Blood Donation System Database

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Section I: Project Description

My database system is centered around the Blood Donation System Database. Blood donation lines can be hectic, because blood type must be determined and only a person with good health can donate blood. This means that it can take forever for medical personnel to review every person in line/ online without an efficient database. It also means that if there are many delays, the recipient could possibly die if the blood they need isn't quickly supplied. Most blood donation databases are unorganized and sloppy which can result in a person getting the wrong blood type. This is a fatal flaw and can result in lawsuits.

My database can provide a system that is precise and methodical. The feature that sets my database from others is that it can track multiple variables and speed up the process to match a hospital with the blood type required at the time even if they don't have their medical information handy. This will allow users to determine if the person has a good health record which ultimately accelerates the process for blood donations and makes it more efficient to keep track of people. If a system is more organized and professional, it would encourage more people to contribute to blood donations. My system is well-managed and puts an emphasis on efficiency and capability to support blood donations around the world by matching donors with recipients, and blood banks with hospitals.

Section II: Use Cases

1.

Use Case Title:	Donor Registration
Actors:	Donor, Hospitals
Description:	After learning about the dire situation in Haiti, Mark decides to donate blood to hospitals to help those in need. Mark visits the website to register as a new user, but a prompt asks for medical information. However, this is Mark's first-time donating blood, and he has not had his physical checked in decades, so he doesn't know if he is compatible. He also doesn't know if hospitals need his blood type. Mark decides to register with false information anyways.

2.

Use Case Title:	Matching Blood Type
Actors:	Patients, Hospitals, Blood Banks, Medical Personnel
Description:	Sally is medical personnel in charge of making sure that blood types are organized and go to the person who needs it. She uses the system to make sure that the person receiving the donation fulfills the requirements required to receive blood, such as diet, blood type, weight...etc. She will also check that the blood is not tampered with and is safe for distribution. If both requirements are fulfilled, she will query a request as soon as possible for transportation of the blood to the hospital.

3.

Use Case Title:	Organizing Donors Information
Actors:	Hospitals, Blood Banks, Medical Personnel, Supervisor
Description:	Natalia works at the Blood Bank. She oversees managing users who have registered with their website. The workflow/workday for Natalia is when she starts off by checking for new registrations. She then checks the validity of the information and saves it. She will update all information from the user. She will then schedule an appointment to finalize the user's health status and blood type. Finally, she confirms the registration with her supervisor.

4.

Use Case Title:	Managing Requests (Possible failure case)
Actors:	Hospitals, Blood Banks, Patients, Donors
Description:	Melissa works at the Blood Bank and manages requests. Every day she gets an influx of requests, either from Hospitals, patients without a means to go to a hospital, or people looking to donate. Melissa must follow a priority list on who she fulfills first that goes like this: Hospitals have top priority, then Donors, and lastly patients. Melissa also uses her own judgement; patients can supersede donors if the situation is dire based on the severity of the request. However, she must override the system protocol to do so, and this requires supervision. A solution to this could be a dedicated unique key that is only given to users with the highest authorization to override the system.

5.

Use Case Title:	Organizing Recipient Information
Actors:	Blood Banks, Hospitals, Supervisor
Description:	Audrey manages recipient information at the blood bank. When she arrives at the office, the first thing she does is look at the blood type required by recipients. She will then view the list of recipients and update their status, because some might have gotten their donations and the system is showing a false positive. This can clog the system. For those who have not received a donation, she will validate their blood donation cards and organize their blood type and medical information in the system. Finally, she confirms the recipient's status with her supervisor.

6.

Use Case Title:	Examination of Patients
Actors:	Medical Personnel, Blood Bank, Receptionist
Description:	Phyllis works at the Blood Bank. He is in charge of drawing blood from patients. Phyllis will receive requests from the receptionist. The receptionist provides Phyllis with appointments on that day. Phyllis will then begin drawing blood using the medical devices provided. After drawing the blood, he will update the records, inventory, and medical information of the Donor. The blood will be stored inside blood bags by Phyllis. He will also reward the Donor with an incentive to continue donating.

7.

