Federico – Hospital Administrative Operations platform

(Software Requirements Specification)

Team: 16_Federico

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1. INTRODUCTION

1.1 Purpose

Federico is a non-clinical hospital operations system designed to maintain a single source of reference for patient administrative data, from initial appointment preference to efficient system of patient stay to final billing settlement. It deliberately focuses on the administrative sub-problem of the broader hospital management problem, excluding all clinical diagnosis and treatment workflows.

1.2 Problem Statement

Hospitals struggle to maintain a consistent, transparent flow of administrative information from appointment booking through admission, bed allocation, non-clinical inventory usage, and final billing. This is a **sub-problem** of the much larger challenge of end-to-end hospital information management. Federico addresses only the **non-clinical, administrative** portion of this larger problem by creating a single source of reference for patient administrative data and workflows.

1.3 Project Scope

Problem Context

The overall problem space of hospital information systems is very large and includes both clinical workflows (diagnosis, prescriptions, lab reports, treatment planning) and non-clinical workflows (appointments, admissions, bed management, billing, inventory, and administrative coordination). Federico explicitly focuses on a non-clinical sub-problem within this larger space.

Specifically, Federico addresses the sub-problem of non-clinical hospital administrative operations: capturing appointment preferences, coordinating admissions and bed allocation, tracking non-clinical inventory usage, and generating transparent billing summaries. All clinical decision-making and medical documentation remain outside the scope of this system and are handled by existing Electronic Medical Record (EMR) or Hospital Information Systems (HIS), if any.

Federico manages the administrative lifecycle of a patient, excluding diagnosis and treatment decisions.

It provides:

- Appointment finalization
- Admission and discharge tracking
- Bed and inventory state management
- Auditable billing aggregation

Clinical decisions and verbal coordination occur **outside the system** and enter Federico only as finalized inputs.

1.4 Non-Clinical Focus (FFSD Project Context)

Under the FFSD curriculum, this project concentrates on non-clinical hospital operations.

The intention is to design, implement, and test a robust, production-like workflow for:

- Out-patient appointment scheduling and confirmation
- In-patient admission and ward allocation
- Tracking patient stay from admission to discharge in terms of time and bed occupancy
- Posting non-clinical inventory usage (e.g., admission kits, linens, amenities) to the patient ledger
- Generating a transparent, itemized billing summary before payment

Clinical activities such as diagnosis, prescription entry, nursing notes, lab result interpretation, surgery workflows, and clinical decision support are out of scope. Federico should be seen as a module in the larger ecosystem of hospital information systems, solving a well-defined administrative sub-problem.

1.5 Definitions and Acronyms

- **HIS**: Hospital Information System
- **IPD**: In-Patient Department
- **OPD**: Out-Patient Department
- **PII**: Personally Identifiable Information
- **EARS**: Easy Approach to Requirements Syntax
- **UHID**: Unique Health Identifier
- **PRE**: Patient Relation Executives
- **HOM**: Hospital Operations Manager

1.6 Out of Scope

- Clinical diagnosis, treatment planning, and prescription management
- Entry and storage of clinical notes, lab results, imaging reports, or nursing observation charts
- Clinical decision support (e.g., suggesting treatments, flagging drug interactions)
- Detailed insurance claims processing beyond basic billing summary
- Integration with external EMR/HIS systems in the current FFSD scope (can be considered future work)

2. OVERALL DESCRIPTION

2.1 User Needs

- **Efficiency:** Automated movement of patient data from "Appointment" to "Billing."
- **Visibility:** Real-time dashboard for bed and stock management.
- **Clarity:** A transparent, itemized breakdown for patient payments.

2.2 Assumptions and Dependencies

2.2.1 Business Assumptions

- The hospital already has established clinical workflows (diagnosis, prescriptions, lab tests) handled through verbal communication, paper records, or a separate EMR/HIS. Federico does not replace or replicate these systems.
- Doctors and clinical staff provide final decisions (e.g., “admit patient”, “discharge patient”, “consultation completed”) out-of-band, and administrative staff are responsible for entering those decisions into Federico.

- Non-clinical billing components such as Ward charges, registration fees, and non-clinical supplies can be priced independently from medical procedures and investigations.

2.2.2 Operational Assumptions

- Manual Communication: Coordination between Patient-Relation-Executive, Doctors, and Hospital Operations Manager regarding slot availability, admission decisions, and discharge readiness occurs outside the system (phone, in-person, or WhatsApp) and is later recorded in Federico.
- Data Entry Responsibility: It is assumed that Patient-Relation-Executive and Hospital Operations Manager roles are trained and accountable for accurately entering finalized decisions into the system.
- Network and Power: The hospital environment provides reasonably stable power and network connectivity during operational hours; long offline modes are not required in the current scope.
- Scale: The target hospitals are small to medium-sized facilities (up to 50–100 beds and 150–300 daily OPD visits).

