Blood Product Management System

Database Specification: Purpose, Blood Problems

Addressed and Blood Donation Rules

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Database Purpose:

The purpose of this database is to maintain data for the blood surplus management system in the region. The data will be used to predict the demand for specific blood products, allocate business surplus and increase blood donations in the region.

Business Problems Addressed:

- Lack of efficient management of blood products in the region.
- Insufficient data analysis for business surplus allocation and demand prediction.
- Difficulty in relocating blood donation sites based on the demand.
- Inadequate information on the number of active and inactive blood donors in the region.
- Limited data on the number of patients and their blood product requirements.
- Insufficient data on blood product processing and surplus information.
- Lack of data on local activities that can increase the need for blood products.
- Limited information on donor feedback and its impact on blood donation.

Blood Donation Rules:

- Each donor will have unique demographic information.
- Patients always have a doctor, nurse, and room.
- Transfusion can only be ordered/administered by attending doctor and nurse.
- Blood will be transferred between departments by storage.
- Blood Expire Date and Time will obtain from the blood bank (BB).
- Hospital will keep entry date and time as when the products arrive from BB.
- Blood transfusion occurs in the patient room.
- The hospital will keep the entryS date and time as when the product arrives from BB.
- Blood transfusion occurs in the patient room.
- All rooms' capacity is designed for one patient to provide maximumS care.
- Blood Product ID will be shared from BB and will not change to track history of the blood.
- BloodProductEntryDatetime will be same as the OrderArrivalDateTime in Order.
- BloodProductExpireDateTime will be produced once the blood product has been processed at the BB.

- The scenario with one unique blood bank is the only considered case.

- The blood donation sites with fixed address are the only considered sites.

- Blood collection specialists and blood processing technicians are both named as technicians in Tech entity.

- There will be no transit record for the inter-department transportation.

- Only whole blood donations will be collected from the donors.

- All the donated blood passed qualification.

- The unprocessed blood products are the whole blood which had been tested before receiving blood product ID.

- If the product remains as whole blood, then donation datetime will be the expiration datetime.

- If blood product has been processed, it will have a new expiration date by blood type.

- Blood Product is stored by storage condition whichS is temperature.

Design Decisions:

Entity Name	Why Entity Included	How Entity is Related to Other Entities
Transfusion	The Transfusion entity is included in this data model to track the blood transfusion events that occur between patients and blood storage facilities.	Transfusion has a one-to-many relationship with Patient entity, meaning one patient can receive multiple transfusions, but each transfusion event is only associated with one patient. Transfusion has a one-to-many relationship with Blood Product entity, meaning each transfusion event involves only one blood product, but one blood product can be used in multiple transfusion events.
Hospital Storage	The Hospital Storage entity is included in this data model to keep track of the inventory of blood products in different storage facilities.	Hospital Storage has a one-to-many relationship with Blood Product entity, meaning one storage location can contain multiple blood products, but each blood product is only located in one storage location at any given time. Hospital Storage has a many-to-one relationship with Storage Type entity, meaning multiple storage locations can have the same storage type, but each storage location only has one storage type. Hospital Storage has zero-to-many relationships, meaning the department may have much storage but also not carry any.
Patient	The Patient entity is included in this data model to keep track of the patients who receive transfusions and their medical information.	Patient has a one-to-one relationship with Room entity, meaning each patient is assigned to one room, and each room can only have one patient. Patient has a one-to-many relationship with Nurse entity, meaning one nurse can help multiple patients with transfusion but each transfusion event must have a nurse to administrate the procedure. Patient has a one-to-many relationship with Doctor entity, meaning one doctor can be assigned to make orders for multiple patients, but each patient is assigned to at least one doctor who orders transfusion. Patient has a one-to-many relationship with Transfusion entity, meaning one patient can receive multiple transfusions, but each transfusion event is only associated with one patient.