Use Case Title:	Dealing with patients
Actors:	Receptionist, hospital
Description:	Mathew is a receptionist at Highland hospital. Many times, there are walk in patients that Mathew must handle. He will either allow them to enter or deny them depending on the severity of the patient. Depending on the inventory of blood on that day, Mathew might allow a walk-in Patient. However, If the patient is already registered with the hospital or is a new patient, he will have to first confirm insurance information and update records accordingly.

Section III: Database Requirements (Business Rules)

1. **Blood Banks**

    1.1. A blood bank shall have many medical personnel

    1.2. A blood bank shall have at least one Donor

    1.3. A blood bank shall have zero Patients

    1.4. A blood bank shall require at least one medical information from Donors

    1.5. A blood bank can transport blood to one or more Hospitals

2. **Hospitals**

    2.1. A hospital shall have many medical personnel

    2.2. A hospital shall have at least one Patient

    2.3. A hospital shall have zero Donors

    2.4. A hospital shall require at least one medical information from patients

    2.5. A hospital shall register with at least one blood bank before receiving blood

3. **Blood Type**

    3.1. A blood type shall be assigned to many patients

    3.2. A blood type shall be assigned to many Donors

    3.3. A blood type shall be validated by at least one medical personnel

    3.4. A blood type shall be owned by both Patients and Donors

4. **Patient**

    4.1. A Patient shall have one and only one blood type

    4.2. A Patient can register with a hospital

    4.3. A Patient registered with a Hospital shall have priority

    4.4. A Patient shall have medical information

    4.5. A Patient shall have one medical personnel always attended by

    4.6. A Patient shall receive blood from at least one Donor

    4.7. A Patient shall receive one compatible blood type

5. **Donor**

    5.1. A Donor shall have one and only one blood type

    5.2. A Donor shall register with a Blood Bank

    5.3. A Donor shall have their records stored by at least one Medical Personnel

    5.4. A Donor shall have medical information

    5.5. A Donor shall be validated by a Medical Personnel for drugs

    5.6. A Donor shall use zero drug substances

5.7. A Donor shall receive an Incentive by many Blood Banks

6. **<u>Medical Personnel</u>**

6.1. A Medical personnel shall work for at least one hospital or one blood bank

6.2. A Medical personnel shall validate multiple Donor information

6.3. A Medical personnel shall be assigned to at least one Patient

6.4. A Medical personnel shall have a supervisor, which is also a Medical Personnel

6.5. A Medical personnel shall work in only one department

6.6. A Medical personnel shall be assigned to at least one Patient but not to a Donor

6.7. A Medical personnel shall organize at least one blood type

7. **<u>Supervisor</u>**

7.1. A supervisor shall supervise at least one Medical Personnel

7.2. A supervisor can be a Medical Personnel

7.3. A supervisor shall approve many requests

7.4. A supervisor shall work for one or many institutions

7.5. A supervisor can be a Donor

7.6. A supervisor can be a Patient

8. **<u>Medical Device</u>**

8.1. A Medical Device shall be used by many Medical Personnel

9. **<u>Location</u>**

9.1. A Location shall house one hospital

9.2. A Location shall house one Blood Bank

10. **<u>Exam</u>**

10.1. An Exam shall be conducted by at least one Medical Personnel

10.2. An Exam shall be used to validate Donors and Patients

10.3. An Exam shall be recorded on one Record

11. **<u>Record</u>**

11.1. A record shall contain many Donor Information

11.2. A record shall contain many Patient Information

12. **<u>Blood Bags</u>**

12.1. A Blood Bag shall contain one Donors Blood type

12.1. A Blood Bag shall be used for blood transfusions for at least one patient

13. **Reception**

    13.1. A reception shall work with at least one medical personnel

    13.2. A reception shall help many patients

    13.3. A reception shall be stationed to one location

    13.4. A reception can work at one Hospital or one Blood Bank

    13.5. A reception shall check many Inventory logs

14. **Inventory**

    14.1. The Inventory shall be checked by one supervisor

    14.2. The Inventory shall be updated frequently by one medical personnel

15. **Medical Information**

    15.1. Medical Information shall be provided by many patients

    15.2. Medical Information shall be provided by many Donors

    15.3. Medical Information shall be confirmed by at least one medical personnel

    15.4. Medical Information shall be kept in at least one record

16. **Incentive**

    16.1. Incentive shall be provided by many Blood Banks

17. **Walk-In Patient** (Not Associated with Hospital)

