

# BLOOD DONATION SYSTEM DATABASE

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<b>Milestone/Version</b>	<b>Date</b>
M2V1	11/08/2022
M1V1	10/03/2022

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## Project Description

The goal of the Blood Donation System Database project is to create a system that will allow us to better manage blood donations made by donors, to various blood banks and keep track of donors' blood donations. The monitoring procedure for each blood bank is one of the primary concerns regarding blood donations. Donors who donate blood, blood banks that receive blood donations, and the quality of the blood donated by donors through various blood banks can all be monitored as part of the monitoring process.

This Blood Donation System Database will help blood banks better manage the above-mentioned monitoring process by keeping track of each donor's information, patients receiving blood from blood banks, and other details. By utilizing this kind of monitoring procedure, hospitals will be able to provide a healthcare system with high-quality, uncontaminated blood, which can then save the lives of various patients.

By creating this kind of system for blood donations, it will be much less time-consuming and easier to locate high-quality blood than with traditional manual systems. Overall, the Blood Donation System Database will automate the donation of high-quality blood to patients who require it.

# Use Cases

## 1. Use Case: Blood Bank

**Actors:** Blood Bank Manager (Jimmy)

**Description:** The Blood Bank Organization is a blood bank that is managed by Jimmy. One of the main concerns he has is how this blood bank documents, searches and organizes a donor's blood samples. Usually, employees are trained to use a google drive sheet to input donor's information. Because of this practice, Jimmy spends more time than necessary searching for each donor's information to send to hospitals for further testing. He wishes that there is a system that can quickly search for donors' information and send it to hospitals without taking more time than necessary.

Jimmy is now able to store donors' information by simply entering their information into the Blood Donation System Database. By doing so, it will be very simple and straightforward for Jimmy to search for and send out donors' information to other hospitals, using the Blood Donation System Database. Jimmy will be able to develop a more speedy and effective method for monitoring and retrieving the information about donors with the assistance of this system.

## 2. Use Case: Receiving Blood

**Actors:** Patient (Drake), Hospital Employee (Josh), Blood Diseases

**Description:** Drake got into an accident and was transported to the hospital. In the hospital, Drake's tests resulted in him needing a blood transfusion. He is very nervous and scared. Before this action, he asked Josh if the blood he will be receiving was safe from diseases. Josh checked the hospital records and assured Drake that the blood he will be receiving is completely safe. Although Josh stated that the blood will be safe, Drake has yet to believe the accuracy of the blood results are true. Thus, he asked Josh to check the blood results received from the blood bank for any diseases before moving forward with the transfusion.

Using the Blood Donation System Database, any blood bank will be able to keep track of donors who have or don't have diseases. Therefore, before performing any additional tests, to ensure that it is completely disease-free, blood banks can test for blood donations that may have diseases showing up on the database system record before sending the donor information to the hospitals. Because diseases can be examined by the hospital to determine whether the donor's blood is disease-free or not, the Blood Donation System Database will assist patients like Drake who are afraid of receiving a blood transfusion in reassurance.

### 3. Use Case: Disease Tests

**Actors:** Laboratory Employee (Tom), Test Result

**Description:** Tom works as a blood tester in a laboratory. He must thoroughly examine blood that arrives at the laboratory. He first looks through the patient's records to see if there is any evidence of disease before testing the blood. He will only test for those diseases that exist before carrying out any other tests. If there are no diseases on record, he will conduct many tests to determine the blood type and check for any infectious diseases that were missed by past tests. The blood will be discontinued, discarded, and recorded in the database system once Tom discovers positive results. Therefore, the donor can be informed of their test results by the blood bank.

Laboratories will be able to test for results more quickly if donor information is stored and recorded in the Blood Donation System Database. The system will message the donor, notifying them of their donation and determine whether the donor requires any treatment if the results are positive.

#### 4. Use Case: Donating Blood

**Actors:** Donor (Peter), blood bank, Blood bank manager (Josephina)

**Description:** Peter wanted to donate blood to help others who are in need.

However, he's not sure whether or not his blood is safe, due to a disease that he had. He went into a blood bank and spoke to Josephina. He told Josephina that he had Chlamydia before, but was treated and cured. Josephina then noted on his record that he had this disease before so that the hospital could check for it. After the donation process ended, Peter was still unsure if his blood is clean and safe, so he asked Josephina if he could be informed with the blood results after the hospital tests for diseases.

