Electronic Healthcare System Requirements Specification

April 3rd, 2025

Table of Contents

1. Executive Summary **2**
1.1 Project Overview **3**
2. Product/Service Description **3**
2.1 Product Context **3**
2.2 User Characteristics **3**
2.3 Assumptions **3**
2.4 Constraints Dependencies **3**
3. Requirements **3**
3.1 Functional Requirements **4**
3.2 Non-Functional Requirements 5
3.2.1 Product Requirements **5**
3.2.1.1 Usability Requirements 5
3.2.1.2 Performance Requirements 5
3.2.1.3 Availability 6
3.2.1.4 Security 6
3.2.2 Organizational Requirements 6
3.2.3 External Requirements 6

1.Executive Summary

1.1 Project Overview

Description: This project involves the development of an **Electronic Healthcare System** designed to streamline patient care and medical record management. The system will support a wide range of users, including healthcare providers, patients, and emergency responders. It aims to improve efficiency, enhance patient care, and ensure compliance with healthcare regulations.

Intended Audience: The system is intended for use by:

- **Healthcare Providers**: Doctors, and laboratory staff.
- **Patients**: Individuals seeking medical care and managing their health records.
- **Emergency Responders**: Personnel needing quick access to patient information during emergencies.
- **IT Personnel**: Staff responsible for system maintenance and troubleshooting.

2. Product/Service Description

2.1 Product Context

Description: The **Electronic Healthcare System** is a standalone system designed to manage patient medical records and support healthcare delivery. While it is self-contained, it will interface with external systems such as pharmacies and laboratories to ensure seamless data exchange and coordination.

How the Product Relates to Other Products

- **Standalone but Integrated**: The system manages core healthcare operations (e.g., appointment scheduling, medical record management, prescription management) internally but interfaces with external systems for extended functionality and provide end-to-end healthcare services.

- **Interdependence**: The system relies on external systems (e.g., pharmacies, laboratories) for specific functionalities, such as prescription management and lab test coordination.

Interfaces with Related Systems

- **Internal Interfaces**:
    - **Hospital Databases**: The system integrates with internal hospital databases to manage patient records.
    - **IT Maintenance Tools**: The system supports tools for system monitoring, maintenance, and troubleshooting.

  - **Nutrition Services**: The system integrates with internal systems to support nutrition planning, allowing counselors and nutritionists to access patient records and provide personalized care.

- **External Interfaces**:
  - **Pharmacies**: Integration with pharmacies enables prescription management, including automated refill requests and drug interaction checks.
  - **Laboratory Systems**: The system interfaces with laboratories to manage test requests, process results, and notify relevant parties.
  - **Emergency Services**: Integration with emergency services provides real-time access to critical patient information during emergencies.
  - **Organ Donation Networks**: Integration with organ donation networks facilitates donor and recipient coordination.

Major Components and Interconnections

Below is a high-level description of the system's major components and their interconnections:

1. **Core System**:
   - Manages **appointments**, **medical records**.
   - Acts as the central hub for all internal operations.
2. **Internal Systems**:
   - **Hospital Databases**: Store patient records, appointments.
   - **IT Maintenance Tools**: Support system monitoring, maintenance, and troubleshooting.
   - **Nutrition Services**: Provide tools for nutrition planning, integrated with patient records.
3. **External Systems**:
   - **Pharmacies**: Handle prescription management and drug dispensation.
   - **Laboratories**: Manage lab test requests and results.
   - **Emergency Services**: Access critical patient information during emergencies.
   - **Organ Donation Networks**: Coordinate organ donation processes.
4. **Mobile Applications**:
   - Provide patients and doctors with mobile access to the system for scheduling, record access, and notifications.
   - **Functionalities**:
     - **Patients**: Schedule appointments, access medical records, request prescription refills, and receive reminders.
     - **Healthcare Providers**: View patient records, update treatment plans, conduct virtual therapy sessions, and receive alerts for critical conditions.

2.2 User Characteristics

User Profiles

1. **Patients**:
    - **Role**: Individuals seeking medical care and managing their health records.
    - **Experience**: Limited experience with healthcare systems; may have varying levels of comfort with technology.
    - **Technical Expertise**: Low to moderate; need an intuitive and user-friendly interface.
    - **Other Characteristics**: May require assistance with scheduling appointments, accessing medical records, and understanding medical terminology.
2. **Doctors**:
    - **Role**: Healthcare providers responsible for diagnosing and treating patients.
    - **Experience**: Extensive experience in healthcare; familiar with medical systems and terminology.
    - **Technical Expertise**: Moderate to high; comfortable using digital tools for managing patient records, prescribing medications, and viewing lab results.
    - **Other Characteristics**: Need quick access to patient data and tools for efficient decision-making.
3. **Pharmacy Staff**:
    - **Role**: Personnel responsible for managing prescriptions and inventory.
    - **Experience**: Moderate experience in pharmacy operations; familiar with prescription management.
    - **Technical Expertise**: Moderate; comfortable using digital tools for managing prescriptions and inventory.
    - **Other Characteristics**: Need tools for verifying prescriptions, checking drug interactions, and managing inventory.
4. **Laboratory Staff**:
    - **Role**: Personnel responsible for processing lab tests and managing test results.
    - **Experience**: Moderate experience in laboratory operations; familiar with lab test processes.
    - **Technical Expertise**: Moderate; comfortable using digital tools for managing test requests and results.
    - **Other Characteristics**: Need tools for scheduling tests, processing results, and notifying relevant parties.
5. **Emergency Services Personnel**:
    - **Role**: First responders requiring quick access to critical patient information during emergencies.
    - **Experience**: Moderate experience in emergency response; familiar with healthcare systems.
    - **Technical Expertise**: Moderate; comfortable using digital tools for accessing patient data in real-time.
    - **Other Characteristics**: Need prioritized access to patient records and tools for updating patient status during emergencies.
6. **IT Support**:

Role: Team responsible for system maintenance and troubleshooting.
    - **Experience**: High experience in IT operations; familiar with healthcare systems.
    - **Technical Expertise**: High; comfortable using digital tools for system monitoring, maintenance, and troubleshooting.

- **Other Characteristics**: Need tools for monitoring system performance, applying updates, and resolving technical issues.

7. **Nutritionists**:
    - **Role**: Healthcare providers responsible for creating and monitoring personalized diet plans.
    - **Experience**: Moderate experience in nutrition and diet planning; familiar with healthcare systems.
    - **Technical Expertise**: Moderate; comfortable using digital tools for creating and updating diet plans.
    - **Other Characteristics**: Need tools for tracking patient adherence to diet plans and monitoring progress.
8. **Organ Donor Coordinators**:
    - **Role**: Personnel responsible for managing organ donation processes and records.
    - **Experience**: Moderate experience in organ donation coordination; familiar with healthcare systems.
    - **Technical Expertise**: Moderate; comfortable using digital tools for managing donor and recipient records.
    - **Other Characteristics**: Need tools for coordinating organ donation processes and tracking donor and recipient statuses.

2.3 Assumptions

The following assumptions have been made during the development of the **Electronic Healthcare System**. If any of these assumptions change, the requirements may need to be revised accordingly.

1. **Hardware and Software Availability**:
    - The system will run on modern hardware and software platforms, including **Windows**, **macOS**, and **Linux**.
    - Hospitals and clinics will have the necessary infrastructure (e.g., servers, network connectivity) to support the system.
2. **User Expertise**:
    - Users (e.g., patients, doctors) will have basic training to use the system effectively.
    - IT support will have the technical expertise to maintain and troubleshoot the system.
3. **Data Availability**:
    - Patient records, lab results, and other critical data will be available in digital format and accessible through the system.
    - External systems (e.g., pharmacies, laboratories) will provide real-time data exchange capabilities.
4. **Regulatory Compliance**:
    - The system will comply with healthcare regulations such as **GDPR** (General Data Protection Regulation).
    - Hospitals and clinics will have the necessary processes in place to ensure compliance with these regulations.
5. **Integration with External Systems**:

- External systems (e.g., pharmacies, insurance providers, laboratories) will provide APIs or other integration mechanisms for seamless data exchange.
- Emergency services and legal authorities will have secure access to the system as needed.

6. **System Performance**:
   - The system will operate in environments with reliable internet connectivity and sufficient bandwidth to support real-time data access and updates.
   - The system will handle peak usage without significant performance degradation.
7. **Security**:
   - Hospitals and clinics will implement necessary security measures (e.g., firewalls, encryption) to protect the system from unauthorized access.
   - Users will follow security protocols (e.g., multi-factor authentication, password policies) to ensure data security.
8. **Procurement and Supply Chain**:
   - The procurement office will have access to reliable suppliers for medical equipment and supplies.
   - Inventory levels will be tracked in real-time, and reorder alerts will be acted upon promptly.
9. **User Adoption**:
   - Patients, doctors, and other users will adopt the system and use it as their primary tool for managing healthcare operations.
   - Training and support will be provided to ensure smooth adoption.
10. **Mobile Applications**:
    - Patients and doctors will have access to smartphones or tablets to use the mobile applications.
    - The mobile applications will be compatible with **Android** and **iOS** platforms.

2.4 Constraints and Dependencies

The following constraints and dependencies affect the requirements for the **Electronic Healthcare System**:

Constraints

1. **Regulatory Compliance**:
   - The system must comply with healthcare regulations such as **GDPR** (General Data Protection Regulation).
   - This constraint affects the design of security features, data encryption, and audit trails.

- **Data Security and Privacy**:
  - The system must ensure the security and privacy of patient data at all times.
  - This constraint requires the implementation of end-to-end encryption, multi-factor authentication, and secure access controls.
- **System Performance**:
  - The system must handle at least **100,000 concurrent users** without performance degradation.
  - Response times for critical operations must not exceed **2 seconds**.

  - This constraint affects the design of the system's architecture and database.
- **Integration with Legacy Systems**:
  - The system must operate in parallel with existing legacy systems during the transition period.
  - This constraint requires the system to support data migration and interoperability with older systems.
- **Budget and Resource Limitations**:
  - The development and implementation of the system are subject to budget and resource constraints.
  - This constraint may limit the scope of certain features or require prioritization of requirements.
- **User Training and Adoption**:
  - The system must be easy to use, with minimal training required for new users.
  - This constraint affects the design of the user interface and the development of training materials.
- **Mobile Application Compatibility**:
  - The system must support mobile applications for **Android** and **iOS** platforms.
  - This constraint affects the design and development of the mobile applications.

Dependencies

- **Integration with External Systems**:
  - The system depends on integration with external systems such as **pharmacies**, **laboratories**, **emergency services**, and **organ donation networks**.
  - These integrations are necessary for functionalities like prescription management, lab test coordination, and emergency response.
- **Data Availability**:
  - The system depends on the availability of patient records, lab results, and other critical data in digital format.
  - If data is not available or accessible, the system's functionality may be impacted.
- **Third-Party APIs**:
  - The system depends on third-party APIs for integration with external systems (e.g., pharmacies, insurance providers, laboratories).
  - If these APIs are not available or do not function as expected, the system's functionality may be limited.
- **IT Infrastructure**:
  - The system depends on the availability of modern IT infrastructure (e.g., servers, network connectivity) in hospitals and clinics.
  - If the infrastructure is not available or insufficient, the system's performance may be affected.
- **Regulatory Approvals**:
  - The system depends on obtaining necessary regulatory approvals (e.g., HIPAA compliance certification).
  - If approvals are delayed or denied, the system's deployment may be impacted.
- **User Adoption**:

  - The system depends on the adoption and active use by patients, doctors, and other users.
  - If users do not adopt the system, its effectiveness may be limited.
- **Development of Specific Modules**:
  - Certain modules (e.g., **Emergency Services Integration**, **Organ Donation Coordination**) must be completed before other modules can be built or deployed.
  - This dependency affects the development timeline and prioritization of tasks.
- **Data Migration from Legacy Systems**:
  - The system depends on the successful migration of data from existing legacy systems.
  - If data migration is not completed on time or encounters issues, the system's deployment may be delayed.

3. Requirements

3.1 User Requirements

These requirements define the specific actions and functionalities that users need to perform within the system to fulfill their roles effectively:

Patients

- Patients should be able to schedule, modify, and cancel appointments through the system.
- Patients should have secure access to their medical records and test results.
- Patients should be able to request prescription refills through the system.
- Patients should receive automated reminders for upcoming appointments and medication.
- Patients should have access to telemedicine consultations through the platform.
- Patients should be able to provide feedback and rate their care experience.

Doctors

- Doctors should be able to securely log into the system.
- Doctors should have a dashboard that displays their appointments, messages, and tasks.
- Doctors should be able to view and update patient records easily.
- Doctors should be able to manage and reschedule appointments conveniently.
- Doctors should be able to prescribe medications electronically without complications.
- Doctors should be able to review and integrate lab results seamlessly.

Laboratory Staff

- Laboratory technicians should be able to securely log into the system.
- Laboratory technicians should have a dashboard to view and manage pending test requests.
- Laboratory technicians should be able to schedule patients for tests based on priority.
- Laboratory technicians should be able to conduct tests and record results in patient records.
- Laboratory technicians should be able to upload and attach scanned or machine-generated test reports.
- Laboratory technicians should be able to notify doctors when test results are available.

- Laboratory technicians should be able to notify patients when their results are ready.
- Laboratory technicians shall have all their actions logged for security and audit purposes.

Pharmacy Staff

- Pharmacy staff should be able to log in securely.
- Pharmacy staff should be able to process prescriptions efficiently and check for drug interactions.
- Pharmacy staff should be able to track and manage inventory in real-time.
- Pharmacy staff should be able to communicate with doctors for prescription clarifications.
- Pharmacy staff should be able to issue medications to patients in a timely manner.
- Pharmacy staff should be able to receive automatic alerts for low-stock or expired medications.
- Pharmacy staff should be able to generate reports on dispensed medications and inventory levels.
- Pharmacy staff should have access to patient medication history to avoid duplicate or conflicting prescriptions.
- Pharmacy staff should ensure compliance with pharmacy regulations and patient safety guidelines.
- Pharmacy staff should have access to an intuitive and efficient interface for quick access to necessary information.

Organ Donor Coordinator

- Organ Donor Coordinator should be able to register new organ donors in the system.
- Organ Donor Coordinator should be able to match donors with recipients based on medical compatibility.
- Organ Donor Coordinator should be able to receive notifications when a matching donor-recipient pair is found.
- Organ Donor Coordinator should be able to track the real-time transport status of organs.
- Organ Donor Coordinator should be able to generate reports on organ donation statistics.

Emergency Service

- Emergency staff should have instant access to patient emergency medical records, including allergies and ongoing treatments.
- Emergency responders should receive automatic navigation to the emergency location with traffic-aware routing.
- Emergency responders should be able to communicate directly with hospital staff while transporting a patient.
- Emergency staff should receive automatic alerts if a patient has infectious diseases or special care requirements.
- Emergency staff should be able to submit digital post-incident reports immediately after handling a case.

Nutritionist

- Nutritionist should be able to log in securely.
- Nutritionist should be able to create and update personalized meal plans for patients.
- Nutritionist should be able to track patient progress over time (e.g., weight, BMI, dietary adherence).
- Nutritionist should be able to calculate nutritional needs based on patient data (e.g., age, gender, activity level).
- Nutritionist should have access to an intuitive interface for easy navigation.
- Nutritionist should be able to access patient data and generate reports quickly.
- Nutritionist should be able to share patient data and recommendations with other healthcare providers.
- Nutritionist should be able to receive referrals from physicians.
- Nutritionist should have access to educational resources for patients (e.g., articles, videos).
- Nutritionist should ensure that patient data is secure and accessible only to authorized personnel.

IT Support

- IT Support should be able to add new users (e.g., patients, doctors) to the system.
- IT Support should be able to update user information (e.g., roles, permissions).
- IT Support should be able to deactivate or delete users when necessary.
- IT Support should have the ability to manage user permissions and roles.
- IT Support should be able to monitor system performance in real time.
- IT Support should receive alerts for potential system failures or performance drops.
- IT Support should be able to apply patches and software updates remotely.

3.2 Functional Requirements

Laboratory Staff

Req#	Requirement	Comments	Priority
FR_LAB_01	The system shall manage lab test requests and results, including scheduling and dissemination, and automatically notify doctors, patients, and laboratory staff when new results are posted.	Ensures efficient lab operations and reduces delays in medical decisions.	1
FR_LAB_02	The system shall support uploading, digital storage, and access to imaging files (X-rays, MRIs, CT scans).	Enables secure record management.	1

Organ Donor Coordinator

Req#	Requirement	Comments	Priority
FR_ORG_01	The system must allow coordinators to register organ donors by storing personal and medical details in the database. It should automatically generate donor-recipient matches using data from the database and notify coordinators for further review.	Storing donor information in a database helps keep records organized and easy to access. Using the database to find matches saves time by automating the process and improves the chances of finding compatible recipients quickly	1
FR_ORG_02	The system must allow coordinators to generate monthly and yearly reports using data from the database, covering donor registrations, successful transplants, waiting list status, and other key metrics. These reports should support medical research, performance analysis, and ensure compliance with healthcare regulations.	Generating regular monthly and yearly reports helps track how many donors have registered, how many transplants were successful, and the current waiting list status. Using the database ensures the information is accurate and up-to-date. These reports help hospitals make better decisions, improve performance, and meet legal requirements.	1

Doctors

Req#	Requirement	Comments	Priority
FR_DOC_01	The system must allow doctors to create, edit, and update patient records, including medical history, diagnoses, treatments, and progress notes. These records should be securely stored and accessible in real-time to authorized healthcare providers.	Keeping patient records updated helps doctors make better decisions. When records are accurate and easy to access, doctors can provide faster and safer treatment.	1
FR_DOC_02	The system must enable doctors to electronically prescribe medications, check for potential drug interactions, and send prescriptions directly to connected pharmacies.	Electronic prescriptions help doctors provide accurate medication, prevent errors from handwriting or wrong doses, check for drug interactions, and speed up treatment by sending prescriptions directly to pharmacies.	1

FR_DOC_03	The system must allow doctors to view, manage, and update their schedules in real time, ensuring that patient appointments, surgeries, and other tasks are accurately recorded and synchronized to prevent scheduling conflicts.	This requirement is crucial for the overall functionality of the system. Real-time updates ensure that any changes made to a doctor's schedule are immediately reflected across all relevant parts of the system, thus avoiding conflicts. The inclusion of patient appointments and surgeries is also vital, as these activities are time-sensitive and need to be handled with the utmost accuracy and synchronization.	1

Emergency Service

Req#	Requirement	Comments	Priority
FR_ES_01	The system shall provide emergency responders with real-time streaming of patient vitals from wearable health devices, integrate with GPS for automatic ETA updates, and pre-notify hospital staff about incoming cases.	Ensures timely response and hospital preparedness.	1
FR_ES_02	The system shall include a digital emergency checklist that guides responders based on patient conditions and enables automated report generation through voice commands and sensor data.	Reduces human error and administrative workload.	2
FR_ES_03	The system shall allow ambulances to reroute dynamically based on real-time traffic conditions and allow automatic hospital bed availability checks to ensure patients are taken to the nearest facility with available capacity.	Enhances efficiency in emergency response.	2