    17.1. A walk-In Patient shall have one Medical information

    17.2. A walk-In Patient shall register with one reception

18. **Request**

    18.1. A request shall be handled by one reception

    18.2. A request shall be submitted by many Donors

    18.3. A request shall be submitted by many Patients

19. **Insurance**

    19.1. Insurance shall be handled by one Hospital

    19.2. Insurance shall be provided by many Patients

20. **Appointment**

 20.1. An Appointment shall be submitted by many Patients

 20.2. An Appointment shall be submitted by many Donors to have blood drawn

Section IV: Detailed List of Main Entities, Attributes and Keys

1. Blood Banks (Strong)
   * donor_count: numeric, derived
   * inventory: derived, alphanumeric
   * location: alphanumeric, multi-value, composite

2. Hospitals (Strong)
   * patient_count: numeric, derived
   * inventory: derived, alphanumeric
   * location: alphanumeric, multi-value, composite

3. Donors (Strong)
   * name: composite, alphanumeric
   * health_status: boolean
   * dob: multivalue, timestamp

4. Patients (Strong)
   * name: composite, alphanumeric
   * status: boolean
   * dob: multivalue, timestamp

5. Medical Personnel (Strong)
   * name: composite, alphanumeric
   * occupied: boolean
   * assigned: boolean

6. Medical information (Weak)
   * name: composite, alphanumeric
   * blood_type: alphanumeric
   * Donor_Patient: alphanumeric

7. Location (Strong)
   * location_id: key, alphanumeric
   * name: composite, alphanumeric
   * address: alphanumeric, multi-value, composite

8. Supervisor (Strong)
   * name: composite, alphanumeric
   * email: alphanumeric
   * phone: numeric, multi-value, composite

9. Exam (Strong)
   * id: key, numeric
   * passed: boolean
   * length: numeric

10. Blood Type (Weak)
    * type_id: key, numeric
    * amount: numeric
    * gender: alphanumeric

11. Reception (Strong)
    * name: composite, alphanumeric
    * occupied: boolean
    * phone: numeric, multi-value, composite

12. Record (Strong)
    * blood_type: alphanumeric
    * id: key, numeric
    * location: alphanumeric, multi-value, composite

13. Incentive (Strong)
    * amount: numeric
    * incentive_id: key, numeric
    * name: composite, alphanumeric

14. Inventory (Weak)
    * amount: numeric
    * blood_type: alphanumeric
    * stock: numeric

15. Blood Bags (Weak)
    * blood type: alphanumeric
    * amount: numeric
    * bag_id: key, numeric

16. Medical Device (Strong)
    * type_id: key, alphanumeric
    * amount: numeric
    * name: composite, alphanumeric

17. Walk-In Patient (Strong)
    * name: composite, alphanumeric
    * gender: alphanumeric
    * id: key, numeric

18. Request (Strong)
    * request_id: key, numeric
    * type: alphanumeric
    * amount: numeric

19. Insurance (Strong)
    * name: composite, alphanumeric
    * type: alphanumeric
    * covered: boolean

20. Appointment (Strong)
    * date: composite, alphanumeric
    * user_id: key, numeric
    * location: alphanumeric, multi-value, composite

Section V: Entity Relationship Diagram (ERD)