The Blood Donation System Database will help Peter know for sure if his blood came back positive or negative. If his blood does come back positive, Peter will be informed immediately, so that he can quickly receive proper treatment.

## 5. Use Case: Blood Transfusion

**Actors:** Doctor (Harry), Patient (Billy), Laboratory

**Description:** Billy is about to receive a blood transfusion, done by Harry.

However, Billy is not sure if the blood is completely disease-free, which made her nervous. He was shown all of Harry's blood bank and Laboratory results that were negative for diseases. Now, Billy is more relaxed and ready to receive the blood transfusion after looking at the blood results.

The Blood Donation System Database can help provide further details of blood history tests. These tests are done right after the donor donates it, and is discarded if the results for diseases come back positive. This process will help patients like Billy feel more safe and make the doctors more trustworthy.



# Database Requirements

## 1. Blood Bank

- 1.1. A blood bank shall be managed by at least one manager.
- 1.2. A blood bank shall have zero or many donors.
- 1.3. A blood bank shall have many donor records.
- 1.4. A blood bank shall access many donor records.
- 1.5. A blood bank shall have information on many hospitals.
- 1.6. A blood bank shall use one monitoring process.
- 1.7. A blood bank shall send zero or many messages.
- 1.8. A blood bank shall receive zero or many messages.
- 1.9. A blood bank shall keep only one donor record per donor.
- 1.10. A blood bank shall have one name.
- 1.11. A blood bank shall have at least one address.

## 2. Hospital

- 2.1. A hospital shall have information on many blood banks.
- 2.2. A hospital shall have zero or many donor records.
- 2.3. A hospital shall have access to many donor records.
- 2.4. A hospital shall receive zero or many donor records.
- 2.5. A hospital shall have only one donor record per donor.
- 2.6. A hospital shall provide zero or many blood transfusions.
- 2.7. A hospital shall have only one patient record per patient.

- 2.8. A hospital shall have access to many patient records.
- 2.9. A hospital shall have zero or many laboratories.
- 2.10. A hospital shall send zero or many messages.
- 2.11. A hospital shall receive zero or many messages.
- 2.12. A hospital shall have at least one address.

### **3. Laboratory**

- 3.1. A laboratory shall perform at least one disease check.
- 3.2. A laboratory shall have access to many donor records.
- 3.3. A laboratory shall log at least one blood result per test.
- 3.4. A laboratory shall send zero or many messages.
- 3.5. A laboratory shall receive zero or many messages.
- 3.6. A laboratory shall discard many positive blood results.
- 3.7. A laboratory shall be in zero or many hospitals.
- 3.8. A laboratory shall have at least one address.

### **4. Manager**

- 4.1. A manager shall manage at least one blood bank.
- 4.2. A manager shall access zero or more donor records.
- 4.3. A manager shall send zero or more donor records.
- 4.4. A manager shall log zero or more donor records.
- 4.5. A manager shall use only one monitoring process.
- 4.6. A manager shall have only one full name.
- 4.7. A manager shall have at least one address.

## **5. Doctor**

- 5.1. Doctors shall work for zero or many hospitals.
- 5.2. Doctors shall access many blood results.
- 5.3. Doctors shall access many patient records.
- 5.4. Doctors shall access many donor records.
- 5.5. Doctors shall perform zero or many blood transfusions.
- 5.6. Doctors shall show many blood results to patients.
- 5.7. Doctors shall communicate to zero or many patients.
- 5.8. A doctor shall have one full name.
- 5.9. A doctor shall have at least one address.

## **6. Patient**

- 6.1. A patient shall receive zero or many blood transfusions.
- 6.2. A patient shall ask for zero or many donor records.
- 6.3. A patient shall have communication with many doctors.
- 6.4. A patient shall be shown zero or many blood results.
- 6.5. A patient shall have one patient record.
- 6.6. A patient shall have one full name.
- 6.7. A patient shall have at least one address.

## **7. Donor**

- 7.1. Donors shall donate to zero or many blood banks.
- 7.2. Donors shall send zero or many messages.
- 7.3. Donors shall receive zero or many messages.