Nutritionist

Req#	Requirement	Comment	Priority
FR_NUT_01	The system shall allow the nutritionist to manage (view, add, update, and delete) patient dietary records, assess intake, create personalized plans, and generate progress reports for data-driven decision-making.	Ensures accurate dietary records, continuous monitoring, and actionable insights.	1

FR_NUT_02	The system shall enable the nutritionist to share patient data with other healthcare professionals for coordinated care.	Supports collaboration for improved patient outcomes.	1
FR_NUT_03	The system shall allow the nutritionist to schedule, update, and conduct consultations, both in-person and virtual, for flexible patient care.	Provides accessibility and flexibility in care.	2
FR_NUT_04	The nutritionist shall be able to provide patients with educational materials, meal plans, send reminders, and track adherence to support patient engagement and compliance with dietary plans.	Encourages patient involvement and adherence to dietary plans.	3

Pharmacy Staff

Req#	Requirement	Comment	Priority
FR_PHA_01	The system shall manage prescriptions by allowing pharmacy staff to securely access, verify, process, and update patient prescriptions while checking for drug interactions, duplicate prescriptions, and ensuring secure communication with doctors.	Enhances patient safety, prevents medication errors, and ensures accurate prescription handling.	1
FR_PHA_02	The system shall track and manage pharmacy inventory in real-time, generating automatic reorder alerts for low stock and providing reports on dispensed medications, stock levels, and expiry dates.	Supports efficient inventory control, prevents shortages, and ensures regulatory compliance.	1

FR_PHA_03	The system shall let the pharmacy staff enroll patients in a loyalty program, track their purchase history, apply discounts based on accumulated loyalty points, and generate reports on customer purchasing trends and high-demand medications.	This feature supports customer retention by rewarding loyalty, improves inventory management through insights, and helps in optimizing pharmacy promotions and discounts.	3

IT Support

Req#	Requirement	Comments	Priority
FR_IT_01	The system shall allow IT Support to add, update, deactivate, or delete user accounts and user information (e.g., roles, permissions).	Ensures new users can be registered and granted appropriate access and ensures user data remains accurate and up-to-date.	1
FR_IT_02	The system shall monitor system performance in real time and provide alerts for potential issues.	Ensures proactive system monitoring and stability.	1
FR_IT_03	The system shall allow IT Support to apply patches and software updates remotely.	Ensures timely maintenance and security compliance.	2

Patients

Req#	Requirement	Comments	Priority
FR_PT_01	The system shall allow patients to schedule, modify, and cancel appointments.	Ensures flexibility and accessibility for patients.	2
FR_PT_02	The system shall provide patients with secure access to their medical records and test results.	Protects patient privacy while enabling self-care.	1
FR_PT_03	The system shall allow patients to request prescription refills.	Simplifies medication management for patients.	2
FR_PT_04	The system shall provide access to telemedicine consultations through the platform.	Enhances healthcare accessibility.	3
FR_PT_05	The system shall allow patients to provide feedback and rate their care experience.	Supports continuous improvement in healthcare services.	3

FR_PT_06	The system shall allow patients to quickly access emergency services, enabling one-click alerts to emergency responders.	Enhances rapid response capabilities during medical emergencies, ensuring timely medical intervention and improved patient safety.	1
FR_PT_07	The system shall allow patients or their representatives to request organ matches, linking their profiles directly with potential donor databases.	Facilitates urgent connections between patients needing transplants and available organ donors.	1

3.3 Non-Functional Requirements

3.3.1 Product Requirements

3.3.1.1 Usability Requirements

- New users should require no more than 2 hours of training to use basic system functionalities effectively.
- The system should provide a comprehensive help section with at least 50 indexed help frames
- The system shall ensure that all user interfaces are intuitive and accessible to users with minimal training.
- The system shall support multilingual interfaces to accommodate diverse user bases.
- The system shall provide a mobile-friendly experience, with dedicated apps for Android and iOS.
- The system shall provide a high-contrast, simplified interface for emergency responders, optimized for use in high-stress environments.

3.3.1.2 Performance Requirements

- The system shall handle at least 100,000 concurrent users without performance degradation.
- Response times for all critical operations shall not exceed 2 seconds.
- The system shall support at least 50,000 simultaneous emergency requests to ensure scalability.

3.3.1.3 Availability

- The system shall provide data backup and disaster recovery solutions to ensure data integrity and availability.
- The system should average 10,000 hours between failures. on average, the system should operate flawlessly for about 10,000 hours before encountering a problem

- The system should have a downtime probability of less than 0.1%.
- The system should not have more than one failure per 14 months.
- The system must be available 99.9% of the time, as previously stated.
- The system shall perform daily backups of all critical data, with backups stored in a secure, offsite location. Data recovery shall be possible within 1 hour of an outage.

3.2.1.4 Security

- The system shall implement end-to-end encryption for all data transmissions.
- The system shall use multi-factor authentication for users.
- The system shall automatically log out users after 15 minutes of inactivity to prevent unauthorized access.
- The system shall ensure all data related to emergency health interventions is securely encrypted and stored for a minimum of 6 years to comply with medical privacy laws.

3.2.1.5 Speed

- The system must process at least 1000 transactions per second during peak usage.
- The response time for user interactions should not exceed 1 second under normal conditions.
- Screen refreshes should occur in no more than 2 seconds.

3.2.1.6 Size

- Minimum Starting Capacity of 1 TB (1000 GB). For initial operations and accommodate the storage of detailed medical images and other large data files.
- For hardware installations, the system should be efficient enough to run on servers without requiring more than 4 ROM chips.

3.2.1.7 Robustness

- The system should be capable of restarting within 5 minutes after any failure.
- Less than 0.005% of system events should result in failures.
- The likelihood of data corruption during failures should be less than 0.001%

3.2.1.8 Portability

- The system should be deployable on all major operating systems including Windows, macOS, and Linux.
- The system shall also be accessible via **mobile applications** on **iOS** and **Android** platforms, ensuring seamless functionality across both desktop and mobile devices.

3.2.1.9 Scalability

- The system shall be scalable to accommodate an increasing number of users, data volume, and transaction intensity.
- The system shall be capable of integrating multiple hospitals and clinics without system downtime.

3.2.1.10 Maintainability

- The system shall be easy to maintain and update, with capabilities for modular upgrades and patches.
- The system shall provide comprehensive logging and monitoring tools to facilitate troubleshooting and system analysis.

3.3.2 Organizational Requirements

- The system shall integrate with the organization's existing Enterprise Resource Planning (ERP) system for procurement and financial tracking.
- The system shall include a training program for all users, with documentation available in both digital and printed formats.
- The system shall provide role-based training modules tailored to procurement staff, insurance companies, and laboratory technicians etc.
- The system shall generate monthly performance reports for review by the system's administrative team.
- The system shall enforce the organization's role-based access control (RBAC) policy, ensuring users only access data relevant to their roles.

3.3.3 External Requirements

3.3.3.1 Legislative Requirements:

- The system shall comply with GDPR (General Data Protection Regulation) for data protection and privacy.

3.3.3.2 Data Retention and Archiving:

- The system shall comply with legal data retention policies, retaining patient records for a minimum of 6 years and financial records for 7 years.
- The system shall provide secure archiving solutions for long-term data storage, ensuring data integrity and accessibility.

3.3.3.3 Industry Standards:

- The system shall comply with ISO 27001 for information security management.

4. Use Cases

4.1.1 Doctor Use Cases

UC_DOC_01	Manage Patient Records
Summary	The system allows doctors to create, edit, and update patient records, including medical history, diagnoses, treatments, and progress notes.
Actors	Doctor
Preconditions	-Doctor must be logged into the system. -If the patient exists, their record must be retrievable from the database. -If the patient is new, the system must allow new patient entry.
Main Sequence	1. **Doctor logs into the system** using a secure username and password. 2. **Doctor navigates to the 'Patient Records' module** from the system dashboard. 3. **Doctor searches for the patient** by name, patient ID, or other identifier. If the patient exists: 4. **The system retrieves the patient's record** and displays the following: • Personal details (name, date of birth, contact information) • Medical history • Diagnoses and treatments • Prescribed medications • Progress notes 5. **Doctor reviews the record** and makes necessary updates. 6. **Doctor modifies or adds new details**, such as: • Updating medical history (e.g., new allergies or conditions). • Entering new diagnoses and treatments.

	• Adding new medications. • Writing progress notes. 7. **Doctor submits the changes.** 8. **The system validates and securely stores the updated record.** If the patient does not exist: 9. **The system informs the doctor that no matching record was found.** 10. **Doctor selects 'Create New Patient'.** 11. **Doctor enters the patient's personal and medical details.** 12. **Doctor submits the new patient record.** 13. **The system validates and securely stores the new record.**
Alternative Sequence	- If a patient is not found, the system prompts the doctor to create a new record. - If data validation fails, the system requests corrections.
Non-Functional Requirements	- Secure access and encryption - Easy search and update functions
Postconditions	- The patient record is updated (if the patient existed). -A new patient record is created (if the patient did not exist). -The information is securely stored and available in real time.

UC_DOC_02	Electronic Prescription
Summary	The system enables doctors to prescribe medications electronically, check for potential drug interactions, and send prescriptions to pharmacies.
Actors	Doctor, Pharmacy

Preconditions	- Doctor must be logged in. - The patient must have an active medical record.
Main Sequence	1. Doctor logs into the system using secure credentials. 2. Doctor selects the 'Prescribe Medication' option. 3. Doctor searches for and selects the patient. 5. Doctor enters prescription details, including: • Medication name • Dosage and frequency • Duration of use 6. The system checks for potential drug interactions by: • Comparing with the patient’s existing medications • Checking for known allergies • Identifying contraindications 7. If interactions are found, the system alerts the doctor and suggests alternatives. 8. Doctor reviews and confirms the prescription. 9. The system securely sends the prescription to the selected pharmacy. 10. The pharmacy system receives the prescription and verifies it. 11. Pharmacist checks stock availability. 12. If medication is available, the pharmacist: • Prepares the medication. • Labels it with instructions. • Updates the system to "Ready for Pickup." 13. If medication is out of stock, the pharmacist: • Notifies the system to alert the doctor.

	• Suggests an alternative if available. 14. Patient receives an SMS or email notification that the prescription is ready. 15. Patient arrives at the pharmacy, verifies identity, and collects medication. 16. Pharmacist updates the system to mark the prescription as 'Dispensed'.
Alternative Sequence	- If the doctor enters incomplete prescription details, the system prompts for missing information before proceeding. -If the patient does not have a medical record, the doctor is prompted to create one before prescribing medication. -If the doctor accidentally submits a duplicate prescription, the system warns them and asks for confirmation.
Non-Functional Requirements	- High security and encryption - Real-time interaction checking - Integration with pharmacy systems
Postconditions	-The prescription is securely stored and sent to the pharmacy. -The patient collects their medication without errors. -The pharmacy logs the successful dispensation of the medication.

UC_DOC_03	Manage Doctor’s Timetable
Summary	This use case allows doctors to manage their schedules by viewing, updating, and organizing patient appointments, surgeries, and administrative tasks. The system ensures that patient bookings are automatically reflected in the timetable and prevents scheduling conflicts. Doctors can also manually add appointments if a patient is physically present or unable to book online.
Actors	• Primary Actor: Doctor

	• Secondary Actors: System, Patients
Preconditions	- The doctor must be logged into the system with valid credentials. -The system must have access to the doctor's existing schedule and patient appointments. -The system must support patient-initiated bookings that automatically reflect in the doctor's schedule. -The doctor must have the appropriate system permissions to modify the schedule.
Main Sequence	1. Doctor logs in using secure credentials. 2. Doctor navigates to the "Timetable" or "Schedule" section. 3. The system retrieves and displays the doctor's full schedule, including: • Confirmed Patient Appointments (automatically booked by patients). • Pending Appointments (requests that require manual approval). • Surgery Schedules. • Administrative Meetings or Tasks. • Breaks or Blocked Time Slots. 4. Doctor views appointment details, including: • Patient's name, contact details, and medical history (if authorized). • Reason for the visit. • Appointment type (physical visit, teleconsultation, follow-up). • Appointment status (confirmed, pending, rescheduled). 5. Doctor updates the schedule as needed: • Manually Add Appointments (New Step!): ○ If a patient is physically present or unable to book online, the doctor selects "Add Appointment". • Doctor enters patient details (or selects an existing patient from the system). • Doctor selects an available time slot. • System validates availability and prevents double booking.

	• Doctor confirms, and the system updates the timetable. • Patient receives an appointment confirmation. • Reschedule Appointments: Selects a new time slot → System checks for conflicts → Patient is notified. • Block Time Slots: Doctor blocks time for personal use or administrative tasks → System prevents bookings in those slots. 6. System automatically prevents double bookings and ensures time slot availability. 7. Doctor confirms and saves changes. 8. System updates the timetable and sends notifications to affected patients (if changes were made).

4.1.2 Organ Donor Coordinator Use Cases

UC_ORG_01	Register Organ Donors
Summary	The system allows coordinators to register organ donors by storing personal and medical details. It automatically generates donor-recipient matches and notifies coordinators for further review.
Actors	Organ Donor Coordinator
Preconditions	- The coordinator must be logged into the system with valid credentials. -The donor must provide required personal and medical details for registration. -The system must have access to the donor-recipient matching database to check for potential matches.
Main Sequence	1. Coordinator logs into the system using valid credentials. 2. Coordinator navigates to the 'Register Donor' section from the dashboard. 3. Coordinator selects 'Add New Donor'. 4. Coordinator enters donor’s personal details, including: • Name • Date of birth • Contact information • Address 5. Coordinator enters donor’s medical details, including:

	• Blood type • Known allergies • Any medical conditions that may affect donation 6. The system validates the entered information to ensure completeness and correctness. 7. The system stores the donor details in the database for future reference. 8. The system attempts to generate a donor-recipient match based on: • Blood type compatibility • Urgency level of recipient • Geographic proximity 9. The system notifies the coordinator with a match recommendation if a match is found. 10. Coordinator reviews the match details and finalizes the registration. 11. System confirms donor registration and logs the activity.
Alternative Sequence	- If validation fails, the system prompts for corrections. - If no match is found, the donor remains in the database for future matches.
Non-Functional Requirements	- Secure data storage - Fast retrieval of donor information
Postconditions	- Donor details are saved in the system. - A match is generated (if available). - Notification sent to the coordinator.

UC_ORG_02	Generate Reports
Summary	The system allows coordinators to generate monthly and yearly reports covering donor registrations, transplants, waiting list status, and key metrics.
Actors	Organ Donor Coordinator
Preconditions	- Coordinator must be logged into the system. - The database must contain donor and transplant data.

Main Sequence	1. Coordinator logs into the system using authorized credentials. 2. Coordinator selects 'Generate Report' from the dashboard. 3. Coordinator chooses the report type and time period (monthly or yearly). 4. • The system retrieves relevant data from the database, including: • Number of donor registrations • Number of successful transplants • Current waiting list statistics 5. The system processes the data and compiles it into a structured report. 6. The system formats the report (e.g., PDF, Excel, or dashboard view). 7. Coordinator reviews the generated report for accuracy. 8. Coordinator exports or shares the report with relevant stakeholders.
Alternative Sequence	- If no relevant data is available, the system notifies the coordinator that report generation is not possible. -If an error occurs during report generation, the system logs the error and provides a retry option. -If the system takes too long to generate the report, the coordinator is given an option to receive it via email when ready
Non-Functional Requirements	- Fast data retrieval - Secure report storage - Compliance with healthcare regulations
Postconditions	- The report is generated and available for review. - The coordinator can download or share the report.

4.1.3 Nutricionist Use Cases

UC Name	**Dietary Record Management & Monitoring**
UC Code and Name	UC_NUT_01: Dietary Record Management & Monitoring

Summary	The system shall allow the nutritionist to manage (view, add, update, and delete) patient dietary records, assess intake, create personalized plans, and generate progress reports for data-driven decision-making.
Dependency	This use case may depend on the "Patient Profile Management" use case for retrieving patient details.
Actors	**Primary Actor:** Nutritionist **Secondary Actors:** Patient (for providing dietary data)
Preconditions	● The nutritionist must be logged into the system. ● The patient must have a registered profile in the system. ● If the patient is new, the system must allow the entry of a new patient profile.
Description of the Main Sequence	1. The nutritionist logs into the system using a secure username and password. 2. The nutritionist navigates to the “Dietary Record Management” module from the dashboard. 3. The nutritionist searches for a patient using a unique identifier (e.g., name, patient ID, or contact details). 10. **If the patient exists:** 4. The system retrieves and displays the patient's dietary records. 5. The nutritionist reviews and updates dietary records. 6. The nutritionist modifies or adds new details. 7. The nutritionist submits the changes. 8. The system validates and securely stores the updated record. 11. **If the patient does not exist:** 9. The system informs the nutritionist. 12. The nutritionist creates a new patient record. 13. The system validates and securely stores the new record. 4. The nutritionist generates a progress report. 5. The system compiles and presents the report for review. 6. The nutritionist finalizes and saves the report.
Description of the Alternative Sequence	1. If the patient has no existing dietary records, the nutritionist creates a new dietary record. 2. If invalid data is entered, the system prompts the nutritionist to correct it. 3. If the patient profile is incomplete, the system notifies the nutritionist.
Non-Functional Requirements	- The system should allow real-time access to dietary records. - Data security measures must be implemented to ensure patient confidentiality. - The system should support a user-friendly interface with role-based access control.
Postconditions	- The dietary records are updated and saved in the system. - A personalized dietary plan is created. - A progress report is generated for monitoring dietary intake.

UC Name	Healthcare Collaboration
UC Code and Name	UC_NUT_02: Healthcare Collaboration
Summary	The system shall enable the nutritionist to share patient data with other healthcare professionals for coordinated care.
Dependency	This use case may depend on "Dietary Record Management & Monitoring" for accessing patient dietary records.
Actors	**Primary Actor:** Nutritionist **Secondary Actors:** Other Healthcare Professionals (Doctors etc)
Preconditions	- The nutritionist must be logged into the system. - The patient’s dietary records must exist in the system.
Description of the Main Sequence	1. The nutritionist logs into the system. 2. The nutritionist selects the "Share Patient Data" option. 3. The system displays a list of available patient records. 4. The nutritionist selects a patient record and chooses a healthcare professional to share it with. 5. The system verifies access permissions and confirms data-sharing authorization. 6. The system securely shares the data with the selected healthcare professional. 7. The system notifies the recipient of the shared patient data.
Description of the Alternative Sequence	1. If the healthcare professional is not authorized, the system denies access. 2. If no patient records are available, the system notifies the nutritionist. 3. If network issues occur, the system prompts the user to retry later.

Non-Functional Requirements	- The system must ensure secure data sharing using encryption and access control mechanisms. - Only authorized healthcare professionals should access patient data. - The system should log all data-sharing activities for auditing purposes.
Postconditions	- Patient data is securely shared with authorized healthcare professionals. -The recipient healthcare professional receives a notification about the shared data.