Zoom In for Clear Quality
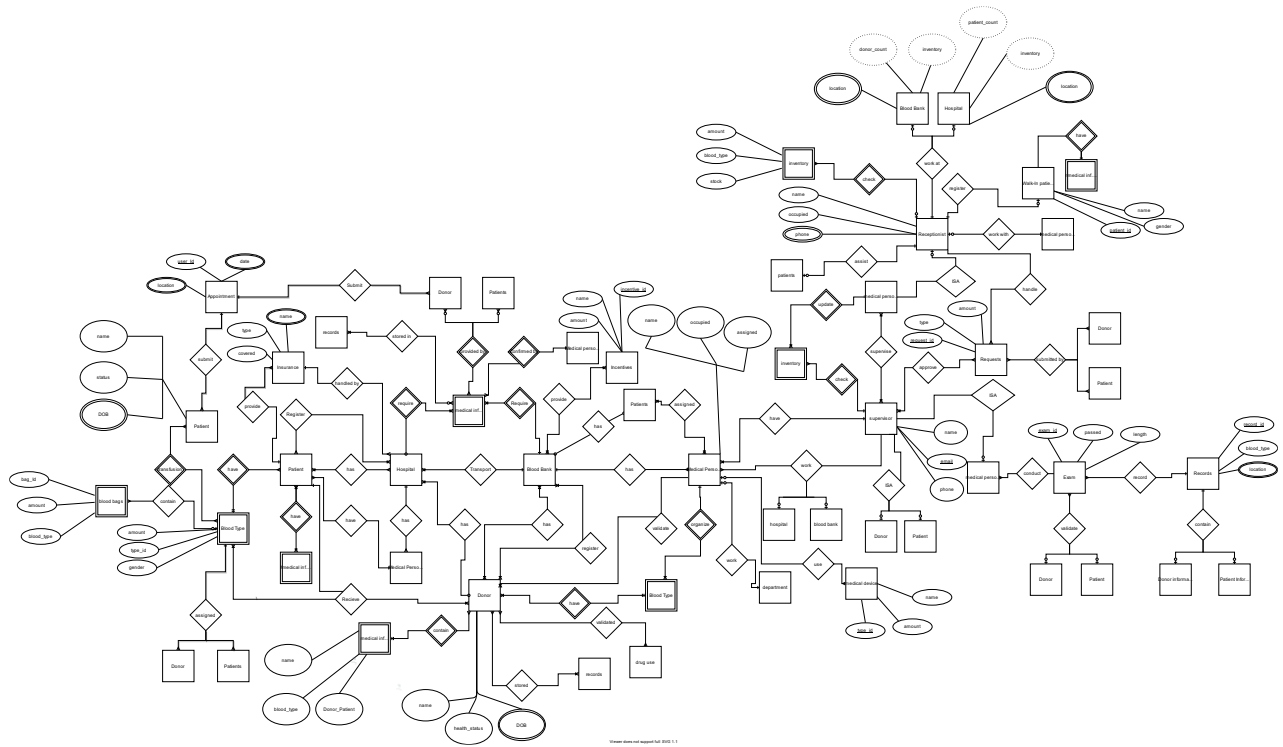
Section VI: Testing Table

Rule	Entity A	Relation	Entity B	Cardinality	Pass/Fail	Error Description
1	Blood Bank	Have	Medical Personnel	1-to-1	Fail	Because a blood bank can have more than one medical personnel
2	Blood Bank	Have	Donor	1-to-1	Pass	
3	Blood Bank	Have	Patients	1-to-0	Pass	
4	Blood Bank	Require	Medical Information	1-to-1	Pass	
5	Blood Bank	Transport	Hospital	1-to-1	Pass	
6	hospital	have	Medical personnel	1-to-M	Pass	
7	hospital	have	patient	1-to-1	Pass	
8	hospital	have	Donor	1-to-0	Fail	Because a hospital shouldn't have Donors.
9	hospital	require	Medical information	1-to-1	Pass	
10	hospital	register	Blood bank	1-to-1	Pass	
11	Blood Type	assigned	patient	1-to-1	Fail	Because a blood type can be assigned to more than one patient
12	Blood Type	assigned	donor	1-to-1	Fail	Because a blood type can be assigned to more than one Donor
13	Blood Type	validated	Medical personnel	1-to-1	Pass	
14	Blood Type	owned	Patient/Donor	1-to-M	Pass	
15	Patient	have	Blood type	1-to-1	Fail	A Patient should only