- 7.4. Donors shall know at least one blood result.
- 7.5. Donors shall be informed with zero or many disease checks.
- 7.6. Donors shall have zero or many diseases.
- 7.7. A donor shall have one full name.
- 7.8. A donor shall have at least one address.

## **8. Patient Record**

- 8.1. A patient record shall have information on one patient.
- 8.2. Patient records shall be accessed by at least one hospital.
- 8.3. Patient record shall contain only one blood type.
- 8.4. Patient records shall be accessed by many doctors.
- 8.5. Patient record shall contain only one full name.
- 8.6. Patient record shall contain at least one address.

## **9. Donor Record**

- 9.1. Donor records shall be accessed by many blood banks.
- 9.2. Donor records shall be accessed by many hospitals.
- 9.3. Donor records shall be accessed by many laboratories.
- 9.4. Donor records shall be accessed by many managers.
- 9.5. Donor records shall be shown to zero or many patients.
- 9.6. A donor record shall have information on only one donor.
- 9.7. A donor record shall contain only one blood type.
- 9.8. A donor record shall be logged by zero or many managers.
- 9.9. A donor record shall be retrieved by zero or many managers.

- 9.10. A donor record shall be sent by zero or many managers.
- 9.11. A donor record shall be received by zero or many hospitals.
- 9.12. A donor record shall contain at least one disease check.
- 9.13. A donor record shall be accessed by many doctors.
- 9.14. A donor record shall be in many blood banks.
- 9.15. A donor record shall contain one full name.
- 9.16. A donor record shall contain zero or many addresses.

## **10. Blood Transfusion**

- 10.1. Blood transfusion shall be provided by zero or many hospitals.
- 10.2. Blood transfusion shall be performed by zero or many doctors.
- 10.3. Blood transfusion shall be received by zero or many patients.

## **11. Disease Check**

- 11.1. Disease checks shall inform zero or many donors.
- 11.2. Disease checks shall be performed by at least one laboratory.
- 11.3. Disease checks shall be logged in many donor records.

## **12. Blood Result**

- 12.1. Blood results shall contain zero or many positive results.
- 12.2. Blood results shall contain zero or many negative results.
- 12.3. Blood results shall be logged by at least one laboratory.
- 12.4. Blood results of positives shall be discarded by many laboratories.
- 12.5. Blood results shall be accessed by many doctors.
- 12.6. Blood results shall be given to many donors.

12.7. Blood results shall contain only one blood type.

12.8. Blood results shall be shown to zero or many patients by doctors.

**13. Blood Type**

13.1. Blood type shall exist in at least one donor record.

13.2. Blood type shall exist in at least one patient record.

13.3. Blood type shall be contained in only one blood result.

**14. Positive Result**

14.1. Positive results shall exist for zero or many blood results.

14.2. Positive results shall be discarded by many laboratories.

**15. Negative Result**

15.1. Negative results shall exist for zero or many blood results.

**16. Monitoring Process**

16.1. Monitoring process shall have one description.

16.2. Monitoring process shall be used by many blood banks.

16.3. Monitoring process shall be used by many managers.

**17. Description**

17.1. A description shall exist in one monitoring process.

**18. Message**

18.1. Messages shall be sent to zero or many blood banks.

18.2. Messages shall be received by zero or many blood banks.

18.3. Messages shall be sent to zero or many donors.

18.4. Messages shall be received by zero or many donors.

- 18.5. Messages shall be sent by zero or many hospitals.
- 18.6. Messages shall be received by zero or many hospitals.
- 18.7. Messages shall be sent by zero or many laboratories.
- 18.8. Messages shall be received by zero or many laboratories.

**19. Address**

- 19.1. An address shall exist for one blood bank.
- 19.2. An address shall exist for one manager.
- 19.3. An address shall exist for one doctor.
- 19.4. An address shall exist for one patient.
- 19.5. An address shall exist for one donor.
- 19.6. An address shall exist for one laboratorie.
- 19.7. An address shall exist for one hospital.
- 19.8. An address shall exist in one donor record.
- 19.9. An address shall exist in one patient record.