2.2.3 Technical Dependencies

- Federico is a web-based application and depends on a modern browser (Chrome, Firefox, Edge, or Safari) on desktop or tablet devices.
- A relational database (e.g., PostgreSQL/MySQL) or equivalent persistent storage is available for patient, bed, and billing data.
- Optional: Integration with an SMS/Email service for sending appointment confirmations and billing summaries to patients, if implemented.

3. SYSTEM FEATURES AND REQUIREMENTS

3.1 Functional Requirements

3.1.1 Core Requirements

FR-01: Slot Preference Capture
The system shall provide a portal for the Patient to submit doctor selection, preferred dates, and time windows for a consultation.

FR-02: Appointment Matching Dashboard
The system shall present a consolidated appointment-matching view to the Patient-Relation-Executive to finalize a confirmed appointment time based on the Patient's preferences.

FR-03: Consultation-to-IPD Trigger (External Clinical Decision)
The system shall allow the Patient-Relation-Executive to flag a Patient for "Admission" following a doctor's directive taken outside the system, thereby creating an admission request in the Hospital Operations Manager queue.

FR-04: Real-Time Bed Registry
The system shall maintain a real-time registry of all hospital beds and allow the Hospital Operations Manager to assign an available bed to a Patient in a single operation.

FR-05: Automated Daily Metering
The system shall automatically record a daily room charge on the Patient's billing ledger for each 24-hour period that a bed remains marked as "Occupied".

FR-06: Inventory Ledger Integration (Non-Clinical Supplies)
The system shall allow the Hospital Operations Manager to deduct non-clinical supplies from inventory and simultaneously post the corresponding cost to the associated Patient's billing record.

FR-07: Consolidated Administrative Billing Summary
The system shall aggregate room charges, and non-clinical inventory costs into a final itemized billing summary for Finance Associate review, excluding all clinical notes and medical history.

FR-08: Appointment Cancellation and Rescheduling
If an appointment is scheduled for a time less than 24 hours from the current time, the "Self-Service" cancellation/rescheduling feature shall be deactivated, and the user shall be directed to contact PRE.

FR-09: Patient Search and Lookup
The system shall enable the Patient-Relation-Executive to retrieve and select patient records using searchable identifiers such as name, mobile number, UHID, or Patient ID with autocomplete assistance.

FR-10: Bed Shortage Alerts
The system shall automatically notify the Hospital Operations Manager when ward-level bed occupancy exceeds 85% or when no beds are available.

FR-11 Receipt Generation and Download
The system shall generate official payment receipts in PDF format and allow Patients to download them following successful payment confirmation.

3.1.2 EARS Format

- **When** the Patient-Relation-Executive confirms a manually matched appointment slot, **the system shall** transmit a digital confirmation notice to the **Patient UI**.
- **When** the **Hospital Operations Manager** marks a **Patient** as "Admitted," **the system shall** transition the assigned bed status to "Occupied."
- **When** a "Discharge" command is initiated by authorized staff, **the system shall** calculate the total stay duration and lock the **Patient's** billing ledger from further edits.
- **When** the **Finance Associate** finalizes the itemized summary, **the system shall** generate a unique digital payment link for the **Patient**.

3.1.3 Error Handling Requirements

- If a bed is unavailable at admission time, the system shall block admission and display a conflict warning.
- If billing rates are missing, the system shall prevent discharge and surface configuration errors.

3.2 Non-Functional Requirements

3.2.1 Performance and Timing Constraints

- **Response Time**

  The system shall process and display search results for the patient database in less than **1.5 seconds** under a load of 100 concurrent users.

- **Throughput**

  The system shall be capable of handling at least **200 appointment requests** per day without degradation in service.

3.2.2 Security and Compliance Standards

- **Access Control**

  The system shall restrict data access based on the user's role; for example, a Patient Relation Executive shall be constrained from viewing the "Purchase Cost" of inventory items.

- **Data Privacy**

  All patient personal data (PII) must be stored and transmitted in compliance with local healthcare data protection standards (e.g., HIPAA or GDPR principles).

3.2.3 Availability and Reliability

- **System Uptime**

  Federico shall maintain an availability of **99.9%** during hospital operational hours (24/7), excluding scheduled maintenance windows.

- **Fault Tolerance**

  In the event of a database connection failure, the system shall enter a "Read-Only" mode to allow staff to view current bed occupancy while preventing new data corruption.