						have one blood type
16	Patient	Register	hospital	1-to-1	Pass	
17	Patient	Register	Hospital	1-to-1	Pass	
18	Patient	Have	Medical information	1-to-1	Fail	A patient shall have at least one medical information
19	Patient	have	Medical personnel	1-to-1	Pass	
20	Patient	receive	donor	1-to-1	Pass	
21	Patient	receive	Blood type	1-to-1	Pass	
22	Donor	have	Blood type	Only And Only one	Pass	
23	Donor	register	Blood bank	1-to-M	Pass	
24	Donor	have	Medical personnel	1-to-1	Pass	
25	Donor	have	Medical info	1-to-1	Pass	
26	Donor	validate	Medical personnel	1-to-1	Pass	
27	Donor	use	substance	1-to-0	Pass	
28	Donor	receive	Incentive	1-to-1	Fail	Because a Donor can receive incentives by multiple blood banks
29	Medical Personnel	work	Hospital	1-to-1	Pass	
30	Medical Personnel	validate	Donor info	1-to-M	Pass	
31	Medical Personnel	assign	Patient	M-to-N	Pass	
32	Medical Personnel	have	Supervisor	1-to-1	Pass	

33	Medical Personnel	work	Department	1-to-1	Pass	
34	Medical Personnel	assign	Patient	1-to-1	Pass	
35	Medical Personnel	organize	Blood type	1-to-1	Pass	
36	supervisor	supervise	Medical personnel	1-to-1	Pass	
37	supervisor	be	Medical personnel	1-to-1	Pass	
38	supervisor	approve	Requests	1-to-M	Pass	
39	supervisor	work	Blood bank	1-to-M	Pass	
40	supervisor	be	Donor	1-to-1	Fail	Because a supervisor can be multiple Donors
41	supervisor	be	Patient	1-to-1	Fail	Because a supervisor can be multiple Patients
42	Medical device	use	Medical personnel	1-to-1	Pass	
43	location	House	hospital	1-to-M	Fail	Because a location should only have one hospital
44	location	House	Blood bank	1-to-1	Pass	
45	exam	conduct	Medical personnel	1-to-1	Pass	
46	exam	Use	Donor	1-to-1	Pass	
47	exam	Record	Record	1-to-1	Pass	
48	Record	Contain	Medical information	1-to-1	Pass	It can contain multiple medical information
49	Record	Contain	Medical information	1-to-1	Pass	It can contain multiple medical information

50	Blood bags	Contain	Blood type	1-to-1	Pass	
51	Blood bags	Use	Patient	1-to-1	Pass	
52	reception	Work	Medical personnel	1-to-1	Pass	
53	reception	Help	Patient	1-to-1	Fail	A receptionist can help multiple patients
54	reception	Station	Location	1-to-1	Pass	
55	reception	Work	Blood bank	1-to-1	Pass	
56	reception	Check	Inventory	1-to-M	Pass	
57	inventory	Check	Supervisor	M-to-1	Fail	Inventory can be checked by multiple people
58	inventory	Update	Medical personnel	M-to-1	Pass	
59	Medical information	Provide	Patients	M-to-1	Fail	Medical info can be provided by multiple patients
60	Medical information	Provide	Donor	M-to-1	Fail	Medical info can be provided by multiple patients
61	Medical information	Confirm	Medical personnel	M-to-1	Pass	
62	Medical information	Kept	Record	M-to-1	Pass	
63	incentive	Provide	Blood bank	M-to-N	Pass	
64	Walk-in Patient	Have	Medical information	1-to-M	Fail	Patients should only have one medical information
65	Walk-in Patient	Register	reception	1-to-1	Pass	
66	request	Handle	Reception	M-to-1	Pass	

67	request	Submit	Donor	M-to-1	Fail	Request can be submitted by multiple Donors
68	request	Submit	Patients	M-to-1	Fail	Request can be submitted by multiple Patients
69	Insurance	Handle	Hospital	1-to-1	Pass	
70	Insurance	Provide	patients	1-to-M	Pass	
71	Appointment	Submit	Patients	M-to-N	Pass	
72	Appointment	Submit	donor	M-to-N	Pass	