# Main Entities, Attributes, and Keys

## 1. Blood Bank (Strong)

- 1.1. blood\_bank\_id: key, numeric
- 1.2. name: composite, alphanumeric
- 1.3. manager\_id: key, numeric
- 1.4. donor\_id: key, numeric
- 1.5. donor\_record\_id: key, numeric
- 1.6. total\_donation: numeric, derived
- 1.7. monitoring\_process\_id: key, numeric
- 1.8. message\_sent\_id: key, numeric
- 1.9. message\_received\_id: key, numeric
- 1.10. total\_messages: numeric, derived
- 1.11. address\_id: key, numeric

## 2. Hospital (Strong)

- 2.1. hospital\_id: key, numeric
- 2.2. message\_sent\_id: key, numeric
- 2.3. message\_received\_id: key, numeric
- 2.4. donor\_record\_id: key, numeric
- 2.5. blood\_transfusion\_id: key, numeric
- 2.6. blood\_bank\_id: key, numeric
- 2.7. patient\_id: key, numeric



2.8. patient\_record\_id: key, numeric

2.9. laboratory\_id: key, numeric

2.10. doctor\_id: key, numeric

2.11. address\_id: key, numeric

### 3. Laboratory (Strong)

3.1. laboratory\_id: key, numeric

3.2. donor\_record\_id: key, numeric

3.3. blood\_result\_id: key, numeric

3.4. message\_sent\_id: key, numeric

3.5. message\_received\_id: key, numeric

3.6. blood\_bank\_id: key, numeric

3.7. disease\_check\_id: key, numeric

3.8. address\_id: key, numeric

3.9. hospital\_id: key, numeric

### 4. Manager (Weak)

4.1. manager\_id: key numeric

4.2. full\_name: alphanumeric, multi-value, composite

4.2.1. first\_name

4.2.2. last\_name

4.3. blood\_bank\_id: key, numeric

4.4. monitoring\_process\_id: key, numeric

4.5. donor\_record\_id: key,numeric

- 4.6. donor\_record\_logged\_id: key, numeric
- 4.7. donor\_record\_sent\_id: key, numeric
- 4.8. donor\_record\_received\_id: key, numeric
- 4.9. address\_id: key, numeric

## 5. Doctor (Strong)

- 5.1. doctor\_id: key, numeric
- 5.2. blood\_result\_id: key,numeric
- 5.3. blood\_transfusion\_id: key, numeric
- 5.4. donor\_id: key,numeric
- 5.5. donor\_record\_id: key, numeric
- 5.6. patient\_record\_id: key, numeric
- 5.7. hospital\_id: key, numeric
- 5.8. full\_name: alphanumeric, multi-value, composite
  - 5.8.1. first\_name
  - 5.8.2. Last\_name

## 6. Patient (Strong)

- 6.1. patient\_id: key, numeric
- 6.2. donor\_record\_id: key, numeric
- 6.3. patient\_record\_id: key, numeric
- 6.4. blood\_transfusion\_id: key, numeric