- **Audit Trail**

  The system shall maintain an immutable audit log of all billing-related transactions (Ward **charges, inventory deductions, ledger finalizations) for compliance and dispute resolution.**

3.2.4 Usability & Development Constraints

- **Interface Consistency**

The system shall follow a unified CSS framework to ensure that the UI components (buttons, fonts, colours) are consistent across the Patient, Hospital operations manager, and Finance Associate modules.

- **Platform Compatibility**

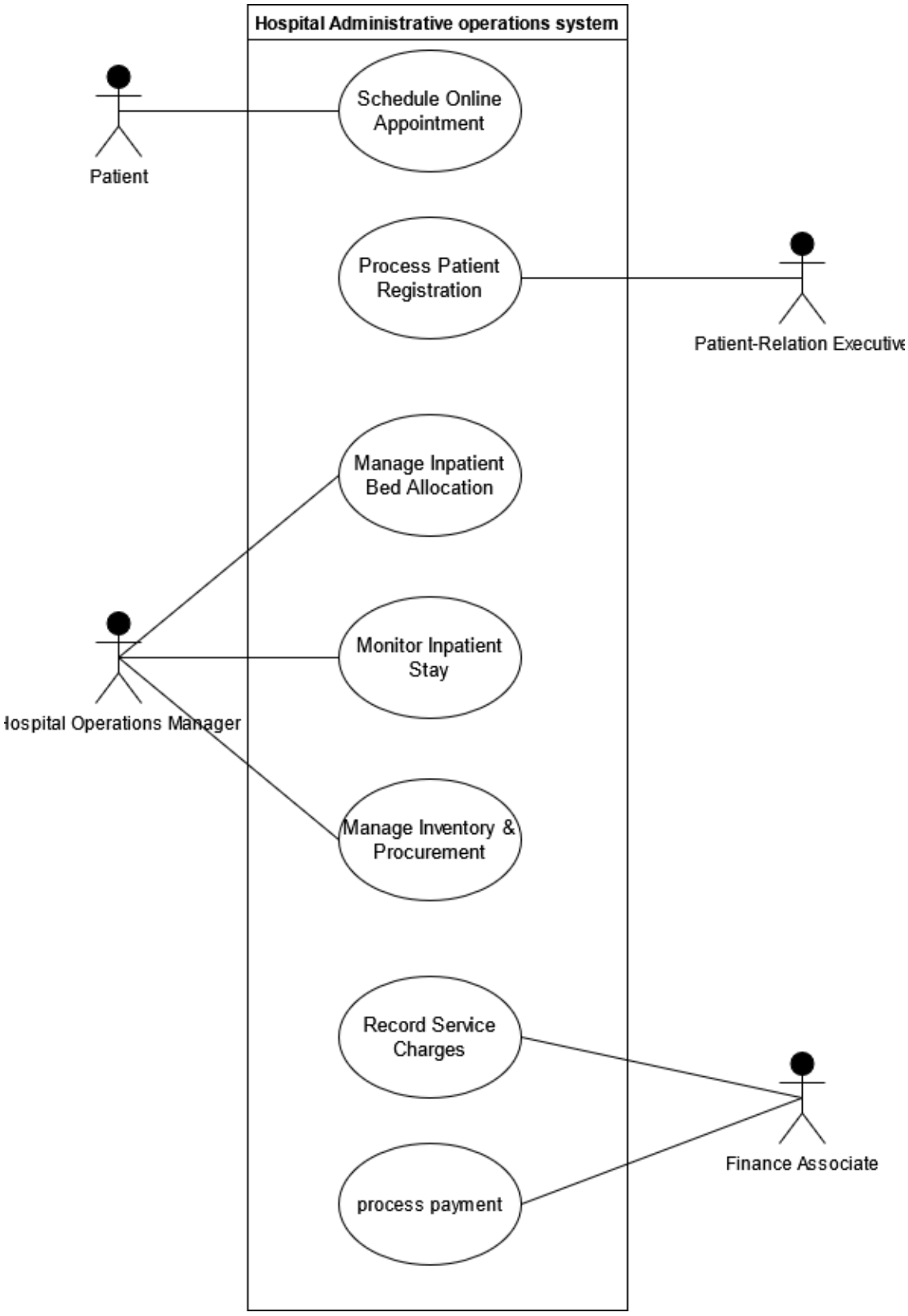
  The administrative dashboards must be fully functional on standard desktop web browsers (Chrome, Firefox, Safari) without the need for additional plugins.

3.2.5 Project-Level Assumptions (FFSD Implementation)

- The initial deployment is assumed for one hospital, multi-hospital, multi-branch configurations are considered future enhancements.
- Formal healthcare regulations (HIPAA/GDPR) are used as design guidelines, but full legal compliance certification is outside the scope of this academic FFSD project.