Section VII: Database Model/EER

Zoom in for clearer quality.
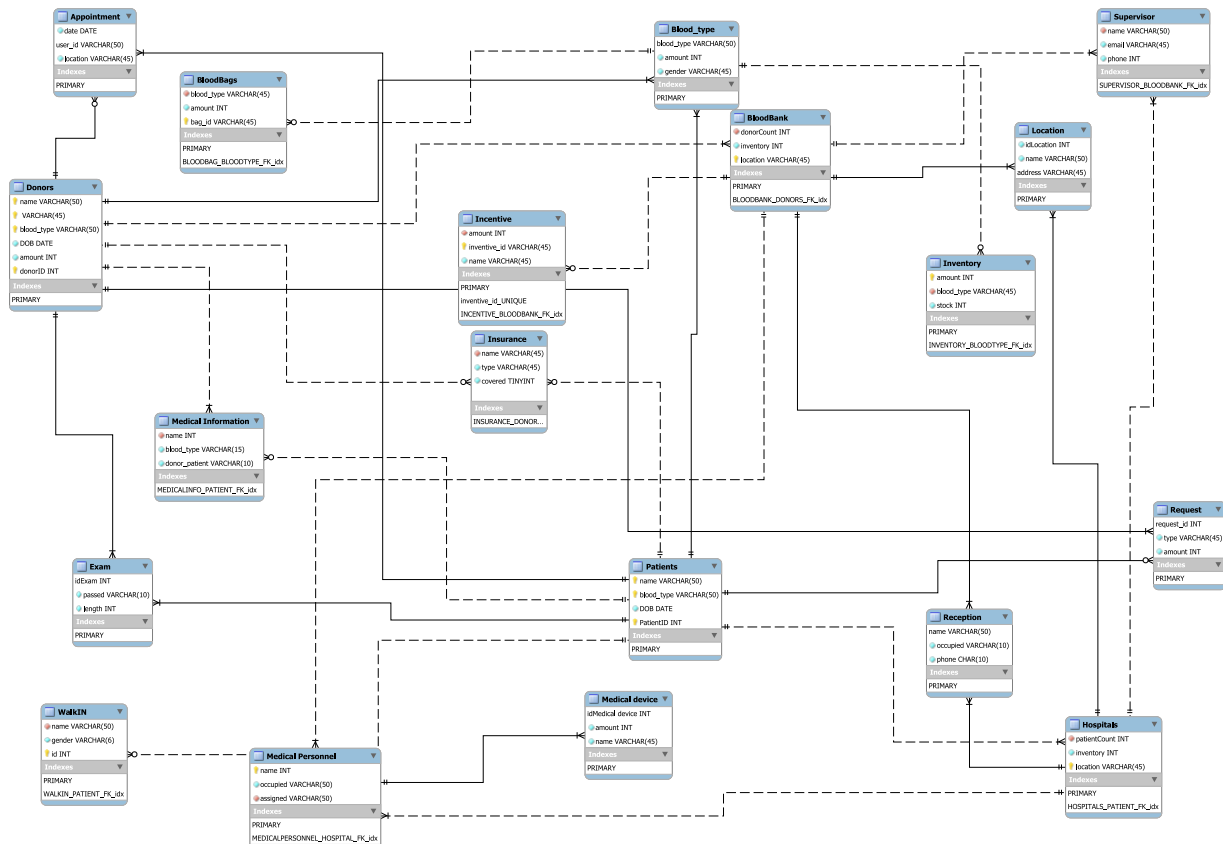
Table	FK	ON DELETE	ON UPDATE	COMMENTS
Appointment	Donor	ON CASCADE	ON CASCADE	If a Donor is deleted or updated, then the appointment from that user should be deleted
Appointment	Patients	ON CASCADE	ON CASCADE	If a Donor is deleted or updated, then the appointment from that user should be deleted

blood_type	Donors	NO ACTION	ON CASCADE	IF a donor is deleted, they should still have a blood type in the system
blood_type	Patients	NO ACTION	ON CASCADE	If a Patient is deleted, they should still have a blood type in the system
Bloodbag	Blood_type	SET NULL	ON CASCADE	If a blood type is deleted, we should set null the type of blood type in the blood bag
BLOODBANK	DONOR	ON CASCADE	ON CASCADE	If a donor is deleted, they should be updated in the system
Exam	Donor	ON CASCADE	ON CASACDE	If a donor is deleted, we should update that in the exam
Exam	Patient	ON CASCADE	ON CASCADE	IF a patient is deleted from the exam, we should update
HOSPITALS	Patients	ON CASCADE	ON CASCADE	If a patient is removed from the hospital, the hospital should update as well
Inventory	Blood_type	SET NULL	ON CASCADE	If a blood type is not in the inventory, we should set null until its filled
INCENTIVE	Bloodbank	NO ACTION	NO ACTION	If a incentive is deleted from the bloodbank, there is no need to do anything
INSURANCE	donor	ON CASCADE	ON CASCADE	If a donor is deleted from the insurance policy, we