Blood Product	The Blood Product entity is included in this data model to keep track of the different types of blood products available for transfusion, as well as their expiration dates and storage locations.	Blood Product has a one-to-many relationship with Blood Storage entity, meaning one blood product can be in multiple storage locations, but each storage location can only contain one blood product. Blood Product has a many-to-one relationship with Storage entity, meaning multiple blood products can be in the same storage location, but each blood product is only located in one storage location at any given time. Blood Product has a many-to-one relationship with Transfusion entity, meaning multiple transfusion events can involve the same blood product, but each transfusion event is associated with only one blood product.
Hospital	The Hospital entity is included in this data model to keep track of the hospitals that are involved in the blood donation and transfusion process.	Hospital has a one-to-many relationship with Hospital Department entity, meaning one hospital can have multiple departments, but each department is only associated with one hospital.
Hospital Department	The Hospital Department entity is included in this data model to keep track of the different departments within a hospital that may be involved in the blood donation and transfusion process.	Hospital Department has a one-to-many relationship with Blood Storage entity, meaning one hospital department can have multiple blood storage locations, but each blood storage location is only associated with one hospital department. Hospital Department has a one-to-many relationship with Doctor entity, meaning one hospital department can have multiple doctors, but each doctor is only associated with one hospital department. Hospital Department has a one-to-many relationship with Nurse entity, meaning one hospital department can have multiple nurses, but each nurse is only associated with one hospital department.
Department Room	The Department Room entity is included in this data model to keep track of the rooms within a hospital department that patients may be assigned to.	Department Room has a one-to-many relationship with Patient entity, meaning one room can have multiple patients, but each patient is only assigned to one room. Department Room has a many-to-one relationship with Hospital Department entity, meaning multiple rooms can be located within the same hospital department, but each room is only located in one hospital department at any given time.

Doctor	The Doctor entity is included in this data model to keep track of the medical professionals who may be involved in the blood donation and transfusion process.	Doctor has a one-to-many relationship with Patient entity, meaning one doctor can be assigned to multiple patients, but each patient is only associated with one doctor. Doctor has a many-to-one relationship with Hospital Department entity, meaning multiple doctors can be associated with the same hospital department, but each doctor is only associated with one hospital department at any given time.
Nurse	The Nurse entity is included to represent the nursing staff who interact with patients and provide care during blood transfusion events. This entity helps to track the assignment of nurses to specific patients and transfusion events, and to provide contact information for each nurse.	One-to-many relationship between Nurse and Patient: Each nurse can be assigned to multiple patients, while each patient can have only one nurse assigned to them. One-to-many relationship between Hospital Department and Nurse: Each nurse can be associated with only one hospital department, while each hospital department can have multiple nurses associated with it.
Storage Type	The Storage Type entity is included to define the different types of storage units available for storing blood products. This entity helps to track the temperature, storage capacity, and allowed product types for each storage unit.	One-to-many relationship between Storage Type and Blood Storage: Each storage type can have multiple blood storage units associated with it. One-to-many relationship between Hospital Department and Blood Storage: Each hospital department can have multiple blood storage units associated with it, and each blood storage unit has a corresponding storage type.
Order	The Order entity is included to keep track of the orders placed for blood products, including the product details, transit information, and status of the order.	One-to-many relationship between blood Order and Blood Product: Each blood order can have multiple blood products associated with it.