UC Name	**Consultation Management**
UC Code and Name	UC_NUT_03: Consultation Management
Summary	The system shall allow the nutritionist to schedule, update, and conduct consultations, both in-person and virtual, for flexible patient care.
Dependency	This use case may depend on "Patient Profile Management" for retrieving patient details.
Actors	**Primary Actor:** Nutritionist **Secondary Actors:** Patient
Preconditions	- The nutritionist must be logged into the system. - The patient must have an active profile in the system.
Description of the Main Sequence	1. The nutritionist logs into the system. 2. The nutritionist accesses the "Consultation Management" module. 3. The system displays a calendar with available consultation slots. 4. The nutritionist selects an available time slot and schedules a consultation.

	5. The system confirms the appointment and notifies the patient. 6. On the scheduled date, the nutritionist conducts the consultation (in-person or virtual). 7. The nutritionist records notes and recommendations after the consultation.
Description of the Alternative Sequence	1. If the patient requests rescheduling, the system allows the nutritionist to modify the appointment. 2. If the patient does not show up, the system logs a missed consultation. 3. If network issues occur in virtual consultations, the system suggests rescheduling.
Non-Functional Requirements	- The system should provide real-time scheduling updates to prevent conflicts. - Secure communication must be ensured for virtual consultations. - The system should provide automated reminders to both the nutritionist and patient.
Postconditions	- The consultation is successfully completed. - The system updates the consultation records.

UC Name	**Patient Engagement & Compliance**
UC Code and Name	UC_NUT_04: Patient Engagement & Compliance
Summary	The nutritionist shall be able to provide patients with educational materials, meal plans, send reminders, and track adherence to support patient engagement and compliance with dietary plans.
Dependency	This use case may depend on "Dietary Record Management & Monitoring" for accessing patient dietary data.

Actors	**Primary Actor:** Nutritionist **Secondary Actor:** Patient
Preconditions	- The nutritionist must be logged into the system. - The patient must have a registered profile in the system.
Description of the Main Sequence	1. The nutritionist logs into the system. 2. The nutritionist accesses the "Patient Engagement" module. 3. The system displays a list of patients and their dietary plans. 4. The nutritionist selects a patient and provides educational materials or updates meal plans. 5. The system sends reminders to the patient. 6. The patient logs dietary intake and progress updates. 7. The system tracks patient adherence and generates a compliance report. 8. The nutritionist reviews the report and adjusts the dietary plan if needed.
Description of the Alternative Sequence	1. If the patient does not engage with reminders, the system escalates the notification frequency. 2. If the patient misses logging their intake, the system prompts them to enter data. 3. If the nutritionist updates a dietary plan, the system automatically notifies the patient.
Non-Functional Requirements	- The system must ensure secure messaging for patient communication. - The system should provide automated reminders via multiple channels (email, SMS, app notifications). - Data analytics should track patient adherence trends.
Postconditions	- The patient receives educational materials and meal plans.

	- The system tracks and records patient adherence. - The nutritionist can assess patient compliance and modify plans accordingly.

4.1.4 Pharmacy Staff Use Cases

UC Name	**Prescription Management**
UC Code and Name	UC_PH_01: Prescription Management
Summary	The system shall manage prescriptions by allowing pharmacy staff to securely access, verify, process, and update patient prescriptions while checking for drug interactions, duplicate prescriptions, and ensuring secure communication with doctors.
Dependency	This use case may depend on "Patient Profile Management" and "Doctor Prescription Entry."
Actors	**Primary Actor:** Pharmacy Staff **Secondary Actors:** Doctors, Patients
Preconditions	- The pharmacy staff must be logged into the system. - The patient must have a valid prescription from a doctor.
Description of the Main Sequence	1. The pharmacy staff logs into the system using secure credentials. 2. The pharmacy staff navigates to the "Prescription Management" module. 3. The system displays a list of active prescriptions. 4. The pharmacy staff searches for a prescription using patient ID, prescription number, or doctor name. 5. The system retrieves the prescription details, including: ○ Patient information ○ Medication details (name, dosage, quantity) ○ Prescribing doctor details ○ Expiry date of prescription 6. The pharmacy staff verifies prescription validity and checks for:

	○ Drug interactions ○ Duplicate prescriptions ○ Dosage errors 7. If no issues are found, the pharmacy staff processes the prescription and dispenses the medication. 8. The system updates the prescription status to "Fulfilled." 9. The system notifies the patient that their medication is ready for collection. 10. If verification from the doctor is required, the system notifies the doctor.
Description of the Alternative Sequence	1. If a drug interaction is detected, the system alerts the pharmacy staff and suggests alternatives. 2. If a duplicate prescription is found, the system prompts for manual review. 3. If the prescription is incomplete or invalid, the system requests clarification from the doctor. 4. If the patient does not collect the prescription within a defined period, the system sends a reminder.
Non-Functional Requirements	- The system must encrypt prescription data to ensure security. - Secure messaging should be available for doctor communication. - The system should maintain a complete audit log of prescription handling.
Postconditions	- The prescription is processed, updated, and marked as fulfilled. - The patient is notified to collect their medication.

Use Case ID	UC_PH_03: Customer Loyalty & Discount Program
Summary	The system allows pharmacy staff to enroll patients in a loyalty program, track purchase history, apply discounts for regular customers, and generate reports on high-demand medications and customer purchasing trends.
Dependency	May depend on "Pharmacy Inventory Management" for tracking dispensed medications.

Actors	**Primary Actor:** Pharmacy Staff **Secondary Actor:** Patients
Preconditions	- Pharmacy staff must be logged into the system. - The patient must have a registered profile in the system.
Description of the Main Sequence	1. **Pharmacy staff logs into the system** using secure credentials. 2. **Pharmacy staff navigates to the "Customer Loyalty Program" module** from the system dashboard. 3. **Pharmacy staff searches for an existing patient profile** using name, patient ID, or contact details. ○ If the patient exists, their profile is displayed. ○ If the patient does not exist, staff must register the patient before proceeding. 4. **Pharmacy staff enrolls the patient in the loyalty program** by selecting the enrollment option and confirming participation. 5. **The system generates a unique loyalty ID** and links it to the patient profile. 6. **Patient makes a purchase** at the pharmacy. 7. **The system tracks the patient's purchase history, including:** ○ Medication names and quantities ○ Date of purchase ○ Total amount spent ○ Any applicable insurance or discounts used 8. **The system calculates loyalty points based on the purchase** and updates the patient's account. 9. **The system applies a discount if the patient has accumulated sufficient loyalty points.** ○ If the patient qualifies for a discount, it is applied automatically. ○ If not, the points are saved for future use. 10. **The system generates a transaction receipt,** displaying purchase details, loyalty points earned, and available discounts.

	11. **The pharmacy staff provides the receipt to the patient** and confirms the successful transaction. 12. **The system updates inventory records** to reflect the dispensed medications. 13. **The system periodically generates reports on:** ● High-demand medications ● Customer purchasing trends ● Effectiveness of the loyalty program 14. **Pharmacy staff reviews the reports** to make data-driven decisions regarding inventory and promotions.
Description of the Alternative Sequence	- If the patient is not registered, the system prompts pharmacy staff to create a new profile. - If there's a discount calculation error, the system notifies pharmacy staff to apply the discount manually or adjust the loyalty balance. - If the patient opts out, the system removes their loyalty status and stops tracking purchases for rewards.
Non-Functional Requirements	- Secure handling of customer data and compliance with privacy regulations. - Real-time discount calculations at checkout. - Automated reports with analytics on customer trends and loyalty program effectiveness.
Postconditions	- Patient is enrolled in the loyalty program (if new). - Purchase is processed, loyalty points are updated, and discounts are applied. - System tracks purchasing trends and generates reports for decision-making.

4.1.5 Laboratory Staff Use Cases

UC Name	UC_LAB_01 – Manage Lab Test Requests and Results
Summary	Lab staff manage lab test requests, input results, and the system automatically notifies doctors, patients, and lab personnel when results are posted.
Dependency	Depends on successful login

Actors	Primary: Laboratory Staff Secondary: Doctor, Patient (as notification recipients)
Preconditions	Laboratory staff must be logged into the system.
Description of the Main Sequence	Step 1: Lab staff logs into the system. Step 2: Lab staff views pending test requests. Step 3: Conducts the lab test or receives results. Step 4: Uploads test results to the system. Step 5: System automatically notifies doctors and patients about result availability.
Description of the Alternative Sequence	Step 1: If test result is delayed, lab staff marks status as "pending". Step 2: If upload fails, system prompts for re-upload.
Non functional requirements	Performance: Results upload should take under 3 seconds. Security: Lab staff have permission to upload doctors and patients can view, but not upload or edit. Notifications should be sent within 10 seconds of result submission.
Postconditions	Test result is stored in the system and notifications are sent to relevant users.

UC Name	UC_LAB_02 – Handle Imaging Files
Summary	Laboratory staff uploads, stores, and manages patient imaging files (X-rays, MRIs, CT scans) securely in the system for authorized access.
Dependency	Depends on successful login
Actors	Primary: Laboratory Staff Secondary: Doctor, Patient (as notification recipients)
Preconditions	Laboratory staff is authenticated and logged in. Imaging data is available in digital format.

Description of the Main Sequence	Step 1: Staff logs into the system. Step 2: Navigates to the “Upload Imaging” module. Step 3: Selects and uploads the imaging file (X-ray, MRI, etc). Step 4: Enters metadata (patient ID, scan type, date). Step 5: Confirms and submits. System stores file securely.
Description of the Alternative Sequence	Step 1: System detects invalid file type – prompts user to reupload. Step 2: Upload is interrupted – system retries or saves draft. Step 3: Missing metadata – system alerts user to complete required fields.
Non functional requirements	Imaging files must be encrypted and stored securely. System must ensure upload completes within 10 seconds for typical file sizes. Maximum file size per upload: 200MB
Postconditions	Imaging files are securely stored, linked to the correct patient, and accessible by authorized healthcare professionals.

4.1.6 Patient Use Cases

UC_PT_01	Appointment Management
Summary	Patients can schedule, modify, and cancel appointments.
Actors	Patient
Description	The patient accesses the scheduling feature, selects an available slot, and confirms the appointment. They can also modify or cancel it.
Pre-Condition	Patient must be logged into their account.
Post-Condition	Appointment is scheduled, modified, or canceled as per the patient’s request.

UC_PT_02	Access to Medical Records
Summary	Patients can securely access their medical records and test results.
Actors	Patient

Description	The patient logs in, navigates to the medical records section, and views their test results.
Pre-Condition	Patient must have valid credentials.
Post-Condition	Patient successfully views their medical records.

UC_PT_03	**Requests Prescription Refill**
Summary	Patients can request prescription refills through the system.
Actors	Patient
Description	The patient submits a refill request through the system, which is forwarded to the healthcare provider.
Pre-Condition	Patient must have an active prescription.
Post-Condition	Refill request is sent to the provider for approval.

UC_PT_04	Telemedicine Access
Summary	The system shall provide access to telemedicine consultations through the platform.
Actors	Patients, Healthcare Providers
Description	Patients can access the telemedicine feature on the platform, enabling them to schedule, attend, and review online consultations with healthcare providers. This service includes features like video calls, chat support, and digital prescriptions.
Pre-Condition	Patients must be registered and logged into the system.
Post-Condition	Patients successfully connect with healthcare providers for consultations, enhancing accessibility and convenience in receiving care.

UC_PT_05	Patient Feedback
Summary	The system shall allow patients to provide feedback and rate their care experience.
Actors	Patients
Description	Patients can access the feedback module in the healthcare management system to rate their care experience and provide detailed feedback on services received. This feature aims to collect valuable insights from patients to help healthcare providers improve service quality.
Pre-Condition	Patients must be registered and logged into the system.
Post-Condition	Feedback is successfully submitted and stored in the system, available for healthcare providers to review and act upon.

UC_PT_06	Emergency Response Activation
Summary	The system shall allow patients to quickly access emergency services, enabling one-click alerts to emergency responders.
Actors	Patients
Description	Patients can activate emergency services through the platform with a single click. This feature immediately alerts emergency responders and shares critical patient information to ensure rapid and effective medical intervention.
Pre-Condition	Patients must be registered and logged into the system.
Post-Condition	Emergency responders are notified, and relevant patient information is shared instantly to facilitate a swift response.

UC_PT_07	Organ Match Request
Summary	The system shall allow patients or their representatives to request organ matches, linking their profiles directly with potential donor databases.
Actors	Patients

Description	Patients or their authorized representatives can initiate a request for organ matches through the platform. This system connects directly with donor databases to find potential matches based on medical compatibility and urgency.
Pre-Condition	Patients must be registered and logged into the system.
Post-Condition	The request is processed, and potential organ matches are identified, facilitating timely communication between transplant teams and patients.

4.1.7 IT Support Use Cases

UC_IT_01	**IT Support Manages User Accounts**
Summary	IT Support can add, update, deactivate, or delete user accounts, and modify user roles and permissions.
Actors	IT Support
Description	IT Support accesses the system's administration panel to manage user accounts and adjust roles and permissions. They can select a user account to create, update, deactivate, or delete it, and modify roles and permissions to ensure appropriate access levels.
Pre-Condition	IT Support must be logged in with admin privileges.
Post-Condition	User accounts are appropriately managed, and roles and permissions are updated to reflect current access needs.

UC_IT_03	**System Monitors Performance**
Summary	The system tracks performance in real time and alerts IT Support to potential issues.
Actors	System, IT Support

Description	The system continuously monitors key performance metrics and sends alerts to IT Support when issues arise.
Pre-Condition	System must be active and running.
Post-Condition	IT Support is notified of system issues.

4.1.8 Emergency Service Use Cases

UC Name:	**UC_ES_01 Real-time Patient Vitals Streaming**
Summary:	The system provides emergency responders with real-time streaming of patient vitals from wearable health devices, integrates with GPS for automatic ETA updates, and pre-notifies hospital staff about incoming cases.
Actors:	• **Primary Actor:** Emergency responders • **Secondary Actor:** Hospital staff
Preconditions:	-The emergency responder must be logged into the system with valid credentials. -Wearable health devices must be functional and paired with the system. -GPS tracking must be enabled.
Description of the Main Sequence:	1. The emergency responder logs into the system using secure credentials. 2. The system verifies the login details and grants access to the dashboard. 3. The responder selects the ‘Real-time Patient Vitals’ module from the dashboard. 4. The responder searches for the patient by entering their unique ID or scanning the wearable device pairing code.

	5. The system retrieves the patient's details and confirms a connection with the wearable device. 6. The system starts receiving real-time vital signs from the patient's device (e.g., heart rate, blood pressure, oxygen levels). 7. The responder reviews the incoming vitals on their interface. 8. The system streams the vitals in real-time to the emergency response team's dashboard. 9. The system calculates the estimated time of arrival (ETA) using GPS data and updates it dynamically. 10. The hospital staff receives a pre-notification with the patient's details, current vitals, and ETA. 11. The emergency responder continuously monitors the vitals and updates necessary records. 12. The system securely stores the patient's vitals and logs for future reference.
Description of the Alternative Sequence:	1. If the wearable device fails to transmit data, responders are alerted to check vitals and input them manually. 2. If GPS tracking is lost, responders manually update ETA and notify hospital staff.
Non-functional Requirements:	- Secure data transmission. - Must support low-latency data transmission.
Postconditions:	- Hospital staff receive the pre-notification with updated patient status. -Patient vitals are securely stored for reference.

UC Name:	**UC_ES_02 Digital Emergency Checklist**
Summary:	The system provides a digital checklist that guides responders based on patient conditions and enables automated report generation through voice commands and sensor data.
Actors:	• **Primary Actor: Emergency responders**

Preconditions:	-The emergency responder must be logged into the system with valid credentials. -The digital checklist system must be functional. -The system should have voice recognition enabled.
Description of the Main Sequence:	1. The emergency responder logs into the system using secure credentials. 2. The system verifies the credentials and grants access. 3. The responder navigates to the ‘Digital Emergency Checklist’ module. 4. The responder inputs or selects the patient's condition or symptoms. 5. The system customizes the checklist based on the patient’s symptoms and displays step-by-step guidance. 6. The responder follows the guided steps, checking off completed tasks. 7. If applicable, the system collects real-time sensor data to update the checklist dynamically. 8. The responder provides voice inputs for additional details (e.g., consciousness level, pain response). 9. The system records the voice input and automatically generates a report.

	10. The system securely saves the report and sends it to relevant hospital staff.
Description of the Alternative Sequence:	1. If voice recognition fails, responders manually input checklist data. 2. If automated report generation is not possible, responders complete reports manually.
Non-functional Requirements:	- The checklist must be accessible offline. - Support voice recognition. - Integrate with hospital records.
Postconditions:	-A completed emergency report is generated and available for medical staff review.

UC Name:	**UC_ES_03 Dynamic Ambulance Rerouting**
Summary:	The system allows ambulances to reroute dynamically based on real-time traffic conditions and enables automatic hospital bed availability checks.
Actors:	• **Primary Actor:** Emergency responder
Preconditions:	- The emergency responder must be logged into the system with valid credentials. -GPS tracking must be active. - Hospital databases must be accessible.
Description of the Main Sequence:	1. The emergency responder logs into the system using secure credentials.