## 7. Donor (Strong)

- 7.1. donor\_id: key,numeric

7.2. full\_name: alphanumeric, multi-value, composite

7.2.1. first\_name

7.2.2. last\_name

7.3. message\_sent\_id: key, numeric

7.4. message\_received\_id: key, numeric

7.5. total\_messages: numeric, derived

7.6. donor\_record\_id: key, numeric

7.7. blood\_result\_id: key, numeric

## 8. Donor Record (Strong)

8.1. donor\_record\_id: key, numeric

8.2. full\_name: alphanumeric, multi-value, composite

8.2.1. first\_name

8.2.2. last\_name

8.3. blood\_type\_id: key, numeric

8.4. blood\_bank\_id: key, numeric

8.5. disease\_check\_id: key, numeric

8.6. address\_id: key, numeric

## 9. Patient Record (Strong)

9.1. patient\_record\_id: key, numeric

9.2. full\_name: alphanumeric, multi-value, composite

9.2.1. first\_name

9.2.2. last\_name

9.3. blood\_type\_id: key, numeric

9.4. hospital\_id: key, numeric

9.5. address\_id: key, numeric

**10. Blood Transfusion (Strong)**

10.1. Blood\_transfusion\_id: key, numeric

10.2. hospital\_id: key, numeric

10.3. doctor\_id: key, numeric

10.4. patient\_id: key, numeric

10.5. transfusion\_description: alphanumeric

10.6. donor\_record\_id: key, numeric

**11. Disease Check (Strong)**

11.1. disease\_check\_id: key, numeric

11.2. disease\_result: numeric

11.3. disease\_description: alphanumeric

11.4. laboratory\_id: key, numeric

11.5. donor\_record\_id: key, numeric

**12. Blood Result (Strong)**

12.1. blood\_result\_id: key, numeric

12.2. positive\_result\_id: key, numeric

12.3. negative\_result\_id: key, numeric

12.4. doctor\_id: key, numeric

12.5. patient\_record\_id: key, numeric

12.6. donor\_record\_id: key, numeric

12.7. laboratory\_id: key, numeric

**13. Blood Type (Strong)**

13.1. blood\_type\_id: key, numeric

13.2. donor\_record\_id: key, numeric

13.3. patient\_record\_id: key, numeric

13.4. blood\_type: alphanumeric, composite

13.4.1. o\_positive\_type

13.4.2. o\_negative\_type

13.4.3. a\_positive\_type

13.4.4. a\_negative\_type

13.4.5. b\_positive\_type