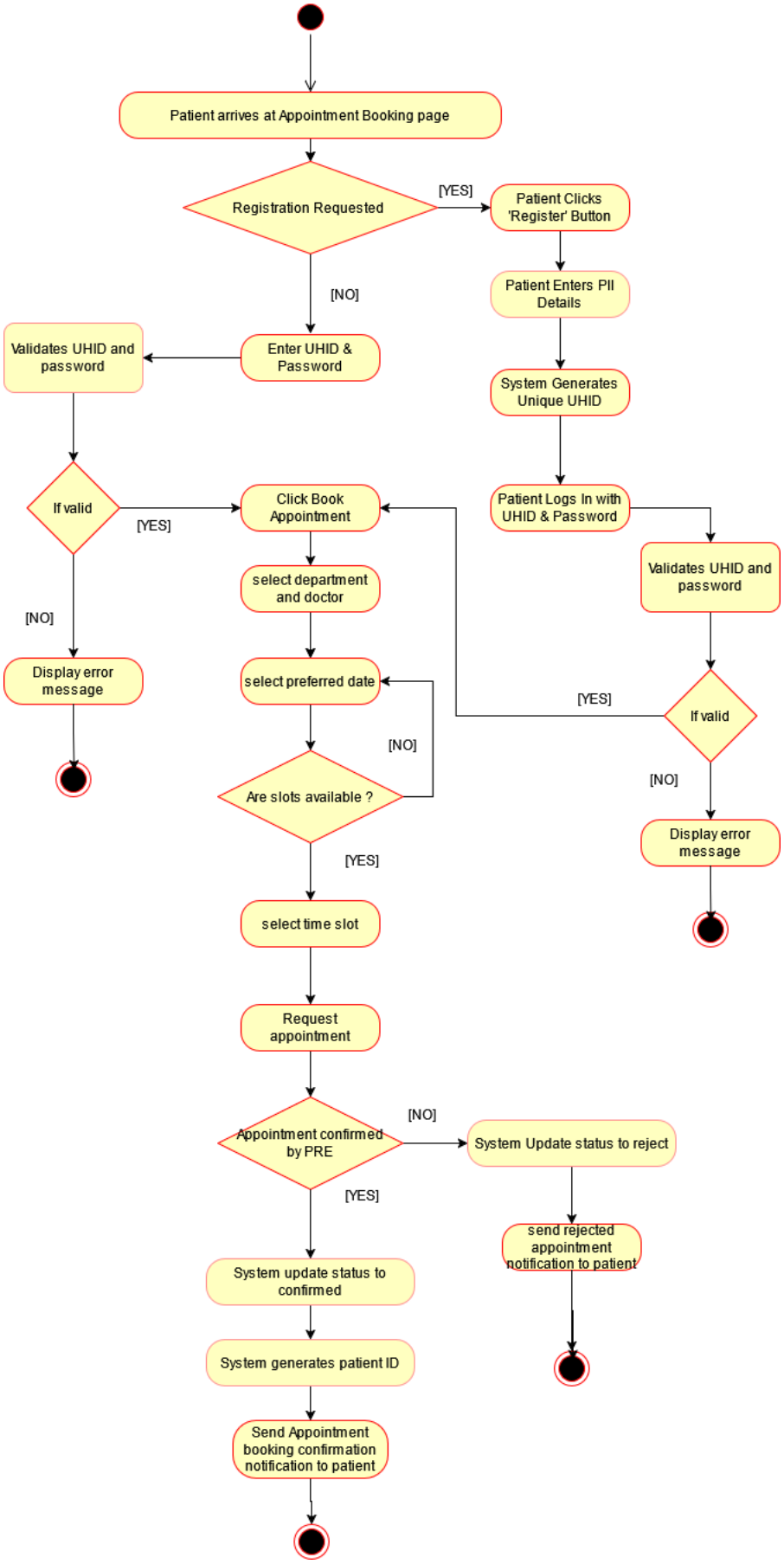
4. UML DIAGRAMS

4.1 Use Case Diagram