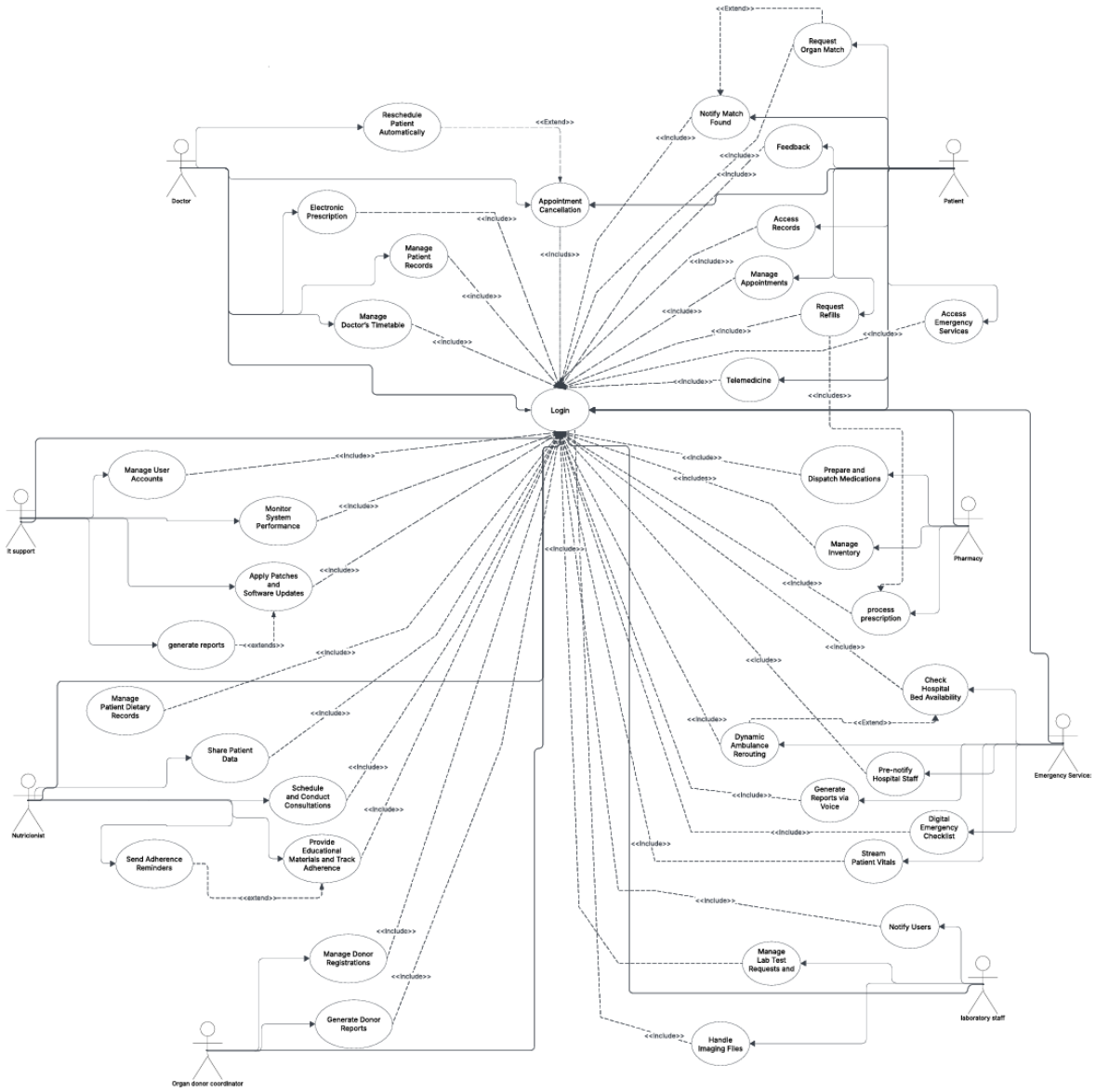
	2. The system verifies the login and grants access. 3. The responder accesses the ‘Dynamic Ambulance Rerouting’ module. 4. The system continuously monitors real-time traffic conditions using GPS data. 5. The system suggests the fastest available route based on traffic updates. 6. The responder confirms the suggested route or selects an alternative if necessary. 7. The system checks hospital bed availability in the nearest facilities. 8. If the initially intended hospital has available capacity, the system confirms the route. 9. If the preferred hospital is full, the system automatically suggests the next best option. 10. The system reroutes the ambulance accordingly and updates ETA. 11. The hospital staff is notified about the incoming patient and estimated arrival time. 12. The responder follows the optimized route while monitoring patient condition updates.

Description of the Alternative Sequence:	1. If GPS tracking fails, responders manually select a route. 2. If no nearby hospitals have available beds, the system suggests the next best option.
Non-functional Requirements:	- Must support real-time updates. - Ensure accurate data processing. - Provide high system reliability.
Postconditions:	- The patient is transported to the most suitable hospital efficiently. - The ambulance reaches the destination using an optimized route.

5. Diagrams

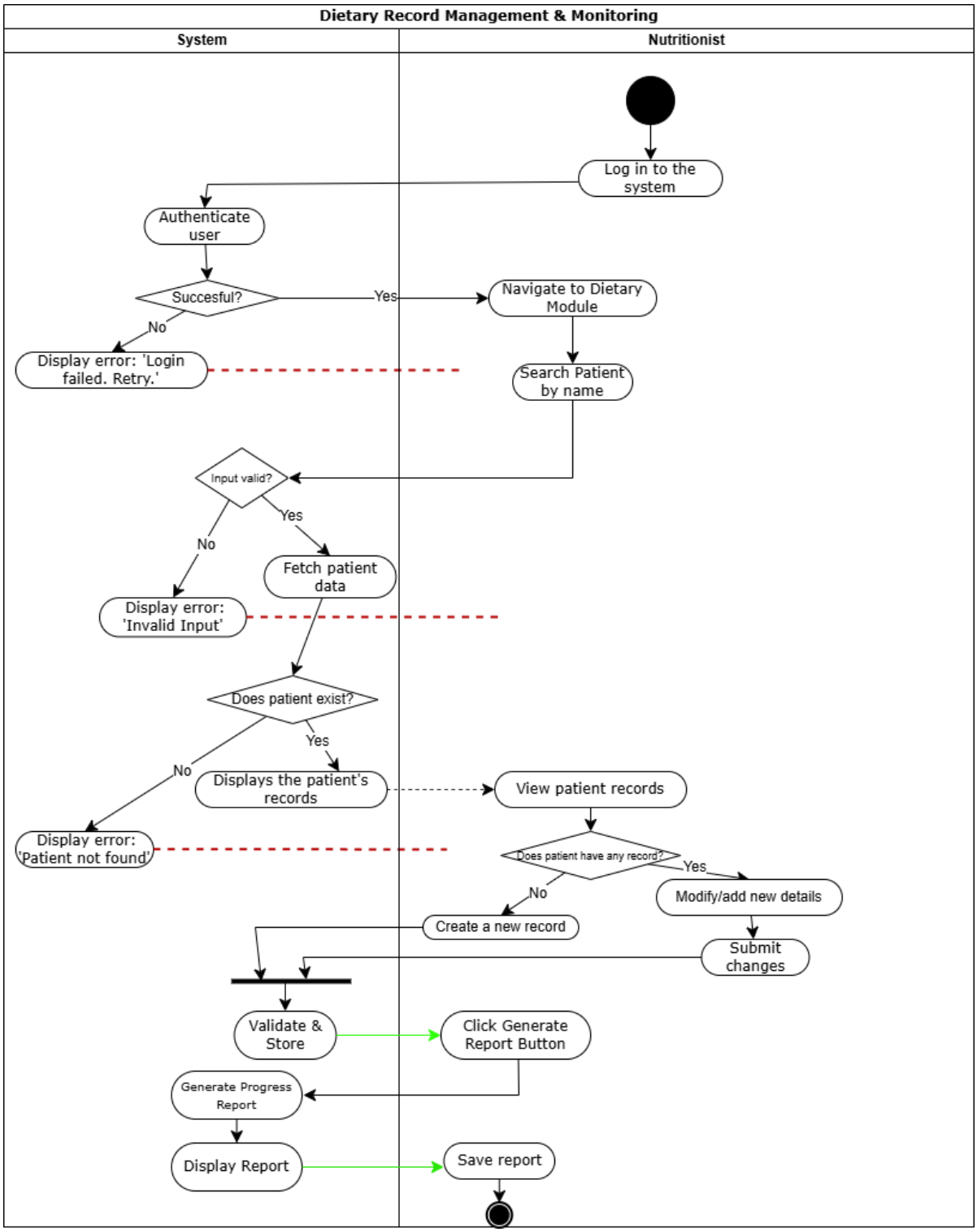
UseCase.pdf

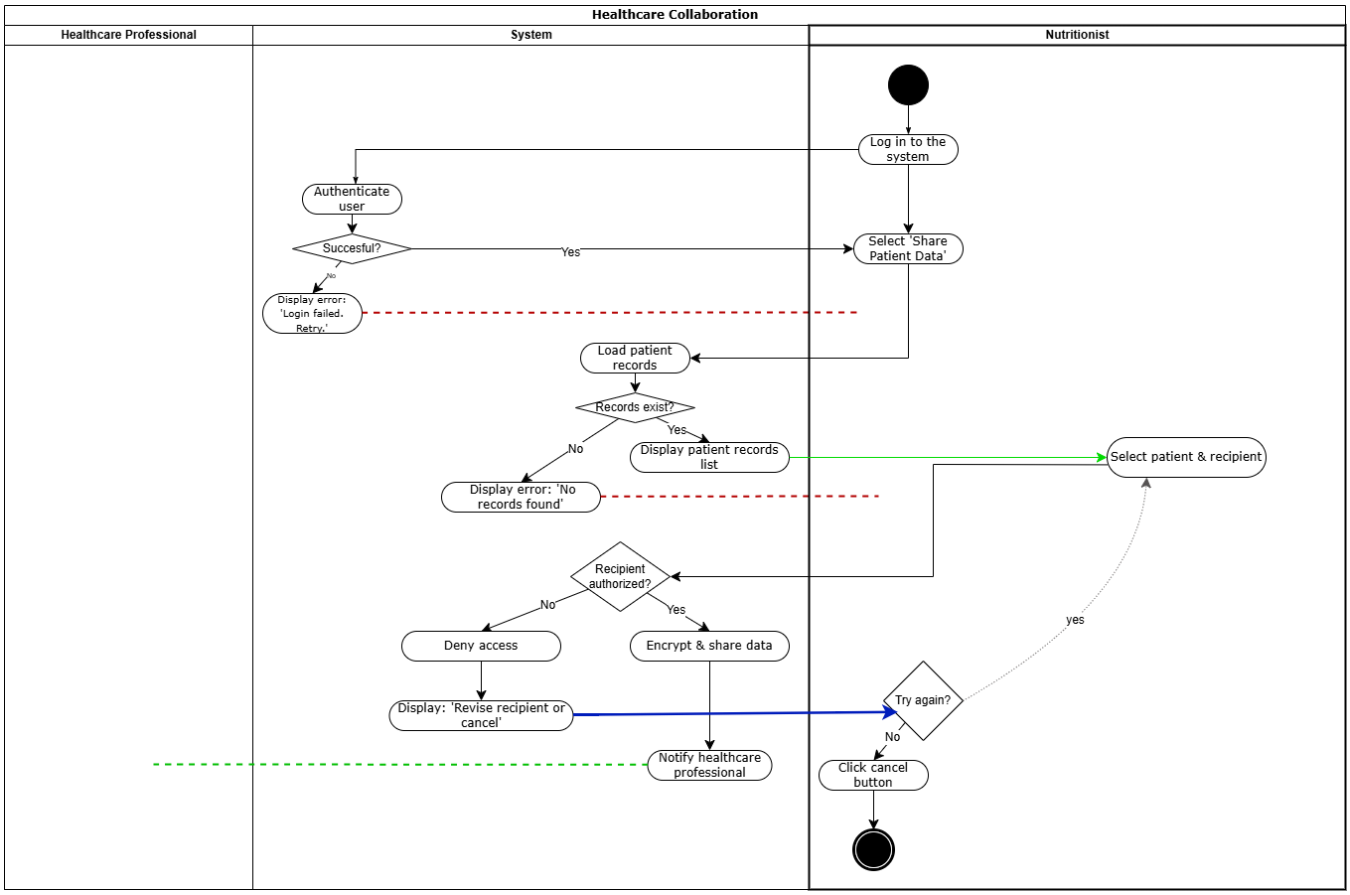
5.1 Use Case Diagram

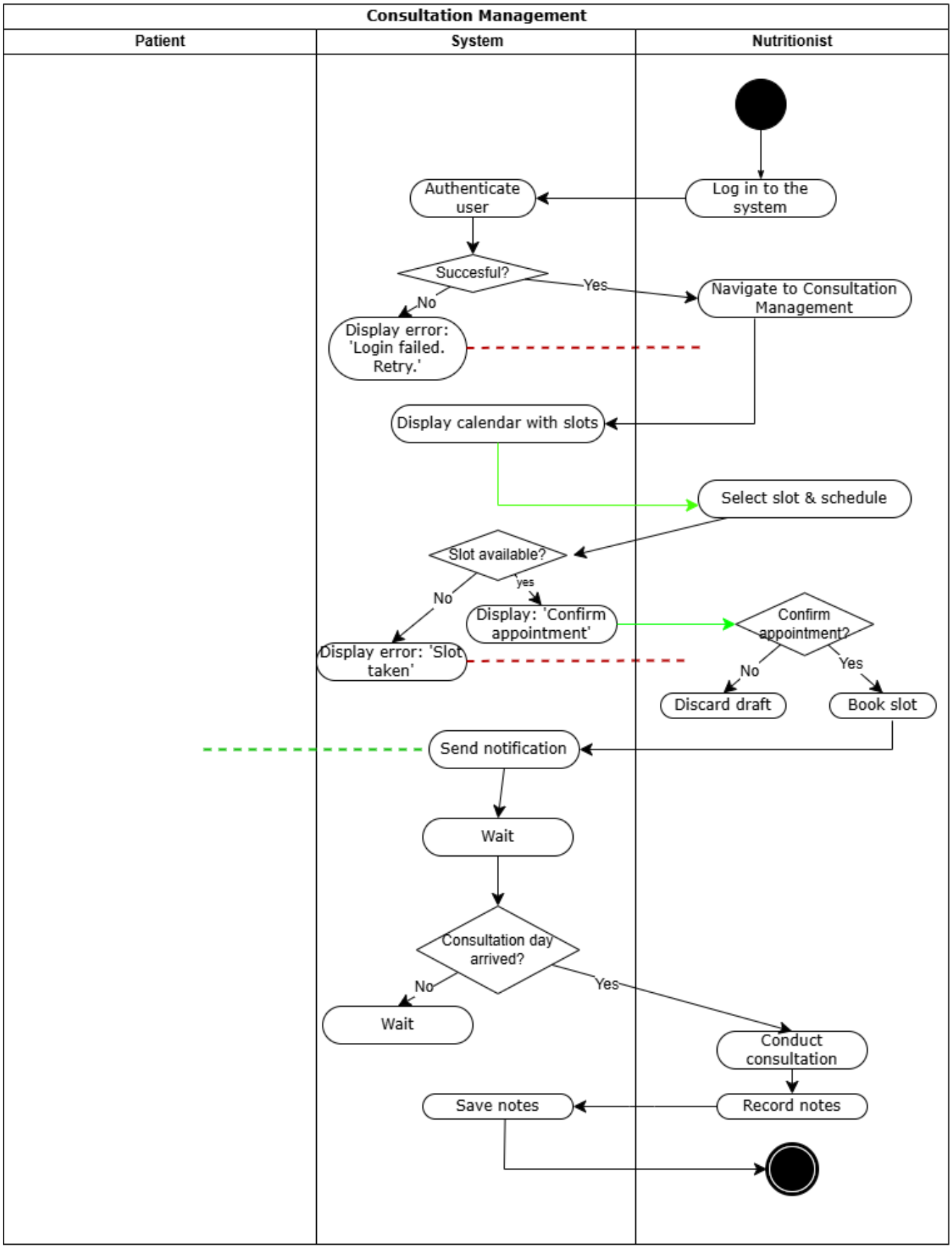

Request Organ Match
Notify Match Found
Reschedule Patient Automatically
Feedback
Doctor
Patient
Appointment Cancellation
Electronic Prescription
Access Records
Manage Patient Records
Manage Appointments
Manage Doctor's Timetable
Request Refills
Access Emergency Services
Telemedicine
Login
Manage User Accounts
Prepare and Dispatch Medications
Monitor System Performance
Manage Inventory
IT support
Pharmacy
Apply Patches and Software Updates
process prescription
generate reports
Check Hospital Bed Availability
Manage Patient Dietary Records
Dynamic Ambulance Rerouting
Share Patient Data
Pre-notify Hospital Staff
Emergency Service
Schedule and Conduct Consultations
Generate Reports via Voice
Nutricionist
Digital Emergency Checklist
Provide Educational Materials and Track Adherence
Stream Patient Vitals
Send Adherence Reminders
Notify Users
Manage Donor Registrations
Manage Lab Test Requests and
Laboratory staff
Generate Donor Reports
Handle Imaging Files
Organ donor coordinator
<<Extend>>
<<Include>>
<<includes>>

