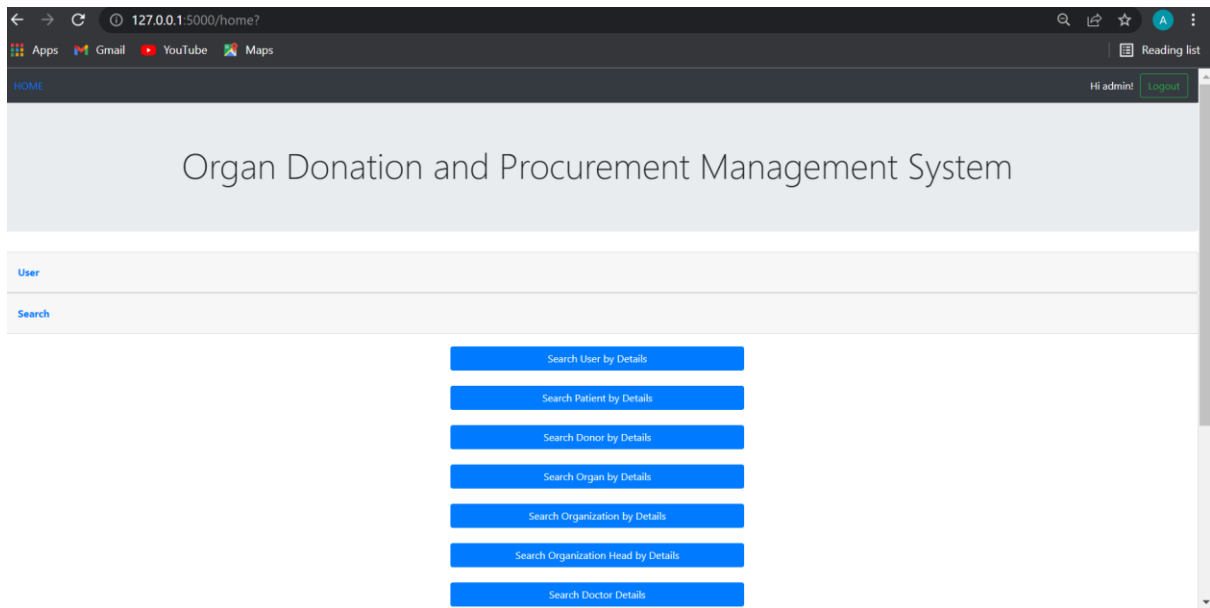


Fig A.3 : Drop down menu

The screenshot displays the 'add_User_page' of the 'Organ Procurement and Donation Management System'. The browser address bar shows '127.0.0.1:5000/add_User_page'. The page layout is similar to the home page, with a dark header and a light blue banner. The main content area contains a form with eight input fields: 'User_ID', 'Name', 'Date_of_Birth', 'Medical_Insurance', 'Medical_history', 'Street', 'City', and 'State'. A green 'Add User' button is positioned below the form.

Fig A.4: Add user

Organ Procurement and Donation Management System

Patient_ID

organ_req

reason_of_procurement

Doctor_ID

User_ID

[Add Patient](#)

Fig A.5: Add patient

Organ Donation and Procurement Management System

SEARCH:

User_ID	Name	Date_of_Birth	Medical_Insurance	Medical_history	Street	City	State
1	Name-1	1978-08-21	1	NIL	Street-1	New Delhi	Delhi
2	Name-2	1975-12-10	0	NIL	Street-2	Mumbai	Maharashtra
3	Name-3	1976-06-04	0	NIL	Street-3	Mumbai	Maharashtra
4	Name-4	1985-10-13	1	NIL	Street-4	Ahmedabad	Gujarat
5	Name-5	1983-10-12	1	NIL	Street-5	Kolkata	West Bengal
6	Name-6	1977-01-18	1	NIL	Street-6	Kolkata	West Bengal
7	Name-7	1976-02-26	0	NIL	Street-7	New Delhi	Delhi
8	Name-8	1973-04-12	1	NIL	Street-8	Mumbai	Maharashtra