13.4.6. b\_negative\_type

13.4.7. ab\_positive\_type

13.4.8. ab\_negative\_type

**14. Positive Result (Strong)**

14.1. positive\_result\_id: key, numeric

14.2. donor\_id: key, numeric

14.3. positive\_result: boolean

**15. Negative Result (Strong)**

15.1. negative\_result\_id: key, numeric

15.2. donor\_id: key, numeric

15.3. negative\_result: boolean

**16. Monitoring Process (Strong)**

16.1. monitoring\_process\_id: key, numeric

16.2. description: alphanumeric

16.3. blood\_bank\_id: key, numeric

16.4. manager\_id: key, numeric

**17. Message (Strong)**

17.1. message\_sent\_id: key, numeric

17.2. message\_received\_id: key, numeric

17.3. message\_description: alphanumeric

17.4. laboratory\_id: key, numeric

17.5. hospital\_id: key, numeric

17.6. donor\_id: key, numeric

**18. Address (Weak)**

18.1. address\_id: key, numeric

18.2. donor\_id: key, numeric

18.3. manager\_id: key, numeric

18.4. doctor\_id: key, numeric

18.5. patient\_id: key, numeric

18.6. blood\_bank\_id: key, numeric

18.7. hospital\_id: key, numeric

18.8. laboratory\_id: key, numeric

**18.9.** address: alphanumeric, multi-value, composite

**18.9.1.** number

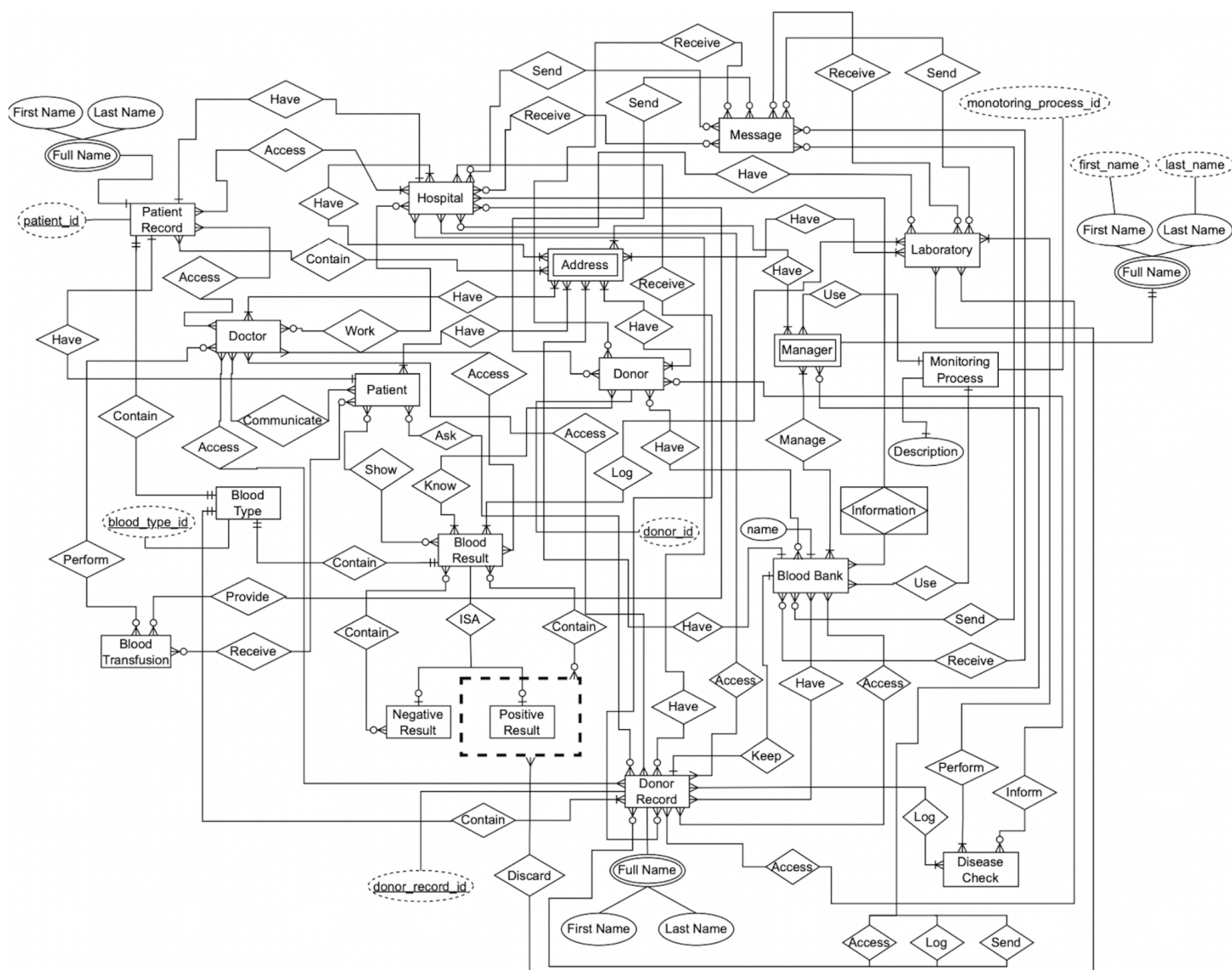
**18.9.2.** street

**18.9.3.** city

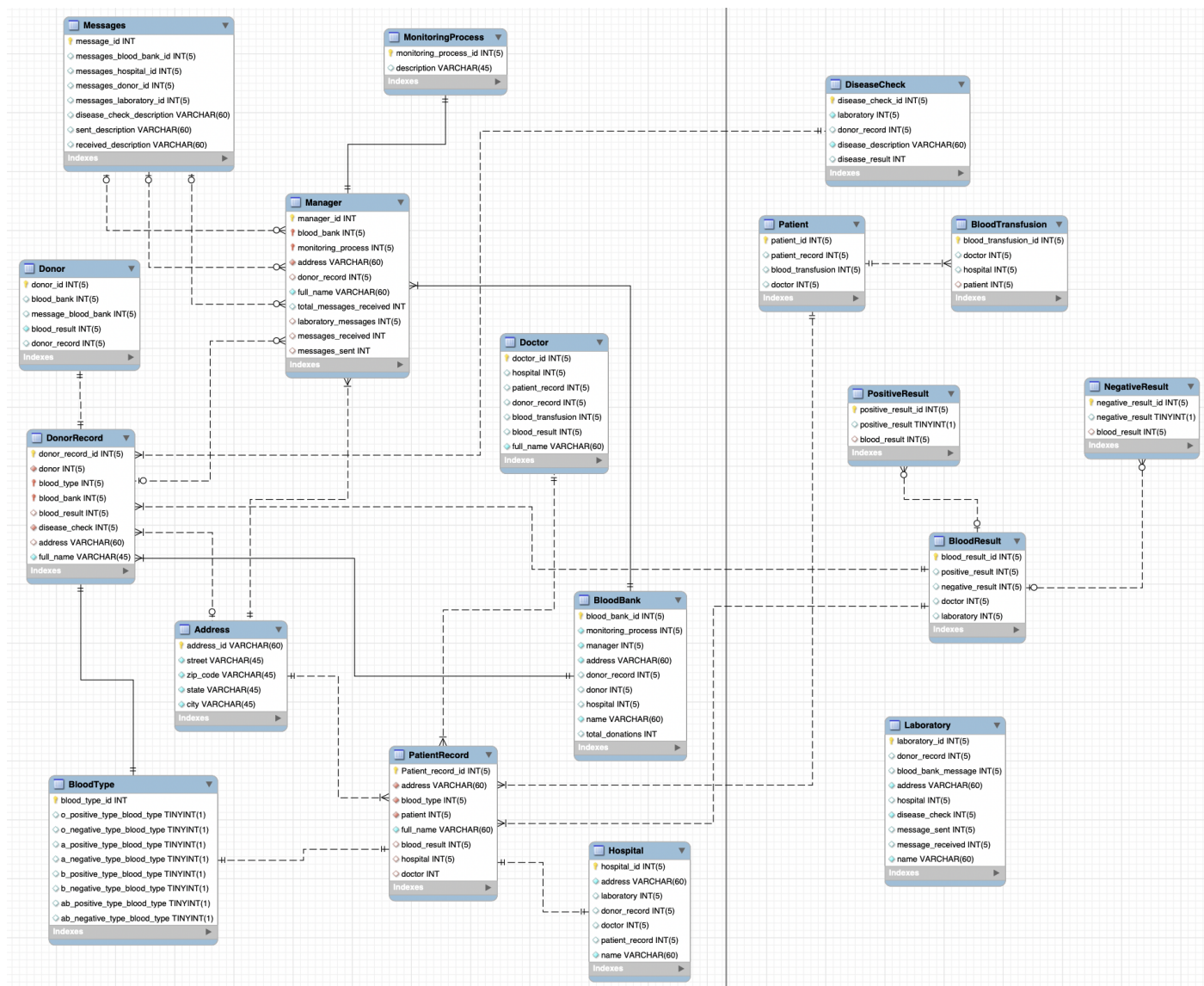
**18.9.4.** state

**18.9.5.** zip\_code

# Entity Relationship Diagram (ERD)







<b>Table</b>	<b>FK</b>	<b>ON DELETE</b>	<b>ON UPDATE</b>	<b>Comment</b>
Manager	Blood Bank	ON CASCADE	ON CASCADE	If the manager gets deleted, then the blood bank that the manager was working in must also get deleted.
Manager	Donor Record	SET NULL	ON CASCADE	If the donor record gets deleted, then the manager must still access it.
Manager	Monitoring Process	ON CASCADE	ON CASCADE	If the monitoring process gets deleted, then the manager using this process must also get deleted.
Manager	Address	ON CASCADE	ON CASCADE	If the manager table gets deleted, then the address of the blood bank must also get deleted.