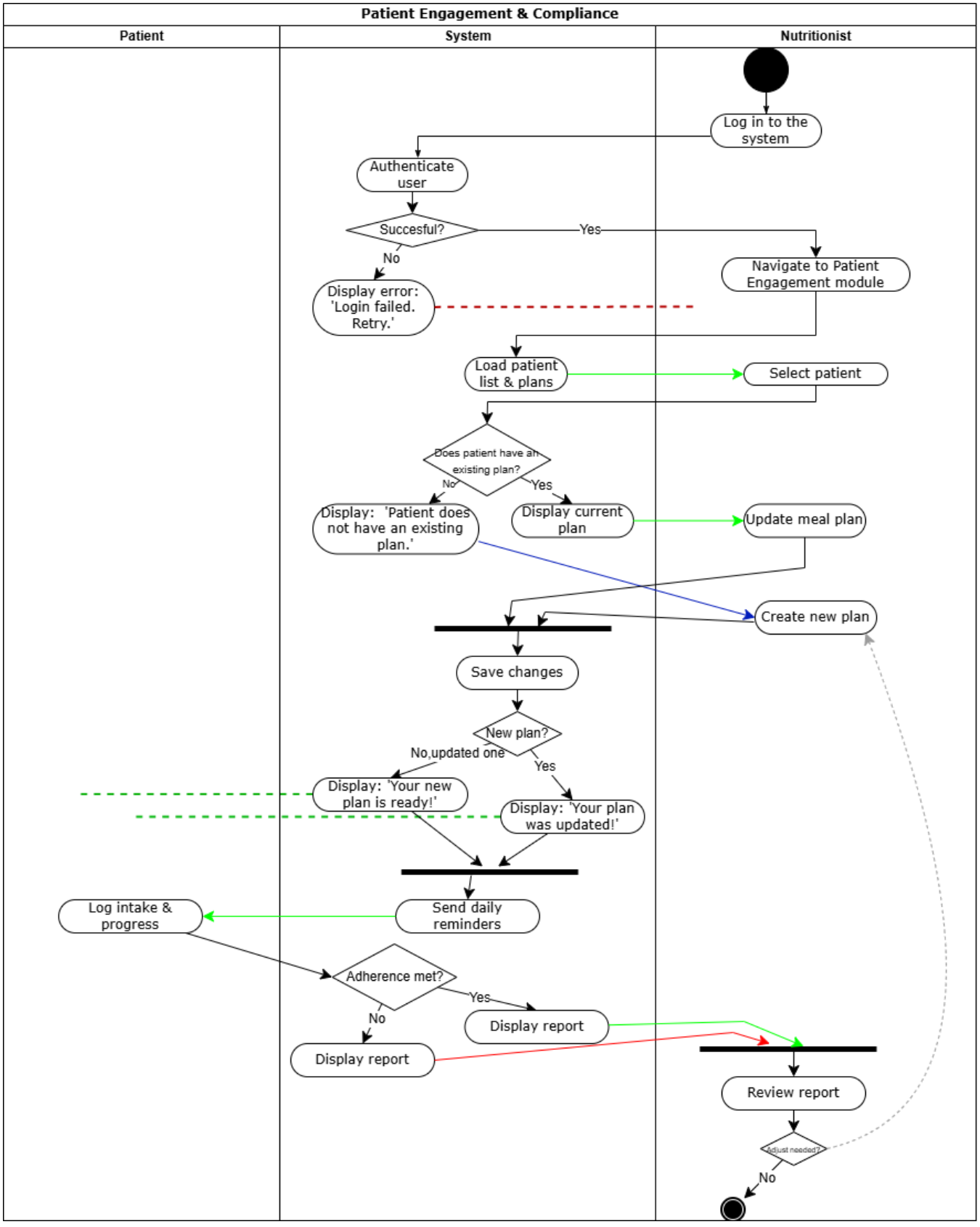
5.2 Activity Diagram

Nutritionist

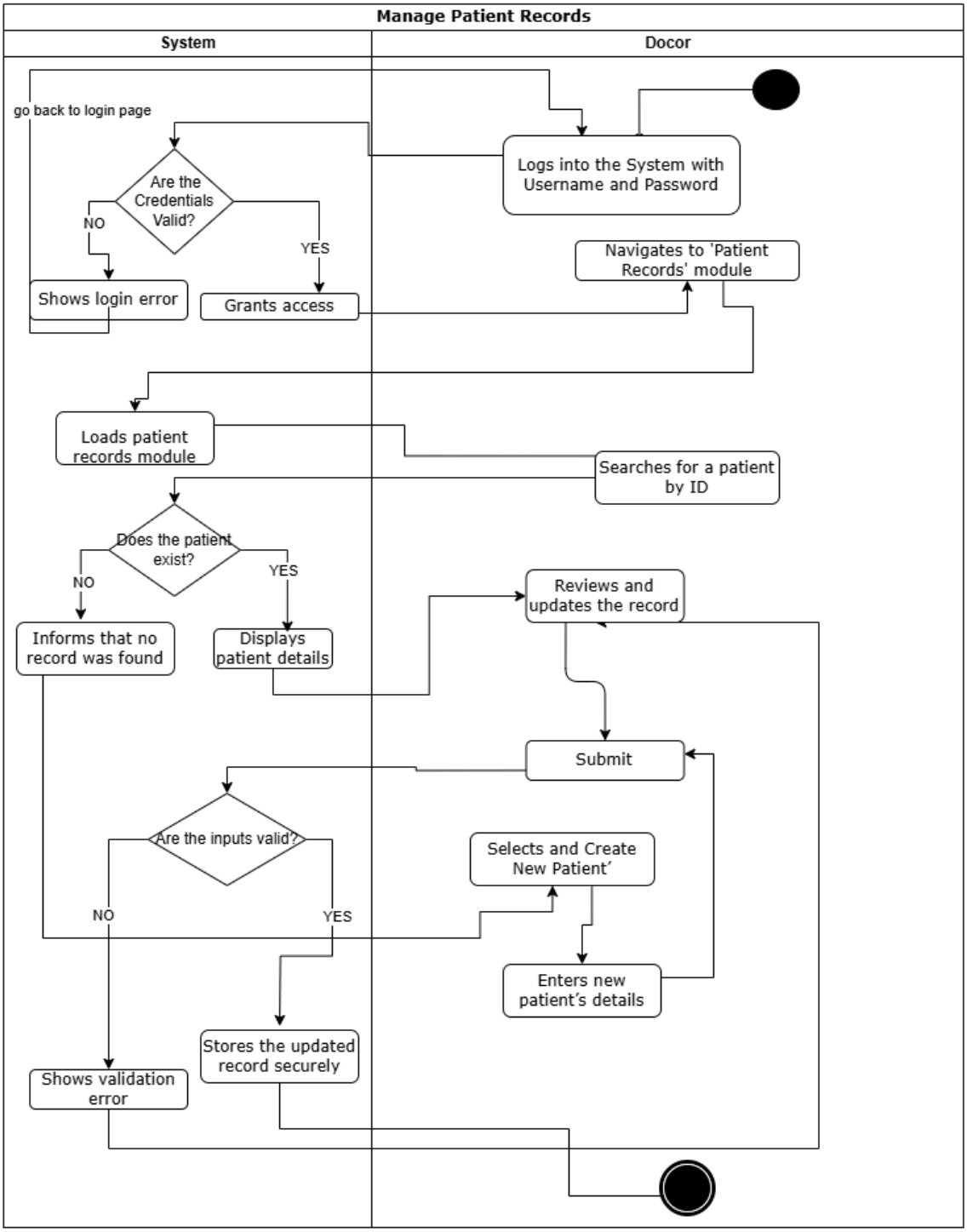


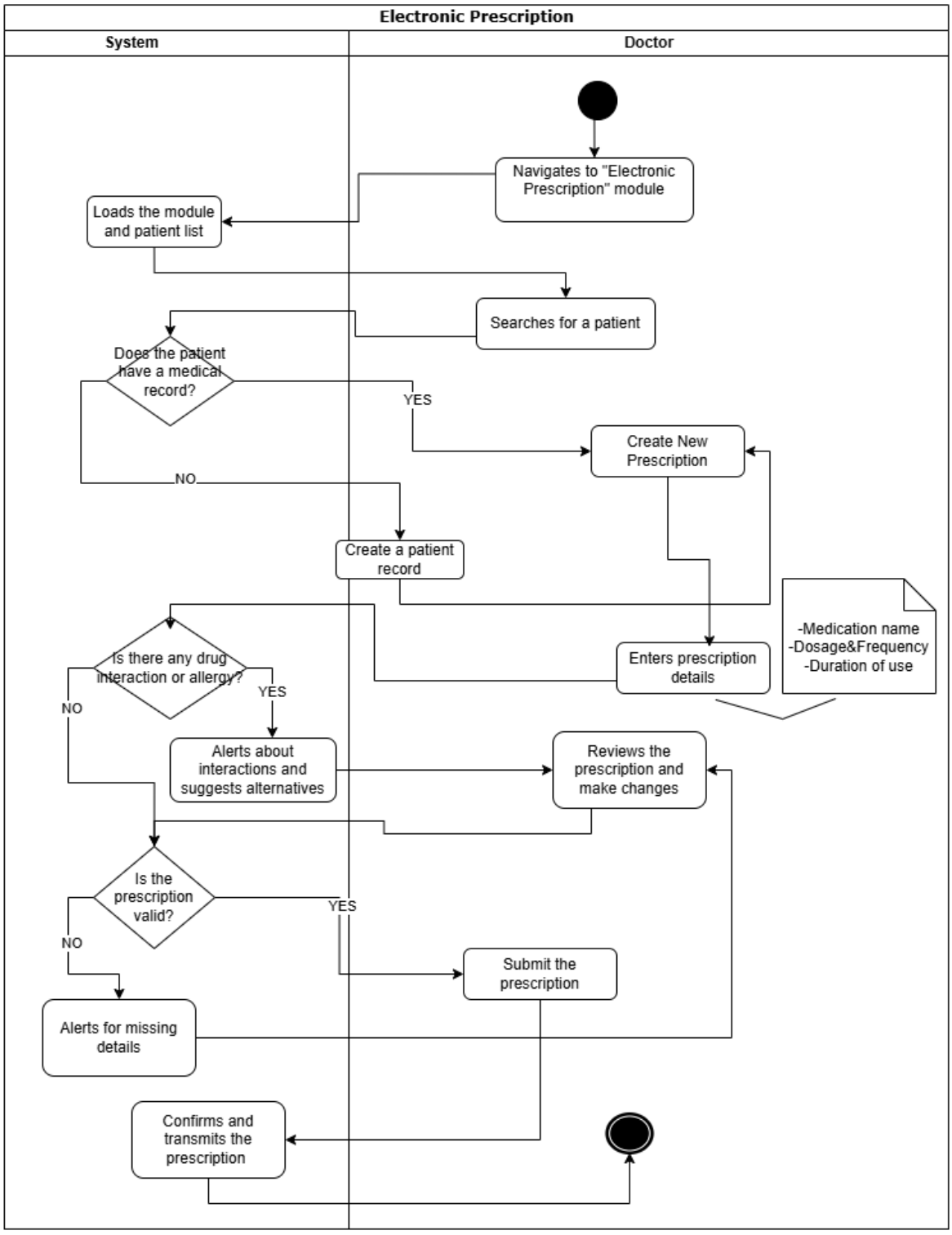

Healthcare Collaboration
Healthcare Professional
System
Nutritionist
Log in to the system
Authenticate user
Succesful?
Yes
No
Select 'Share Patient Data'
Display error: 'Login failed. Retry.'
Load patient records
Records exist?
Yes
No
Display patient records list
Select patient & recipient
Display error: 'No records found'
Recipient authorized?
No
Yes
Deny access
Encrypt & share data
Display: 'Revise recipient or cancel'
Try again?
yes
No
Notify healthcare professional
Click cancel button

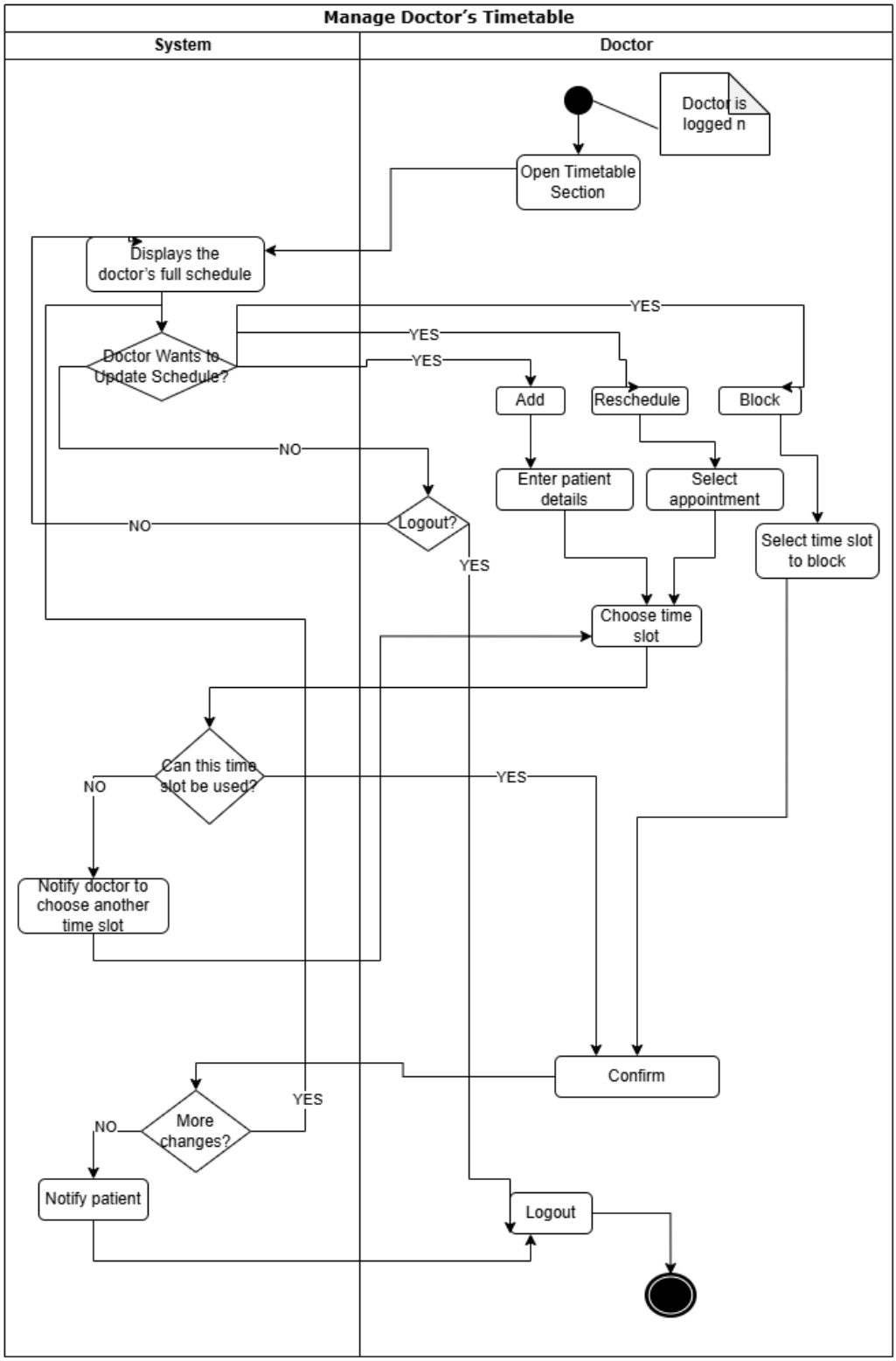

Consultation Management
Patient
System
Nutritionist
Log in to the system
Authenticate user
Succesful?
Yes
No
Navigate to Consultation Management
Display error: 'Login failed. Retry.'
Display calendar with slots
Select slot & schedule
Slot available?
yes
No
Display: 'Confirm appointment'
Display error: 'Slot taken'
Confirm appointment?
No
Yes
Discard draft
Book slot
Send notification
Wait
Consultation day arrived?
No
Yes
Wait
Conduct consultation
Save notes
Record notes


Patient Engagement & Compliance
Patient
System
Nutritionist
Log in to the system
Authenticate user
Succesful?
Yes
No
Display error: 'Login failed. Retry.'
Navigate to Patient Engagement module
Load patient list & plans
Select patient
Does patient have an existing plan?
No
Yes
Display: 'Patient does not have an existing plan.'
Display current plan
Update meal plan
Create new plan
Save changes
New plan?
No,updated one
Yes
Display: 'Your new plan is ready!'
Display: 'Your plan was updated!'
Log intake & progress
Send daily reminders
Adherence met?
Yes
No
Display report
Display report
Review report
Adjust needed?
No

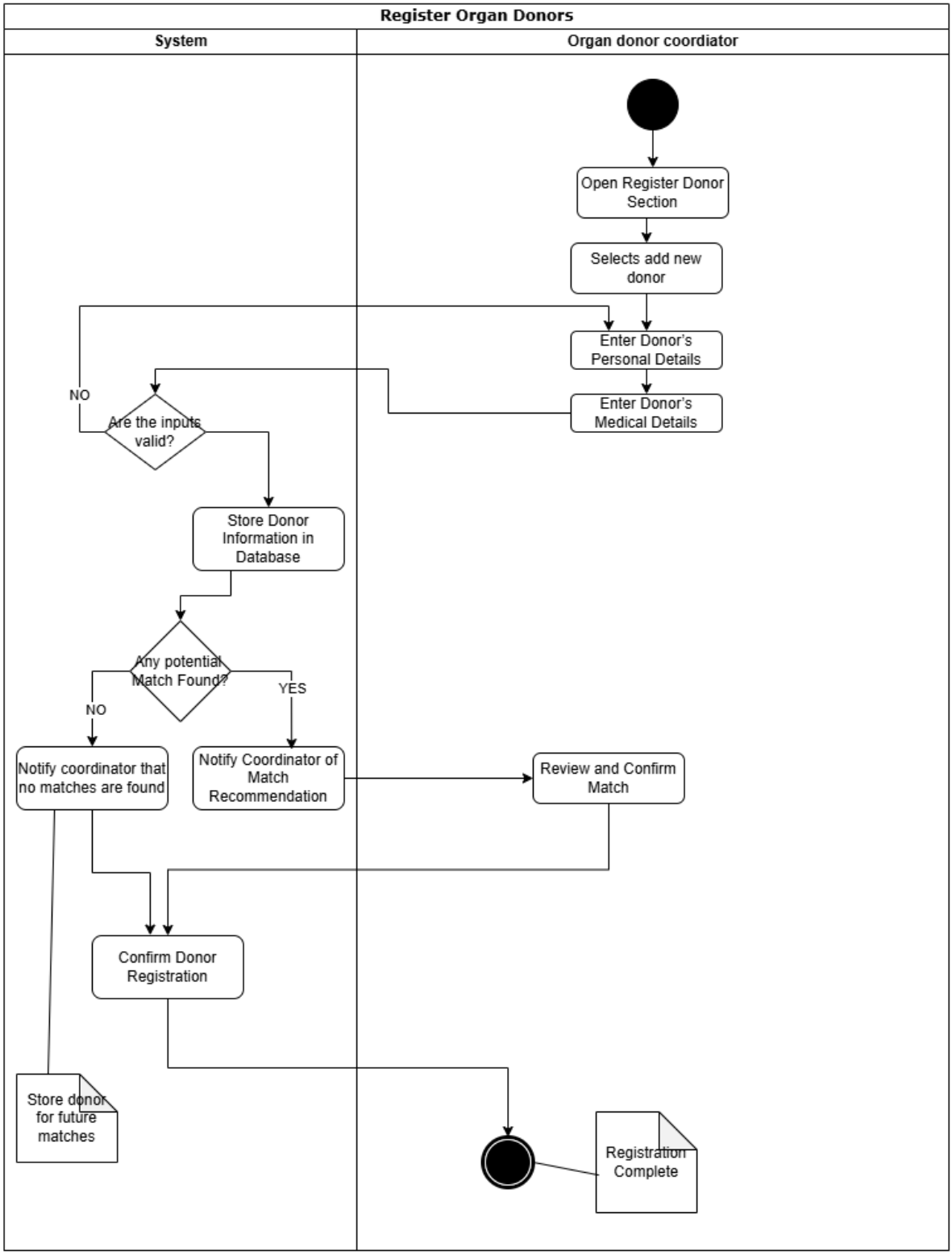
Doctor

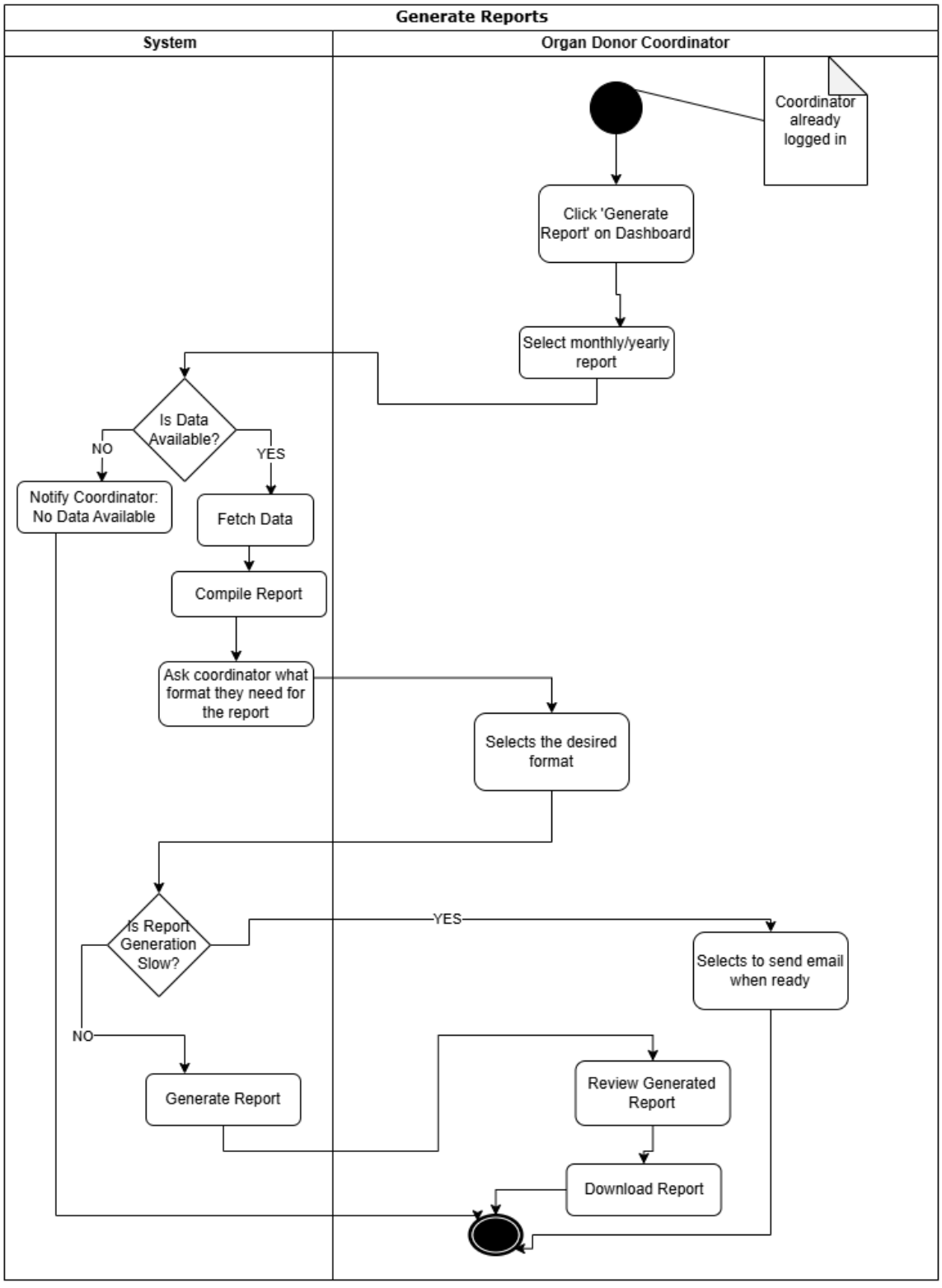

Manage Patient Records
System
Docor
go back to login page
Are the Credentials Valid?
NO
YES
Shows login error
Grants access
Logs into the System with Username and Password
Navigates to 'Patient Records' module
Loads patient records module
Searches for a patient by ID
Does the patient exist?
NO
YES
Informs that no record was found
Displays patient details
Reviews and updates the record
Submit
Are the inputs valid?
NO
YES
Selects and Create New Patient'
Enters new patient's details
Stores the updated record securely
Shows validation error