Fig A.6: Search option

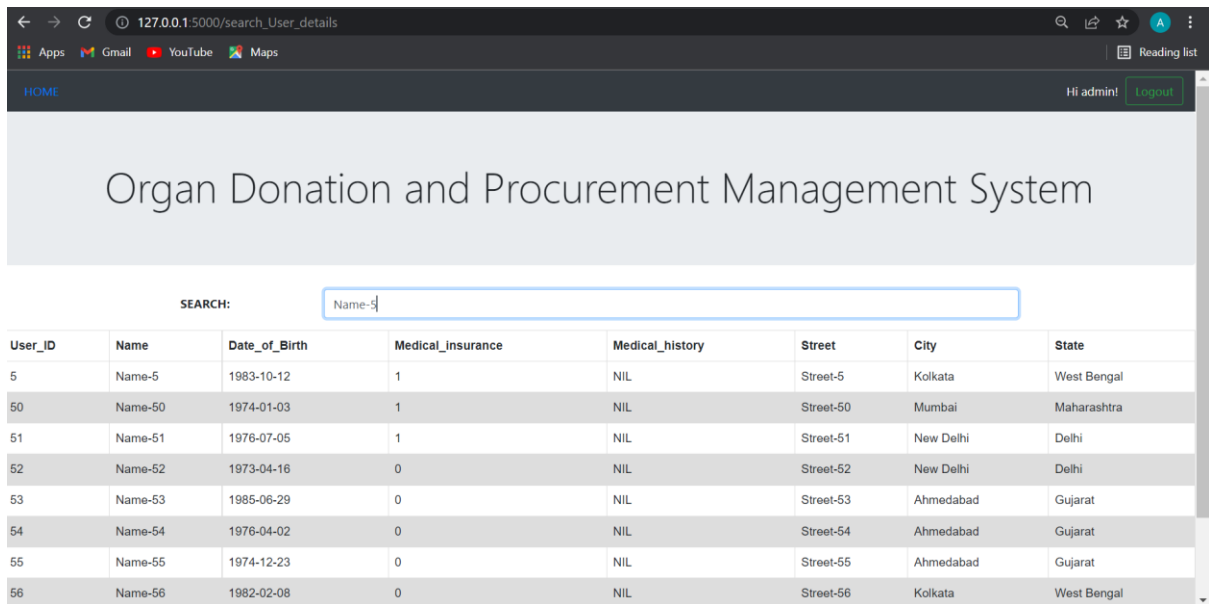


Fig A.7: Search by name

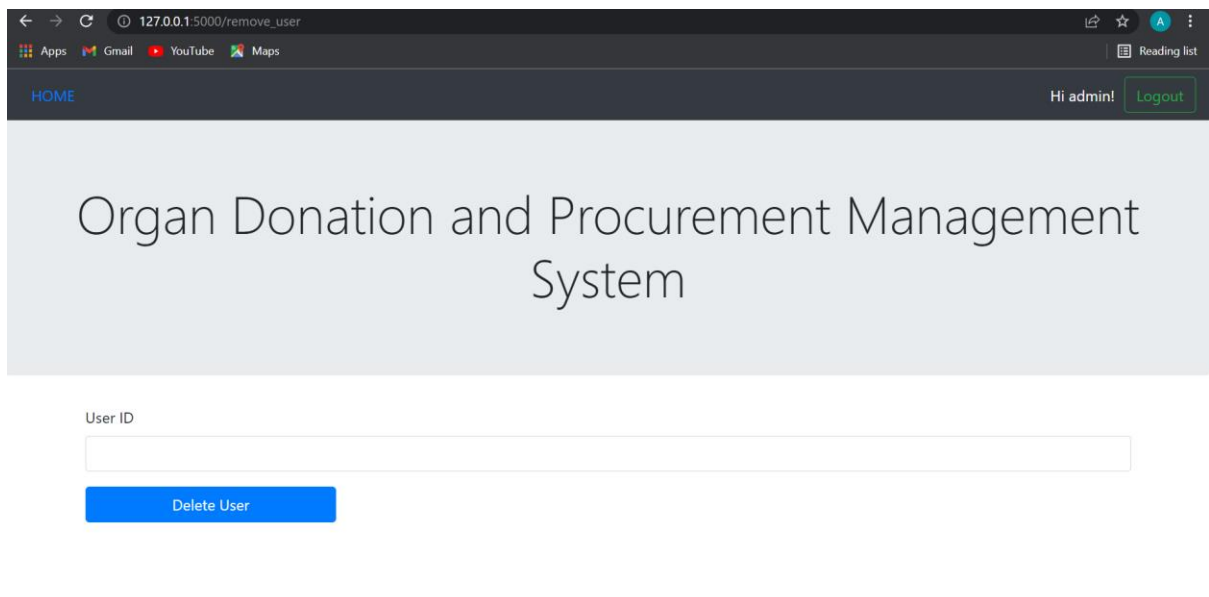


Fig A.8: Delete User

127.0.0.1:5000/remove_patient

Apps Gmail YouTube Maps