				should update that
Insurance	patient	ON CASCADE	ON CASCADE	If a patient is deleted from the insurance policy, we should update that
Location	hospital	ON CASCADE	ON CASCADE	If a hospital is deleted from its location, update that
Location	bloodbank	ON CASCADE	ON CASCADE	If a bloodbank is deleted from its location, update that
Medical device	Medical personnel	NULL	On cascade	If medical personnel is removed from using a medical device, set to null
Medical information	donor	NO ACTION	ON CASCADE	If a donor is removed, its medical information should remain
Medical information	patient	NO ACTION	ON CASCADE	If a PATIENT is removed, its medical information should remain
Reception	bloodbank	ON CASCADE	ON CASCADE	If a bloodbank is removed, we should update accordingly
Reception	hospital	ON CASCADE	ON CASCADE	If a hospital is removed, we should update accordingly
WALKIN	Patient	SET NULL	ON CASCADE	IF a patient is removed from the walkin list, set it to null

Section VIII: Forward Engineering

In files

Section IX: Inserting Data

In files

Section X: Testing

In files

Section XI: Testing Table

Entity	SQLQuery	Pass/Fail	Error Description	Possible Solution
Appointment	Delete	Pass	None	None
Appointment	Update	Fail	Error Code: 1452. Cannot add or update a child row: a foreign key constraint fails (`blooddonationdb`.`appointment`, CONSTRAINT `APPOINTMENT_DONOR_FK` FOREIGN KEY (`user_id`) REFERENCES `donors` (`name`) ON DELETE CASCADE ON UPDATE CASCADE)	You cannot change a primary key.
Blood_type	Delete	Pass	None	None
Blood_type	Update	Pass	None	None
BloodBank	Delete	Pass	None	None
BloodBank	Update	Pass	None	None
BloodBags	Delete	Fail	Error Code: 1054. Unknown column 'C' in 'where clause'	Needs to be in parathesis
BloodBags	Update	Pass	None	None
Donors	Delete	Pass	None	None
Donors	Update	Pass	None	None
Exam	Delete	Pass	None	None

Exam	Update	Pass	None	None
Hospitals	Delete	Pass	None	None
Hospitals	Update	Pass	None	None
Incentive	Delete	Pass	None	None
Incentive	Update	Pass	None	None
Insurance	Delete	Pass	None	None
Insurance	Update	Fail	Error Code: 1064. You have an error in your SQL syntax; check the manual that corresponds to your MySQL server version for the right syntax to use near 'DELETE FROM Inventory WHERE amount = 300' at line 5	Forgot semicolon
Inventory	Delete	Pass	None	None
Inventory	Update	Pass	None	None
Location	Delete	Pass	None	None
Location	Update	Pass	None	None
Medical_device	Delete	Pass	None	None
Medical_device	Update	Pass	None	None
Medical_Information	Delete	Pass	None	None

Medical_Information	Update	Fail	Error Code: 1054. Unknown column 'Bob' in 'where clause'	Value needs to be in parenthesis
Reception	Delete	Pass	None	None
Reception	Update	Pass	None	None
Request	Delete	Fail	Error Code: 1146. Table 'blooddonationdb.requests' doesn't exist	Spelled table wrong
Request	Update	Pass	None	None
Supervisor	Delete	Pass	None	None
Supervisor	Update	Pass	None	None
WalkIn	Delete	Pass	None	None
WalkIn	Update	Fail	Error Code: 1054. Unknown column 'genders' in 'field list'	Key is spelled wrong
Patients	Delete	Pass	None	None
Patients	Update	Pass	None	None