Electronic Prescription
System
Doctor
Navigates to "Electronic Prescription" module
Loads the module and patient list
Searches for a patient
Does the patient have a medical record?
YES
NO
Create New Prescription
Create a patient record
-Medication name
-Dosage&Frequency
-Duration of use
Enters prescription details
Is there any drug interaction or allergy?
YES
NO
Alerts about interactions and suggests alternatives
Reviews the prescription and make changes
Is the prescription valid?
YES
NO
Submit the prescription
Alerts for missing details
Confirms and transmits the prescription

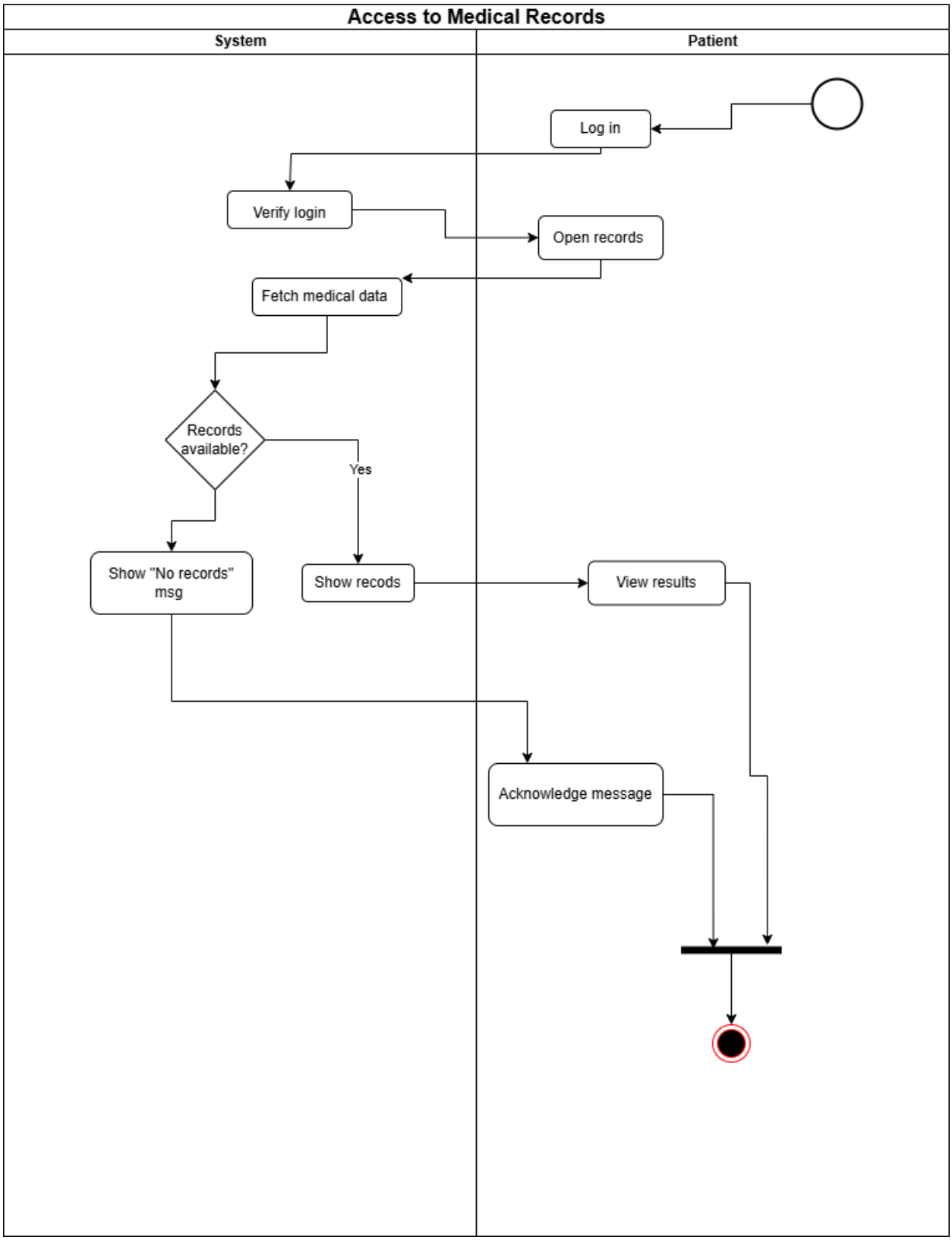

Manage Doctor's Timetable
System
Doctor
Doctor is logged n
Open Timetable Section
Displays the doctor's full schedule
Doctor Wants to Update Schedule?
YES
YES
YES
Add
Reschedule
Block
NO
Enter patient details
Select appointment
Logout?
NO
YES
Select time slot to block
Choose time slot
Can this time slot be used?
NO
YES
Notify doctor to choose another time slot
Confirm
More changes?
YES
NO
Notify patient
Logout

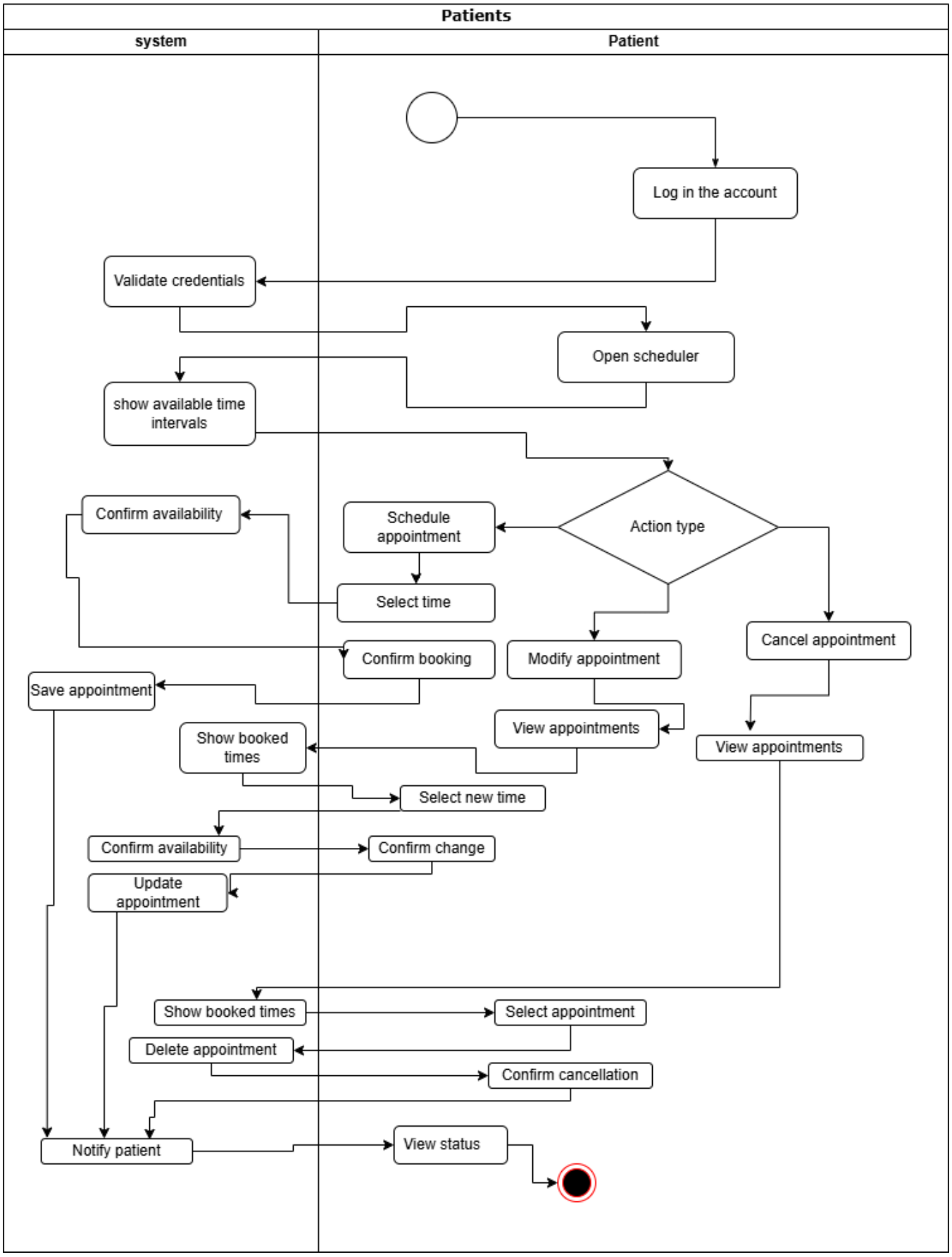
Organ Donor Coordinator

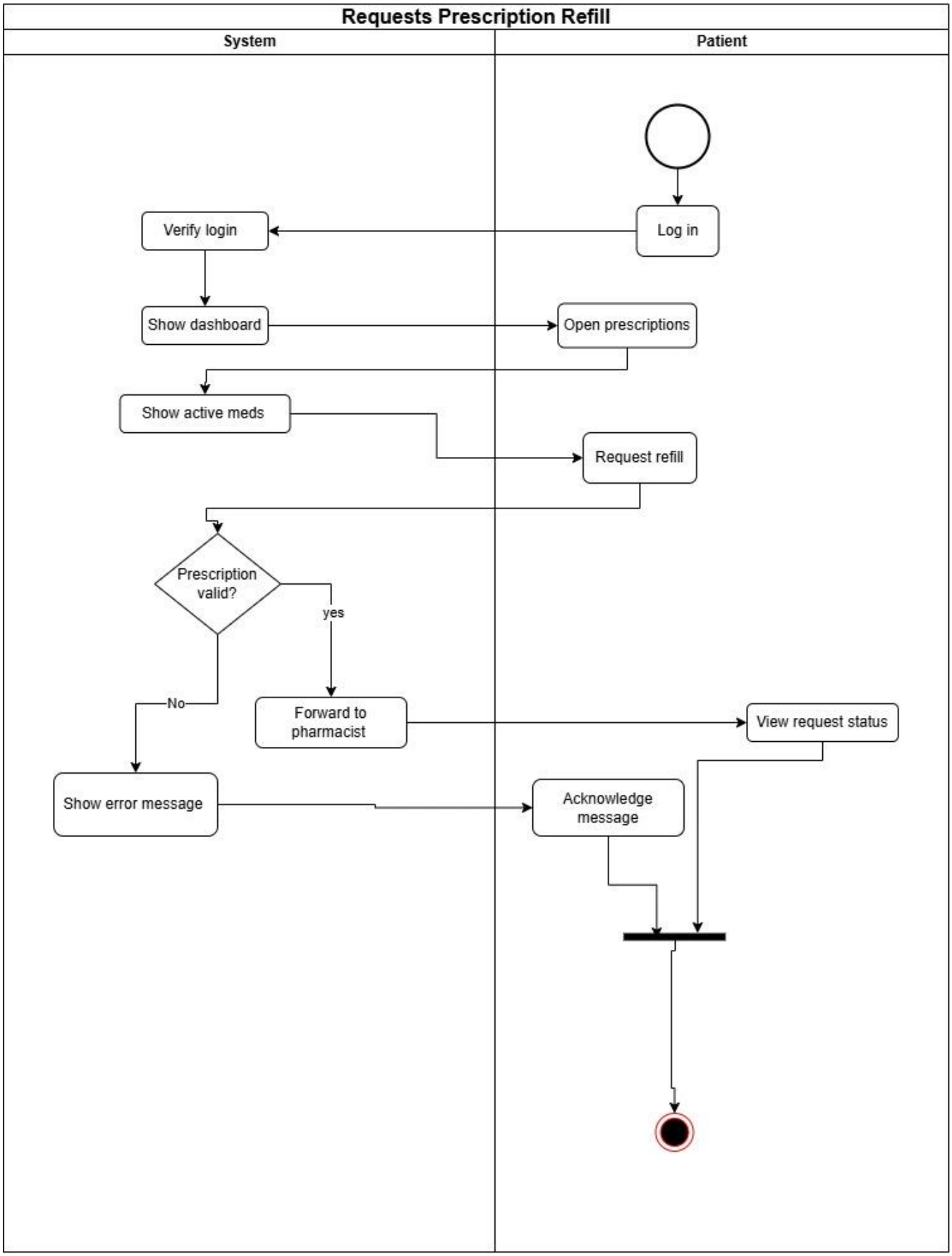



Generate Reports
System
Organ Donor Coordinator
Coordinator already logged in
Click 'Generate Report' on Dashboard
Select monthly/yearly report
Is Data Available?
NO
YES
Notify Coordinator: No Data Available
Fetch Data
Compile Report
Ask coordinator what format they need for the report
Selects the desired format
Is Report Generation Slow?
YES
Selects to send email when ready
NO
Generate Report
Review Generated Report
Download Report