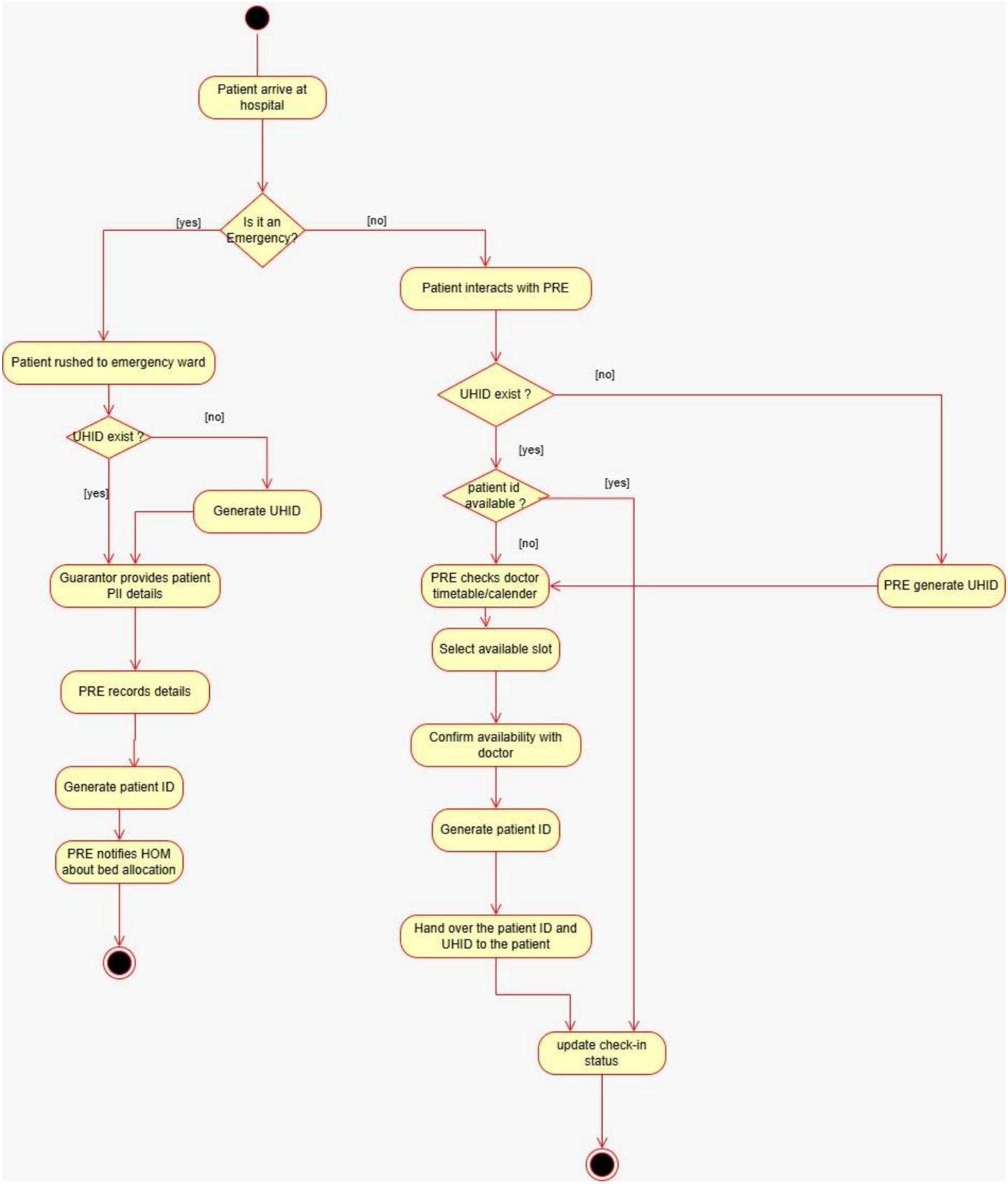


4.2 Activity Diagrams

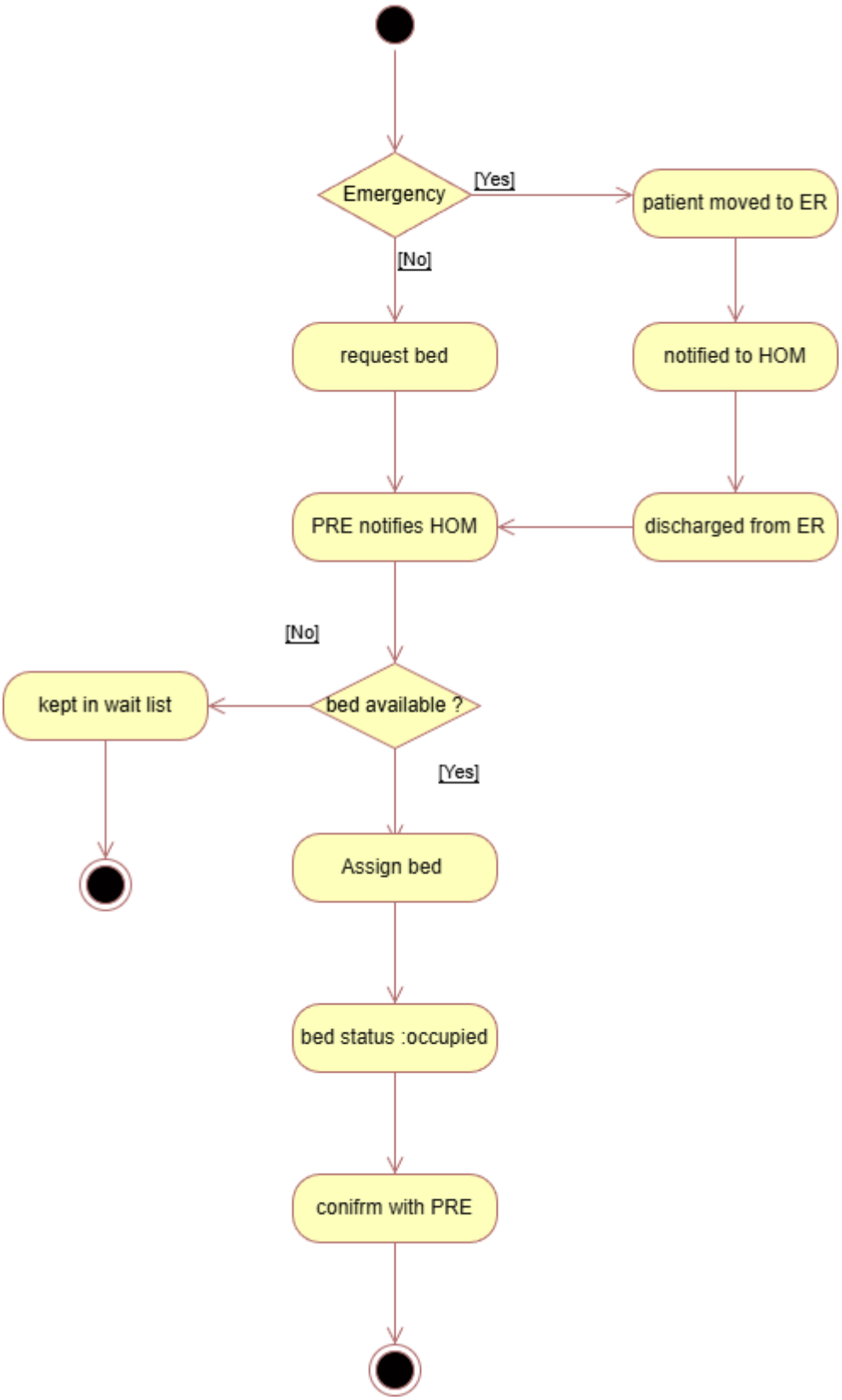