Manager	Messages	SET NULL	ON CASCADE	If the messages get deleted, then the manager must still see old messages.
Donor Record	Donor	ON CASCADE	ON CASCADE	If the donor record gets deleted, then the donor also must get deleted.
Donor Record	Blood Bank	ON CASCADE	ON CASCADE	If the donor record gets deleted, then the blood bank info must also get deleted.
Donor Record	Address	SET NULL	ON CASCADE	If the address table gets deleted, the address of the donor will still appear in the donor record.
Donor Record	Blood Type	ON CASCADE	ON CASCADE	If the donor record gets deleted, then the blood type on the record must also get deleted.
Donor Record	Disease Check	ON CASCADE	ON CASCADE	If the donor record gets deleted, then the disease checks inside the record must also get deleted.
Donor Record	Blood Result	ON CASCADE	ON CASCADE	If the donor record gets deleted, then the blood result inside the record must also get deleted.

Patient Record	Address	ON CASCADE	ON CASCADE	If the patient record gets deleted, then the address inside the record must also get deleted.
Patient Record	Blood Type	ON CASCADE	ON CASCADE	If the patient record gets deleted, then the blood type inside the record must also get deleted.
Patient Record	Blood Result	ON CASCADE	ON CASCADE	If the patient record gets deleted, then the blood result inside the record must also get deleted.
Patient Record	Hospital	SET NULL	ON CASCADE	If the patient record gets deleted, then the hospital should still have the record on file.
Patient Record	Doctor	SET NULL	ON CASCADE	If the patient record gets deleted, then the doctor can still have access to the record.
Blood Transfusion	Patient	SET NULL	ON CASCADE	If the blood transfusion gets deleted, then the patient can still see their blood transfusion.
Positive Result	Blood Result	ON CASCADE	ON CASCADE	If the blood result gets deleted, then the positive result must also get deleted.
Negative Result	Blood Result	ON CASCADE	ON CASCADE	If the blood result gets deleted, then the negative result must also get deleted.