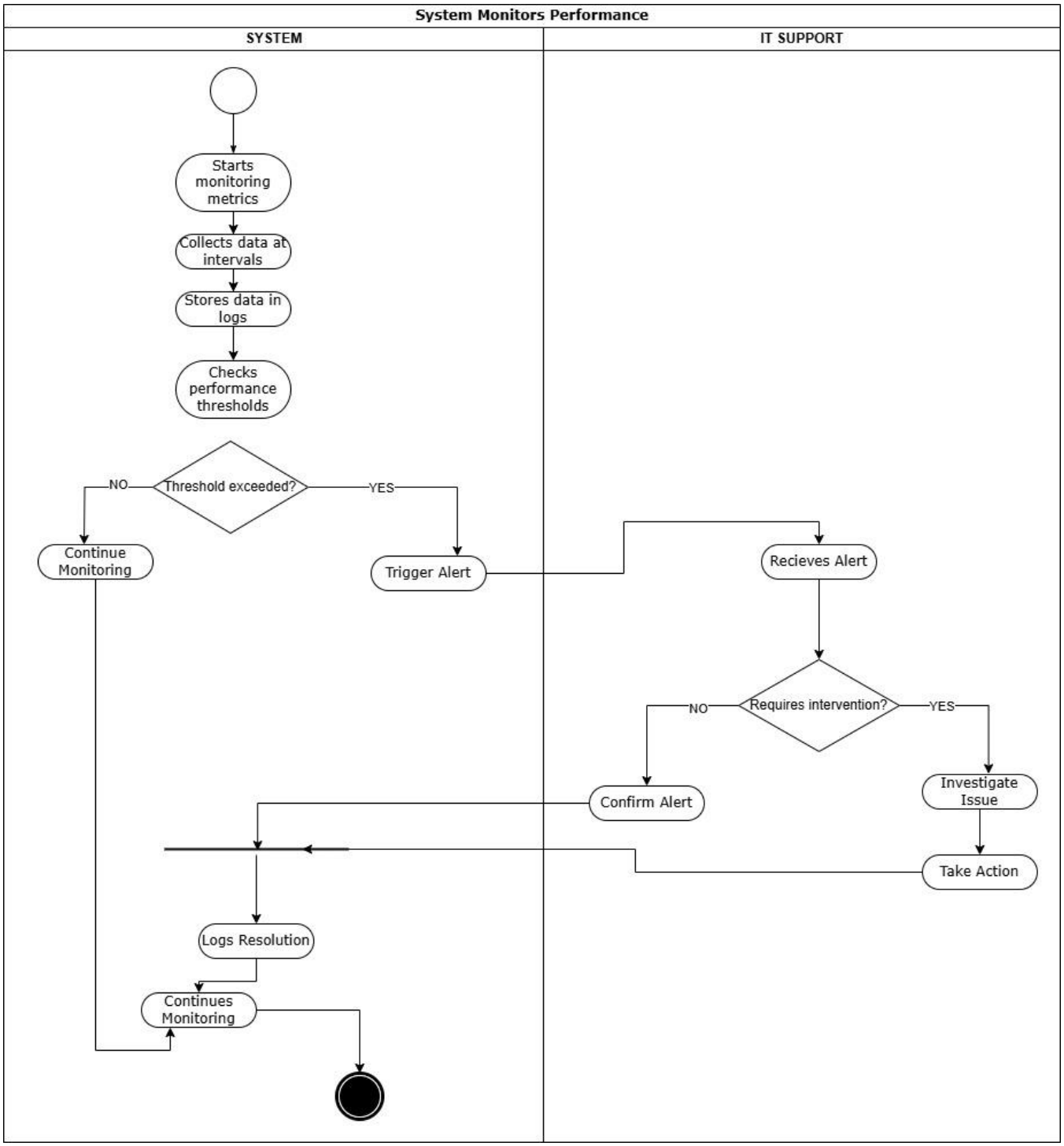
Patient

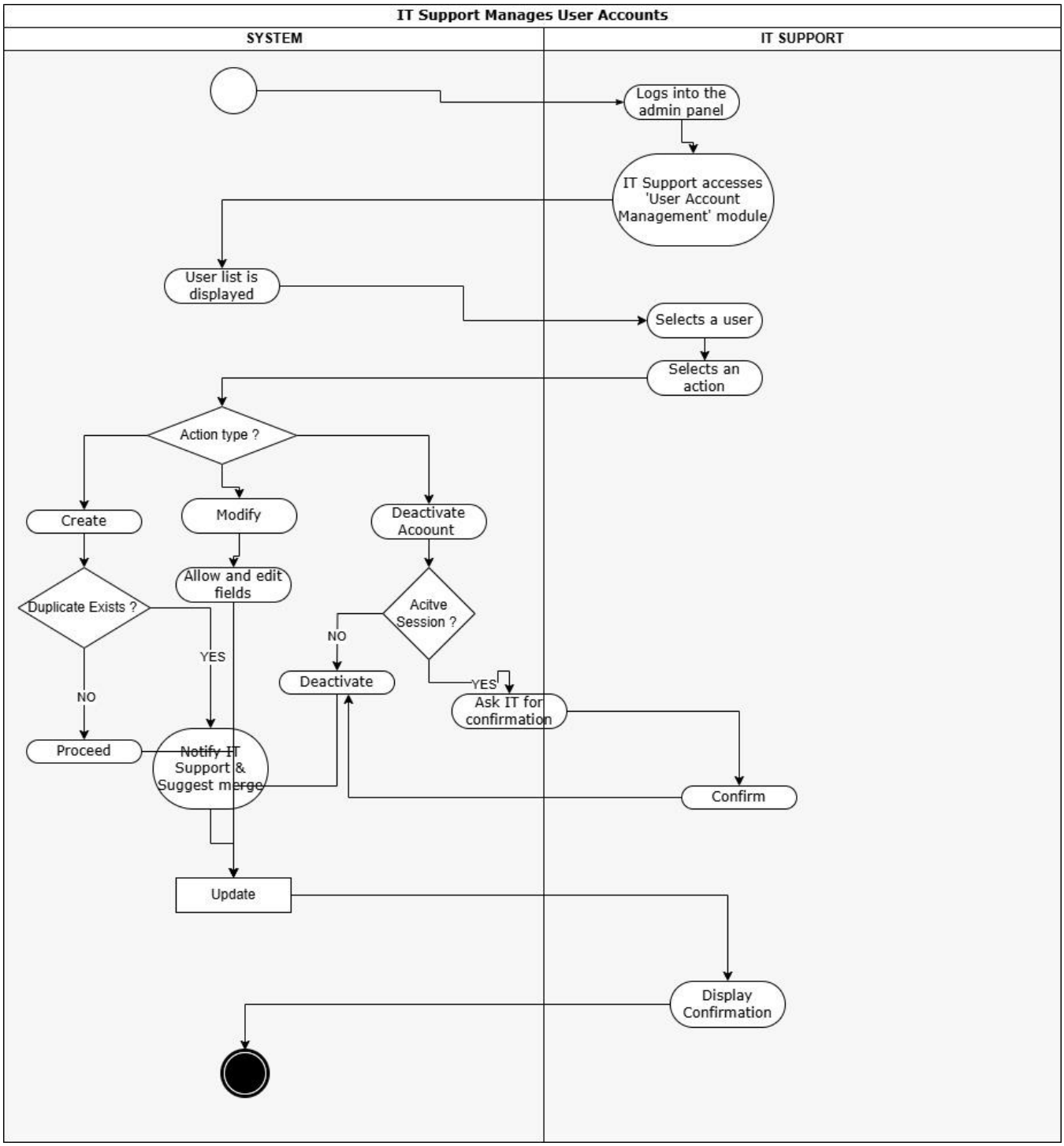

Access to Medical Records
System
Patient
Log in
Verify login
Open records
Fetch medical data
Records available?
Yes
Show "No records" msg
Show recods
View results
Acknowledge message


Patients
system
Patient
Log in the account
Validate credentials
Open scheduler
show available time intervals
Action type
Confirm availability
Schedule appointment
Select time
Confirm booking
Modify appointment
Cancel appointment
Save appointment
View appointments
Show booked times
View appointments
Select new time
Confirm availability
Confirm change
Update appointment
Show booked times
Select appointment
Delete appointment
Confirm cancellation
Notify patient
View status

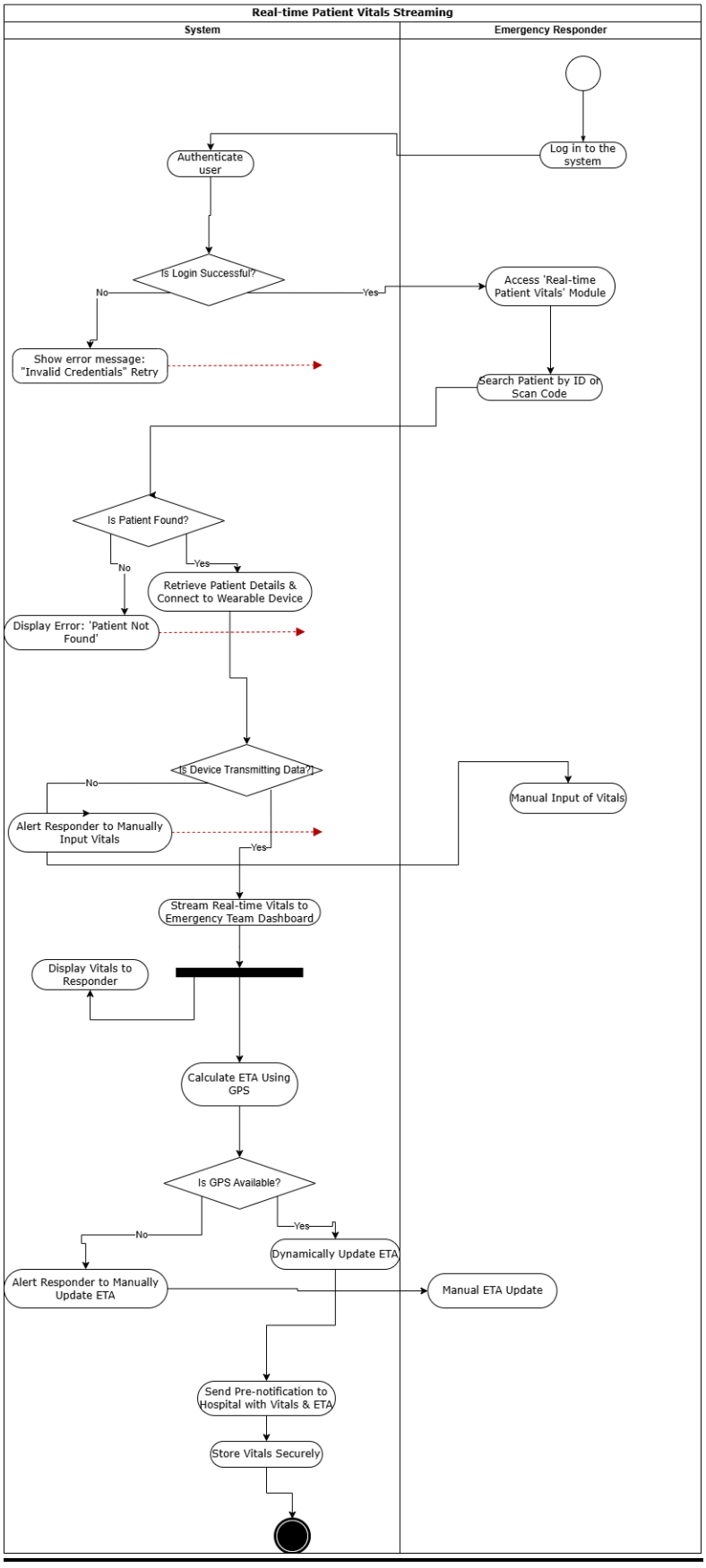

Requests Prescription Refill
System
Patient
Log in
Verify login
Show dashboard
Open prescriptions
Show active meds
Request refill
Prescription valid?
yes
No
Forward to pharmacist
View request status
Show error message
Acknowledge message

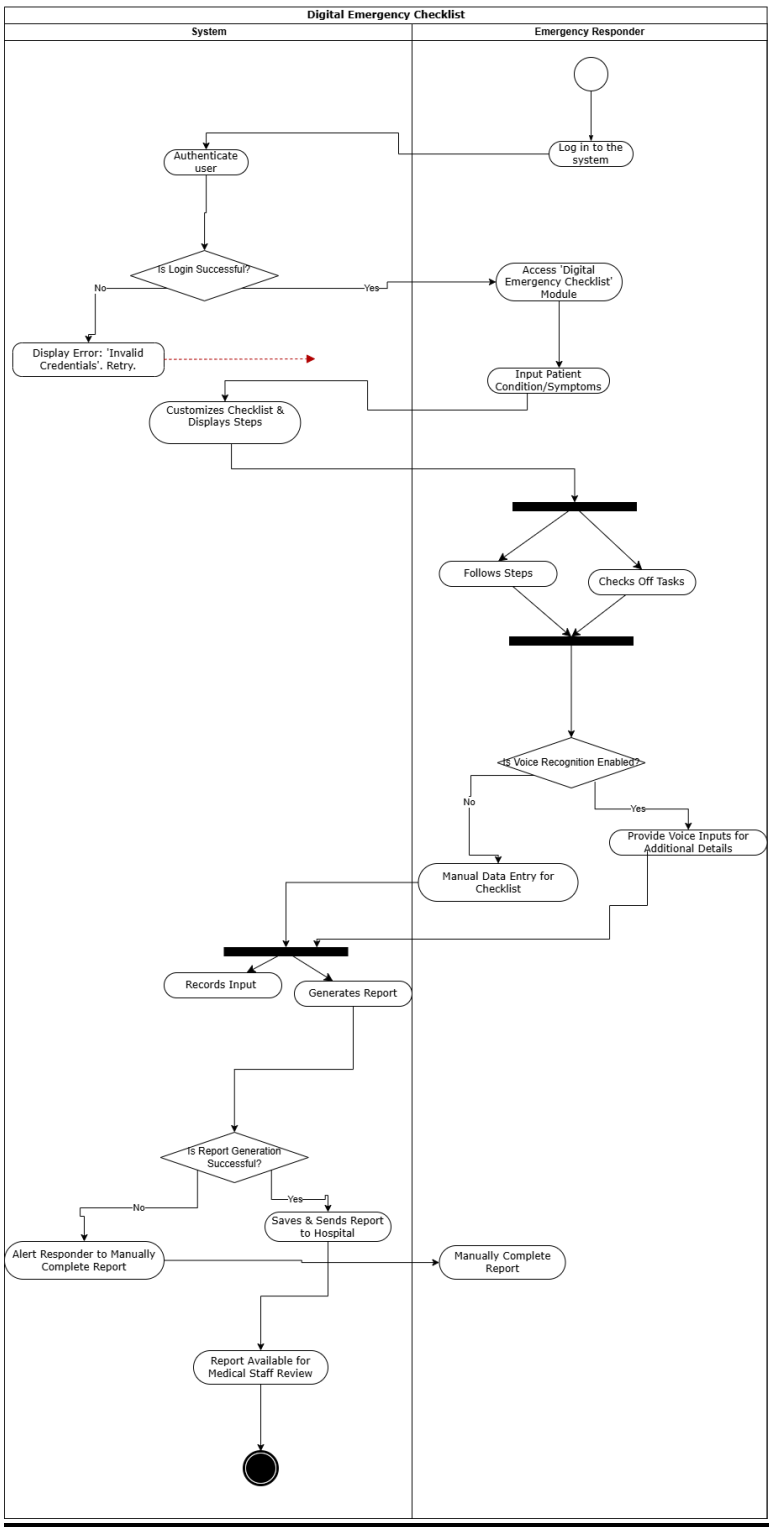
IT Support

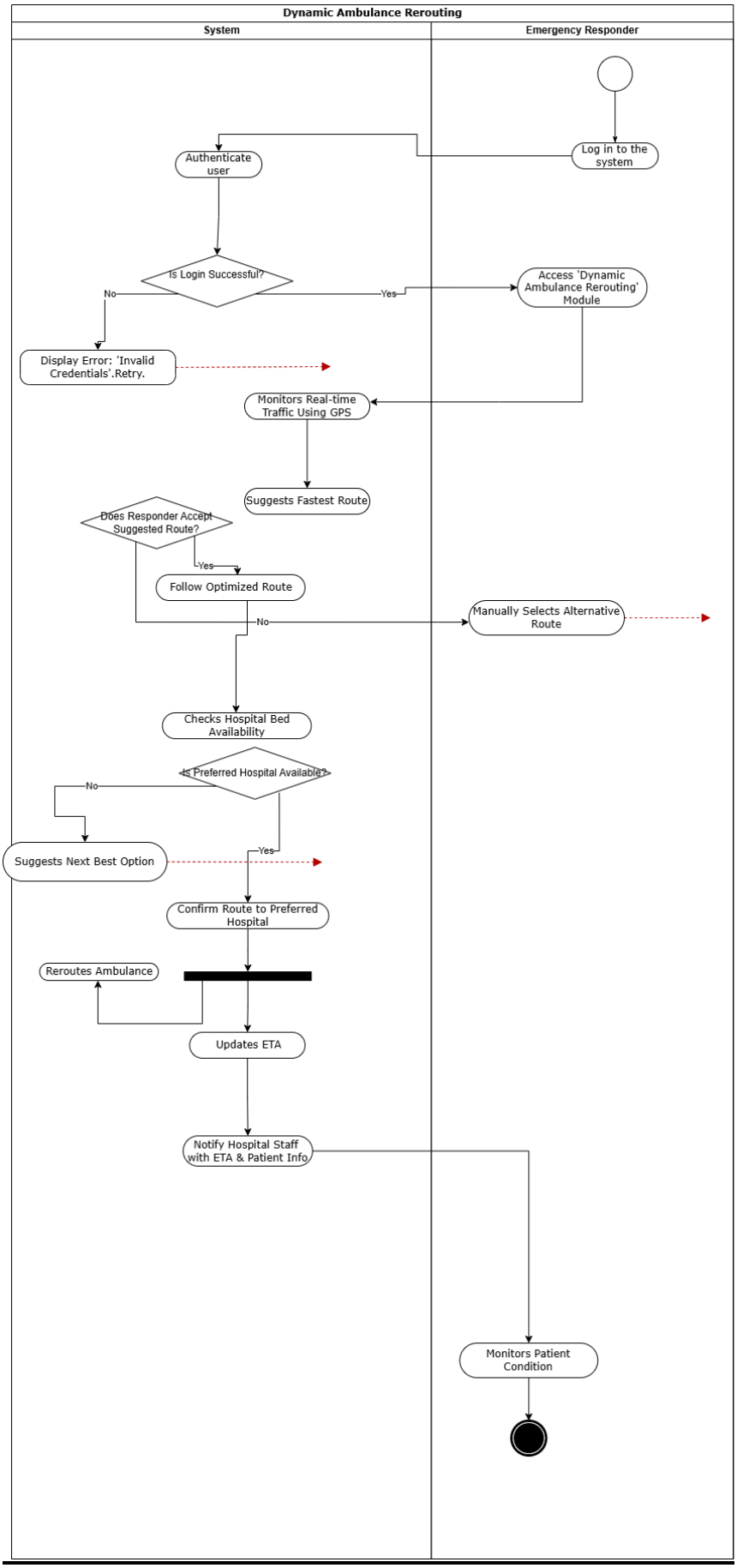

System Monitors Performance
SYSTEM
IT SUPPORT
Starts monitoring metrics
Collects data at intervals
Stores data in logs
Checks performance thresholds
Threshold exceeded?
NO
YES
Continue Monitoring
Trigger Alert
Recieves Alert
Requires intervention?
NO
YES
Confirm Alert
Investigate Issue
Take Action
Logs Resolution
Continues Monitoring


IT Support Manages User Accounts
SYSTEM
IT SUPPORT
Logs into the admin panel
IT Support accesses 'User Account Management' module
User list is displayed
Selects a user
Selects an action
Action type ?
Create
Modify
Deactivate Acoount
Duplicate Exists ?
Allow and edit fields
Acitve Session ?
NO
YES
Deactivate
YES
NO
Ask IT for confirmation
Proceed
Notify IT Support & Suggest merge
Confirm
Update
Display Confirmation