1. Schedule Online Appointment



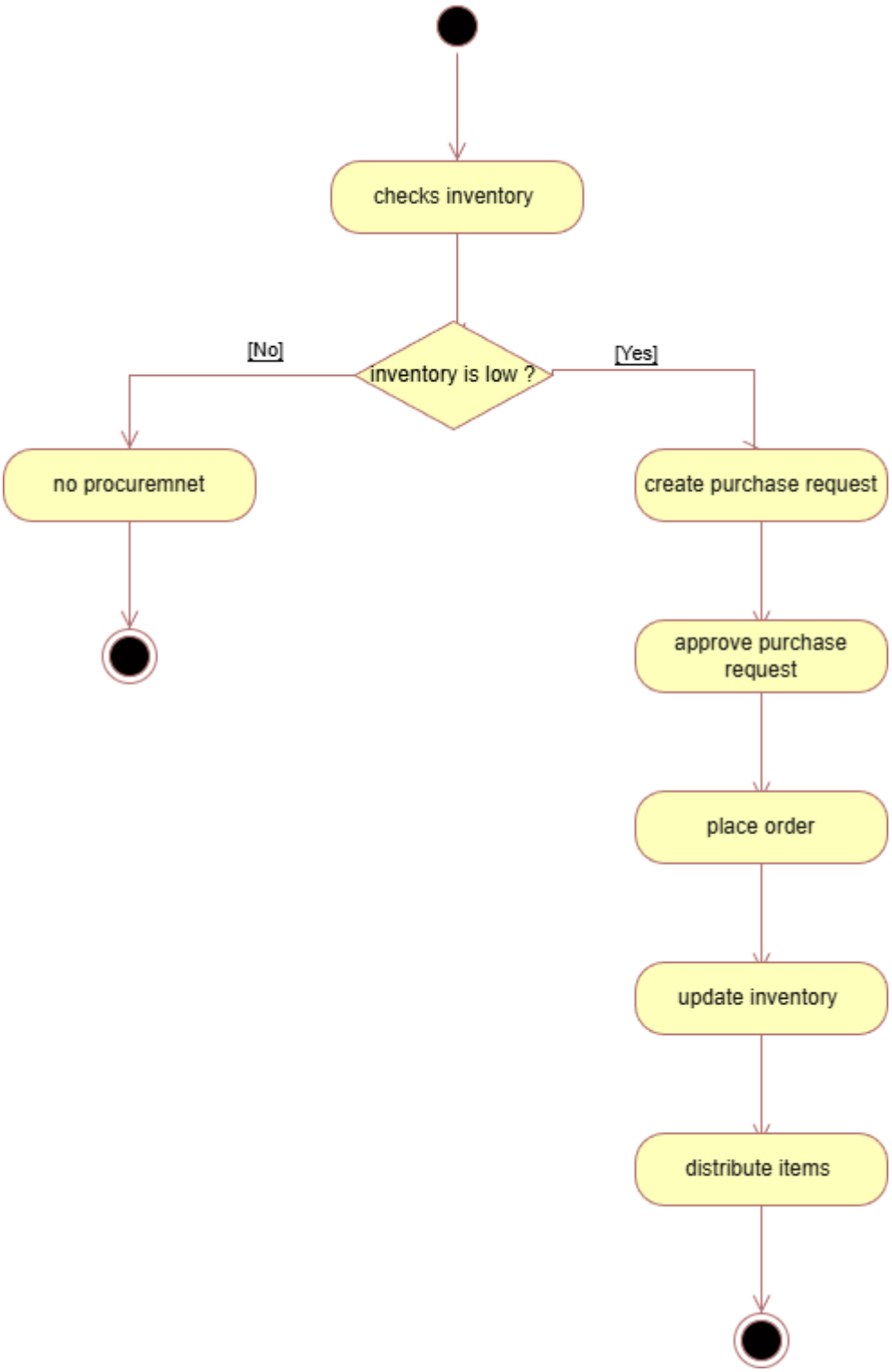