HOME Hi admin! Logout

Organ Donation and Procurement Management System

Patient ID

Organ Required by the Patient

Delete Patient

Fig A.9: Delete patient

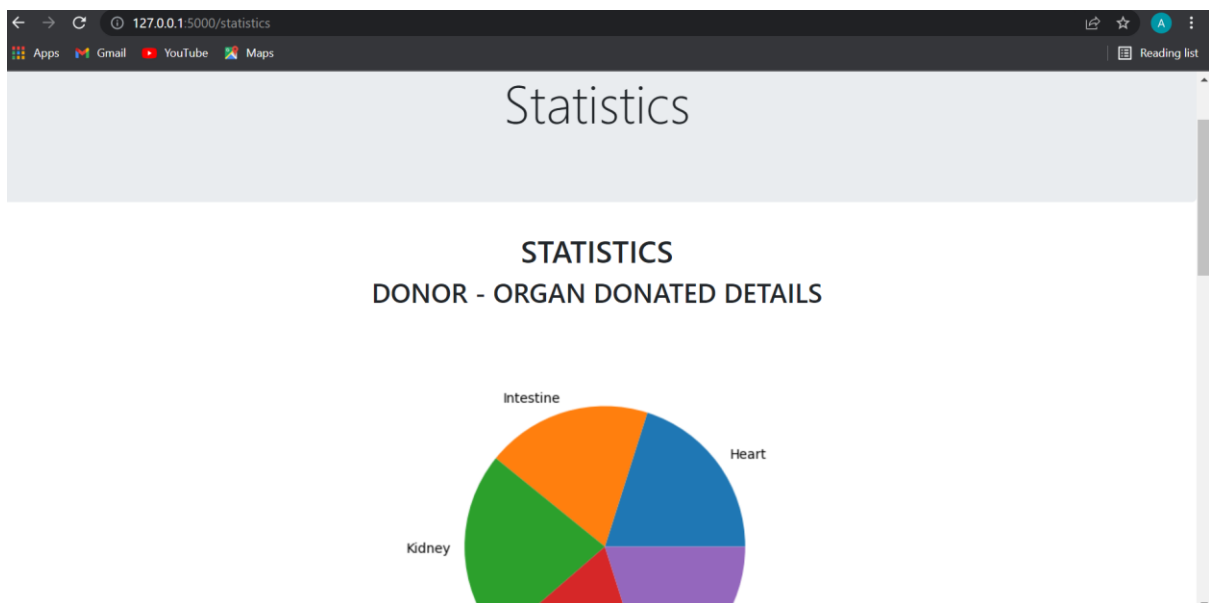


Fig A.10: Statistics