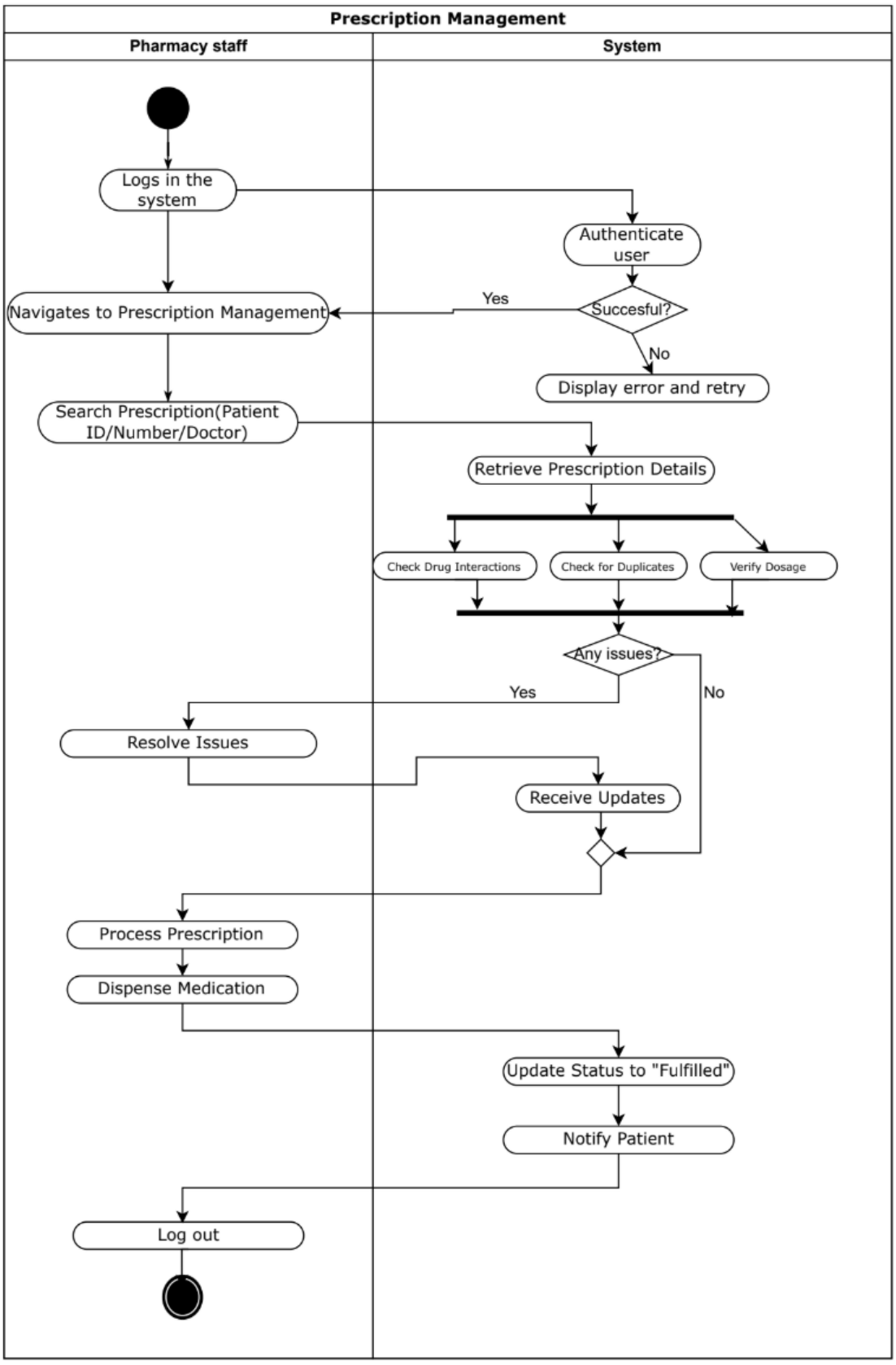
Emergency Service

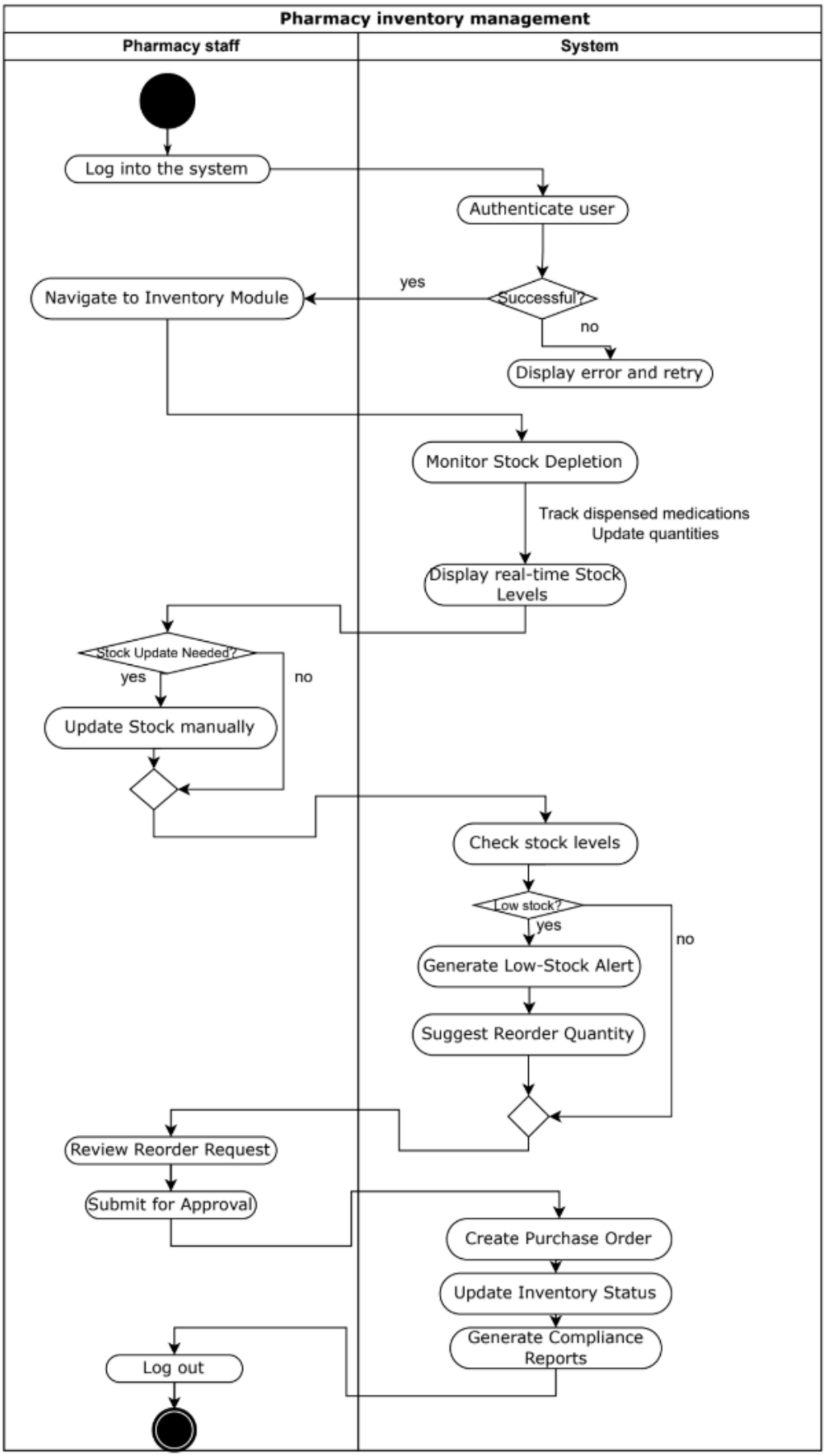


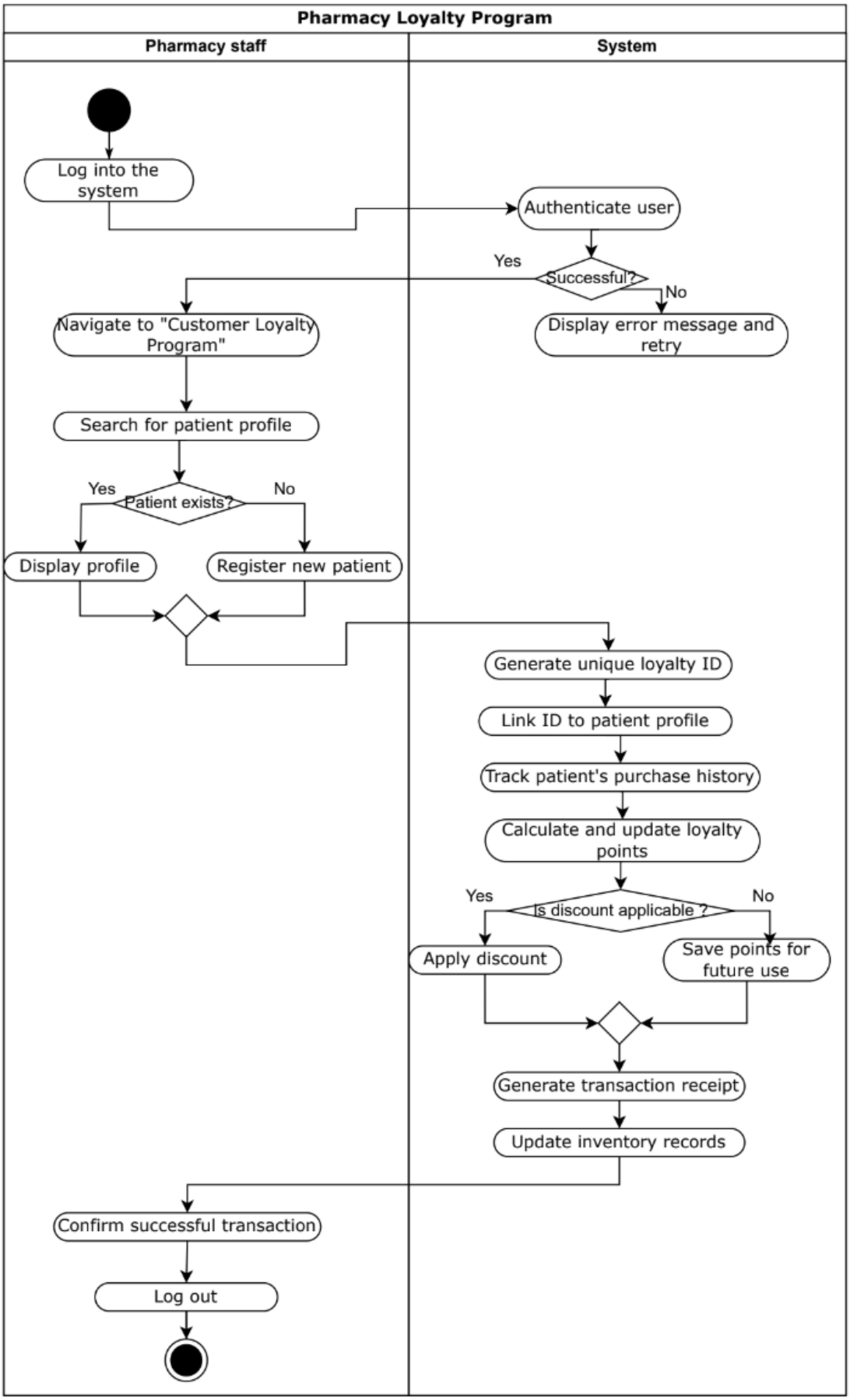

Digital Emergency Checklist
System
Emergency Responder
Log in to the system
Authenticate user
Is Login Successful?
No
Yes
Access 'Digital Emergency Checklist' Module
Display Error: 'Invalid Credentials'. Retry.
Input Patient Condition/Symptoms
Customizes Checklist & Displays Steps
Follows Steps
Checks Off Tasks
Is Voice Recognition Enabled?
No
Yes
Provide Voice Inputs for Additional Details
Manual Data Entry for Checklist
Records Input
Generates Report
Is Report Generation Successful?
No
Yes
Saves & Sends Report to Hospital
Alert Responder to Manually Complete Report
Manually Complete Report
Report Available for Medical Staff Review


Dynamic Ambulance Rerouting
System
Emergency Responder
Log in to the system
Authenticate user
Is Login Successful?
No
Yes
Access 'Dynamic Ambulance Rerouting' Module
Display Error: 'Invalid Credentials'.Retry.
Monitors Real-time Traffic Using GPS
Suggests Fastest Route
Does Responder Accept Suggested Route?
Yes
Follow Optimized Route
No
Manually Selects Alternative Route
Checks Hospital Bed Availability
Is Preferred Hospital Available?
No
Yes
Suggests Next Best Option
Confirm Route to Preferred Hospital
Reroutes Ambulance
Updates ETA
Notify Hospital Staff with ETA & Patient Info
Monitors Patient Condition

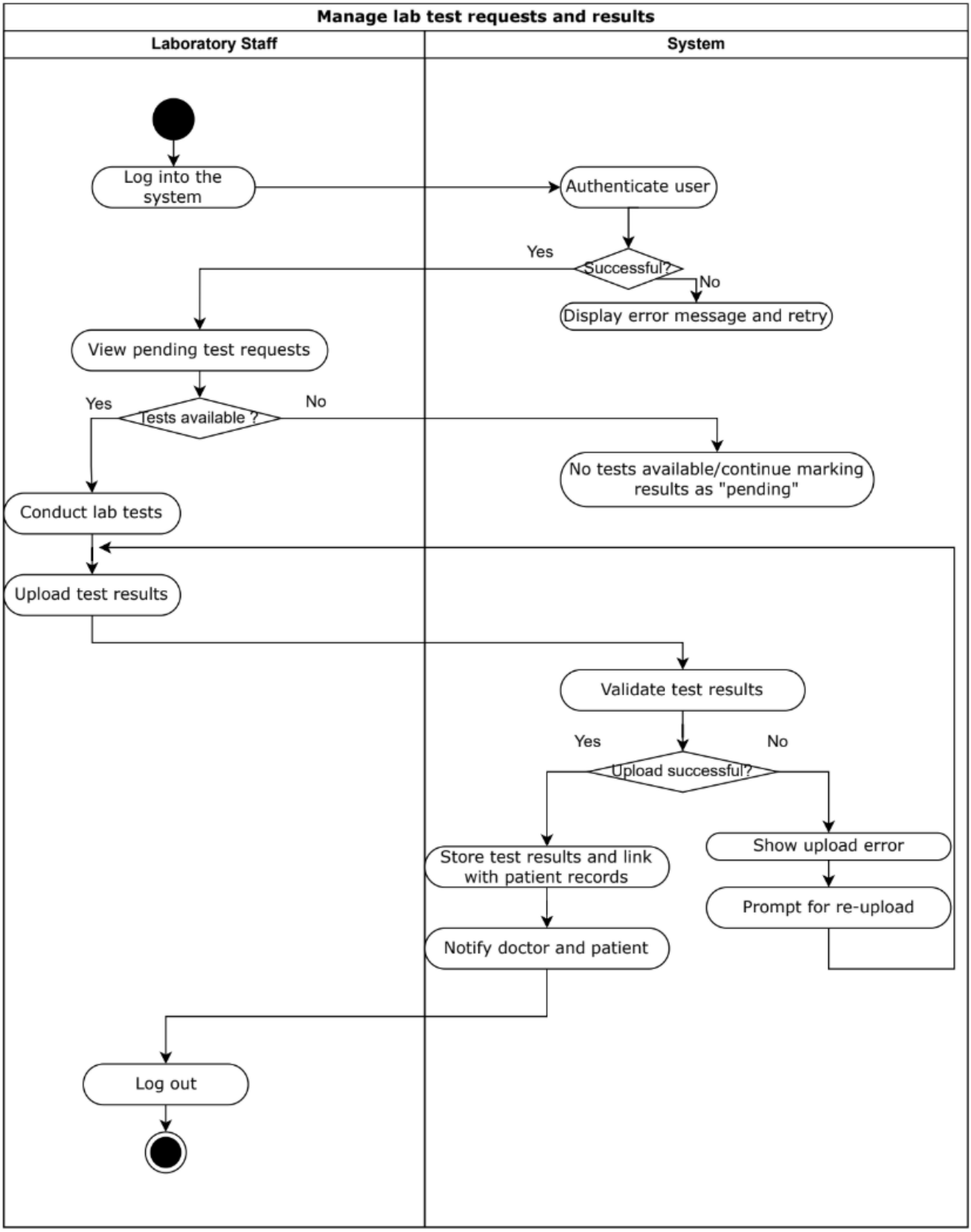
Pharmacy Staff

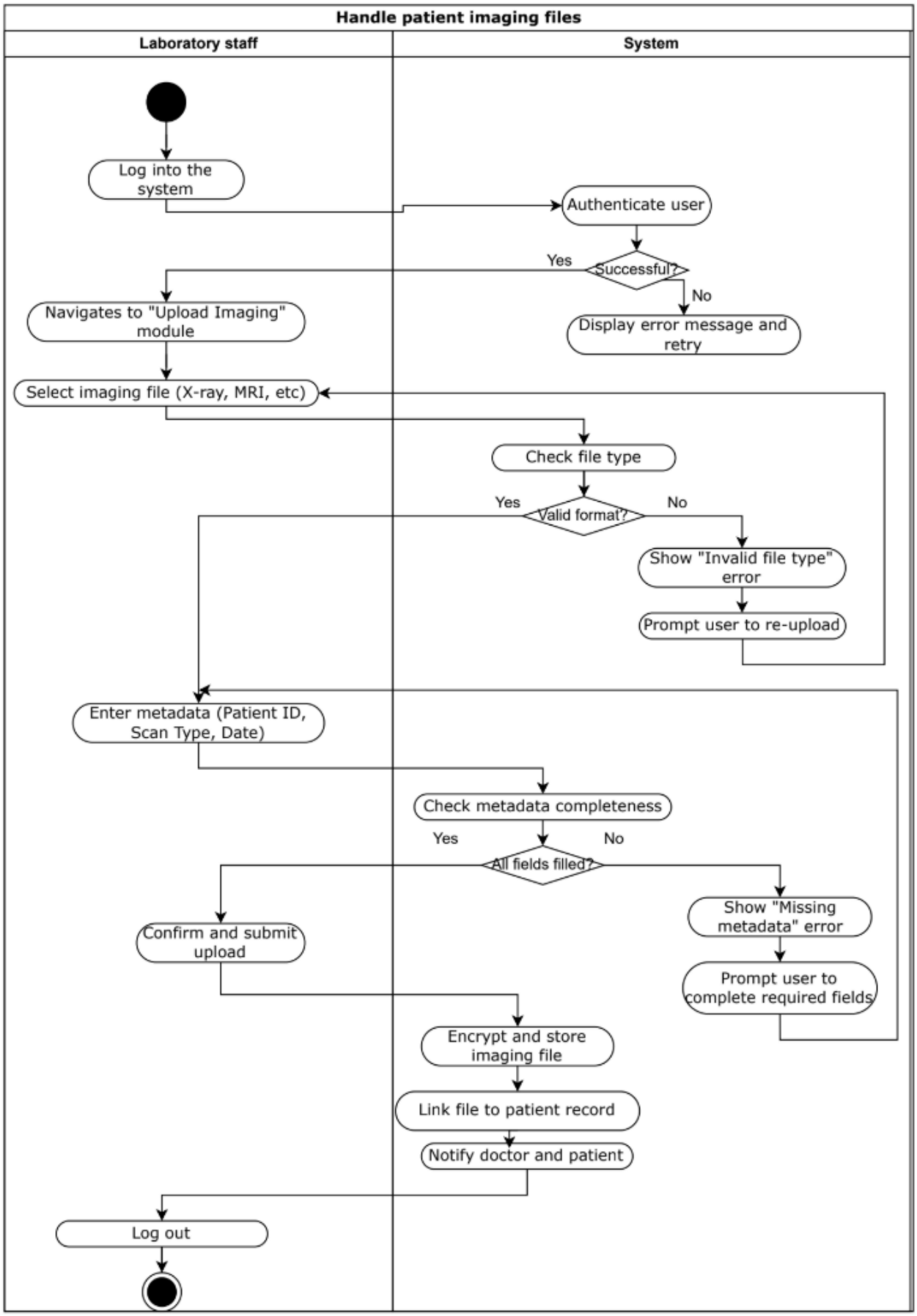



Pharmacy inventory management
Pharmacy staff
System
Log into the system
Authenticate user
Navigate to Inventory Module
yes
Successful?
no
Display error and retry
Monitor Stock Depletion
Track dispensed medications
Update quantities
Display real-time Stock Levels
Stock Update Needed?
yes
no
Update Stock manually
Check stock levels
Low stock?
yes
no
Generate Low-Stock Alert
Suggest Reorder Quantity
Review Reorder Request
Submit for Approval
Create Purchase Order
Update Inventory Status
Generate Compliance Reports
Log out


Pharmacy Loyalty Program
Pharmacy staff
System
Log into the system
Authenticate user
Yes
Successful?
No
Navigate to "Customer Loyalty Program"
Display error message and retry
Search for patient profile
Yes
Patient exists?
No
Display profile
Register new patient
Generate unique loyalty ID
Link ID to patient profile
Track patient's purchase history
Calculate and update loyalty points
Yes
Is discount applicable ?
No
Apply discount
Save points for future use
Generate transaction receipt
Update inventory records
Confirm successful transaction
Log out

Laboratory Staff




Handle patient imaging files
Laboratory staff
System
Log into the system
Authenticate user
Successful?
Yes
No
Navigates to "Upload Imaging" module
Display error message and retry
Select imaging file (X-ray, MRI, etc)
Check file type
Valid format?
Yes
No
Show "Invalid file type" error
Prompt user to re-upload
Enter metadata (Patient ID, Scan Type, Date)
Check metadata completeness
All fields filled?
Yes
No
Show "Missing metadata" error
Prompt user to complete required fields
Confirm and submit upload
Encrypt and store imaging file
Link file to patient record
Notify doctor and patient
Log out