2. Process Patient Registration



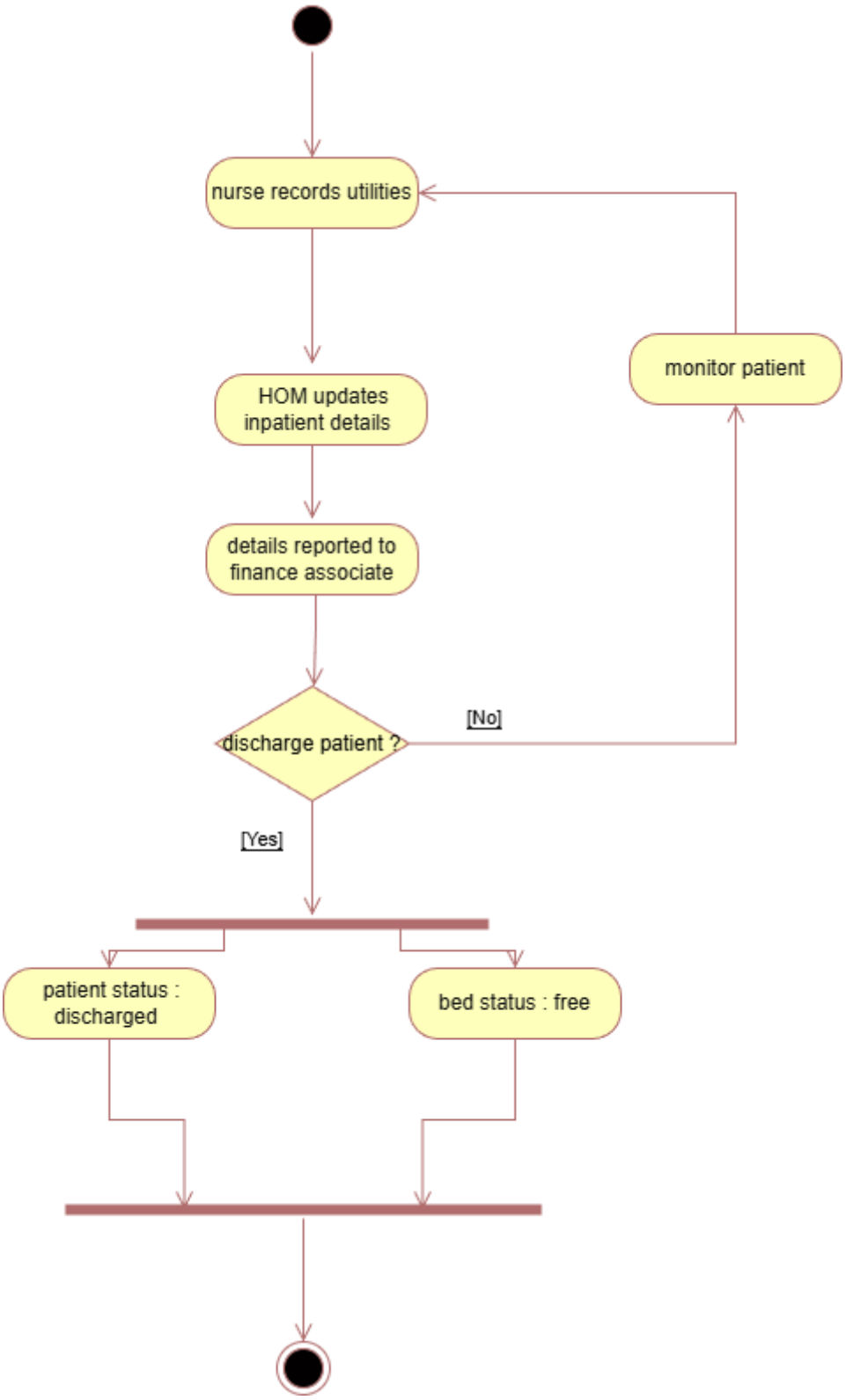
3. Manage Inpatient