Donor	In the blood bank, donors play a crucial role as they are the source of the blood that is stored and used for transfusions. The Donor entity would hold data such as the donor's personal information (name, age, blood type, etc.), and information about past donations.	One-to-many relationship between Donor and Donation: Each donor can have multiple donation records. One-to-one relationship between Donor and Donor History: Each donor has only one donation history.
Donor History	The Donor History entity would hold a donor's donation history to keep track of the availability of donation.	One-to-one relationship between Donor and Donor History: Each donor has only one donation history.
Donor Record	The Donor Record entity is to maintain the donation records of each donor.	Zero-to-many relationship between Donation and Donor Record: Each donor can have multiple times of donation. Zero-to-many relationship between Donor Record and Donor History: Each donor can have multiple times of donation.
Donation	The Donation is used to track information about blood donation.	One-to-many relationship between Tech and Donation: Each blood collection technician can participate in multiple donations. One-to-many relationship between BB Department and Donation: Each blood donation department can have multiple donation records. One-to-many relationship between Donor and Donation: Each donor can have multiple donation records.
Tech	The Tech includes both blood collection specialists who collect blood from donors at donations departments and blood processing technicians who process whole blood into multiple blood products.	One-to-many relationship between Tech and Processed Blood Product Inventory: Each blood processing technician can process multiple blood products. One-to-many relationship between Tech and Donation: Each blood collection technician can participate in multiple donations.

Processed Blood Product Inventory	The <u>Processed Blood Product Inventory</u> helps to improve the safety and effectiveness of blood transfusions.	One-to-one relationship between <u>Processed Blood Product Inventory</u> and <u>Blood Product Information</u>: Each processed blood product has unique blood information. One-to-many relationship between <u>Tech</u> and <u>Processed Blood Product Inventory</u>: Each blood processing technician can process multiple blood products. One-to-many relationship between <u>BB Storage</u> and <u>Processed Blood Product Inventory</u>: The blood storage can store multiple units and types of processed blood products.
Blood Product Information	The <u>Blood Product Information</u> helps blood banks more effectively manage their inventory and ensure that they have the right components available to meet their needs.	One-to-one relationship between <u>Processed Blood Product Inventory</u> and <u>Blood Product Information</u>: Each processed blood product has unique blood information.
BB (Blood Bank) Department	The <u>BB Department</u> stands for two main departments in the blood bank system, including blood donation sites and blood storage sites. By maintaining a record of which donations are stored in which locations, the blood bank can quickly identify and retrieve the products.	One-to-many relationship between <u>BB Department</u> and <u>Donation</u>: Each blood donation department can have multiple donation records. One-to-many relationship between <u>BB Storage</u> and <u>BB Department</u>: All blood donation sits automatically transport the collected whole blood to the unique blood storage site.
BB Storage	The <u>BB Storage</u> is the unique blood bank storage site which manages the unprocessed whole blood collected from donation sites and the processed blood products.	One-to-many relationship between <u>BB Storage</u> and <u>BB Department</u>: All blood donation sits automatically transport the collected whole blood to the unique blood storage site. One-to-many relationship between <u>BB Storage</u> and <u>BB Storage Type</u>: The unique blood bank storage has varied storage types differed by blood types. One-to-many relationship between <u>BB Storage</u> and <u>Transit</u>: The blood storage site should initiate multiple transportations of blood products to hospitals by orders. One-to-many relationship between <u>BB Storage</u> and <u>Unprocessed Blood Product Inventory</u>: The blood storage can store multiple units of unprocessed blood. One-to-many relationship between <u>BB Storage</u> and <u>Processed Blood Product Inventory</u>: The blood storage can store multiple units and types of processed blood products.

Unprocessed Blood Product Inventory	The Unprocessed Blood Product Inventory only stands for the whole blood collected from donation sites. By tracking the date and location of unprocessed blood products, the blood bank can ensure that products are used in a timely manner and that expired products are disposed of appropriately. Those blood will be automatically transported from donation sites to storage.	One-to-many relationship between BB Storage and Unprocessed Blood Product Inventory: The blood storage can store multiple units of unprocessed blood.
Transit	The Transit entity is used to track the transportation from BB Storage to Hospital according to Order. It allows the blood bank to manage the distribution of blood products effectively.	One-to-many relationship between BB Storage and Transit: The blood storage site should initiate multiple transportations of blood products to hospitals by orders. One-to-many relationship between Transit and Order: Each transportation can have multiple units and types of blood products according to the orders from hospital.