Bed Allocation



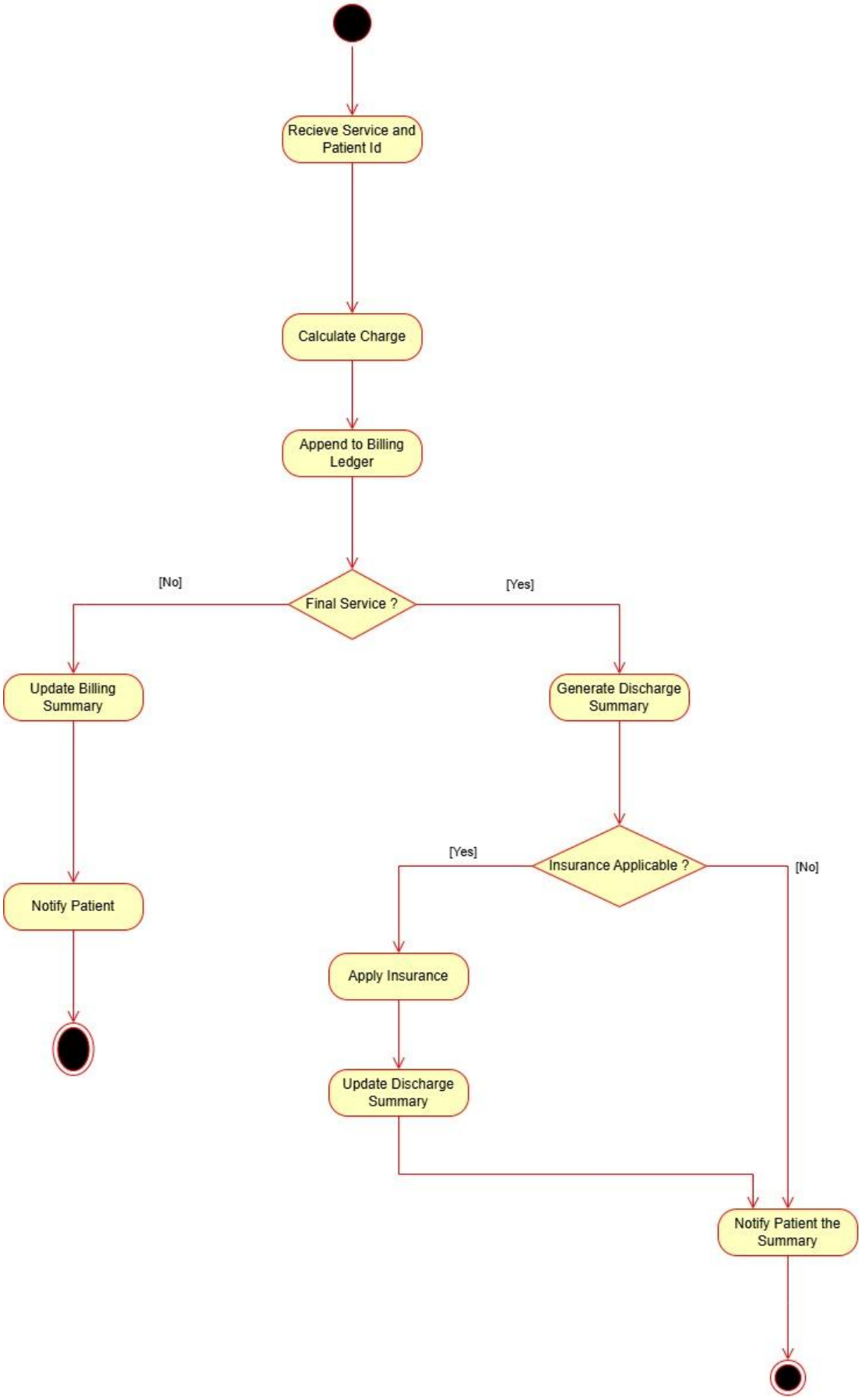
4. Monitor Inpatient Stay



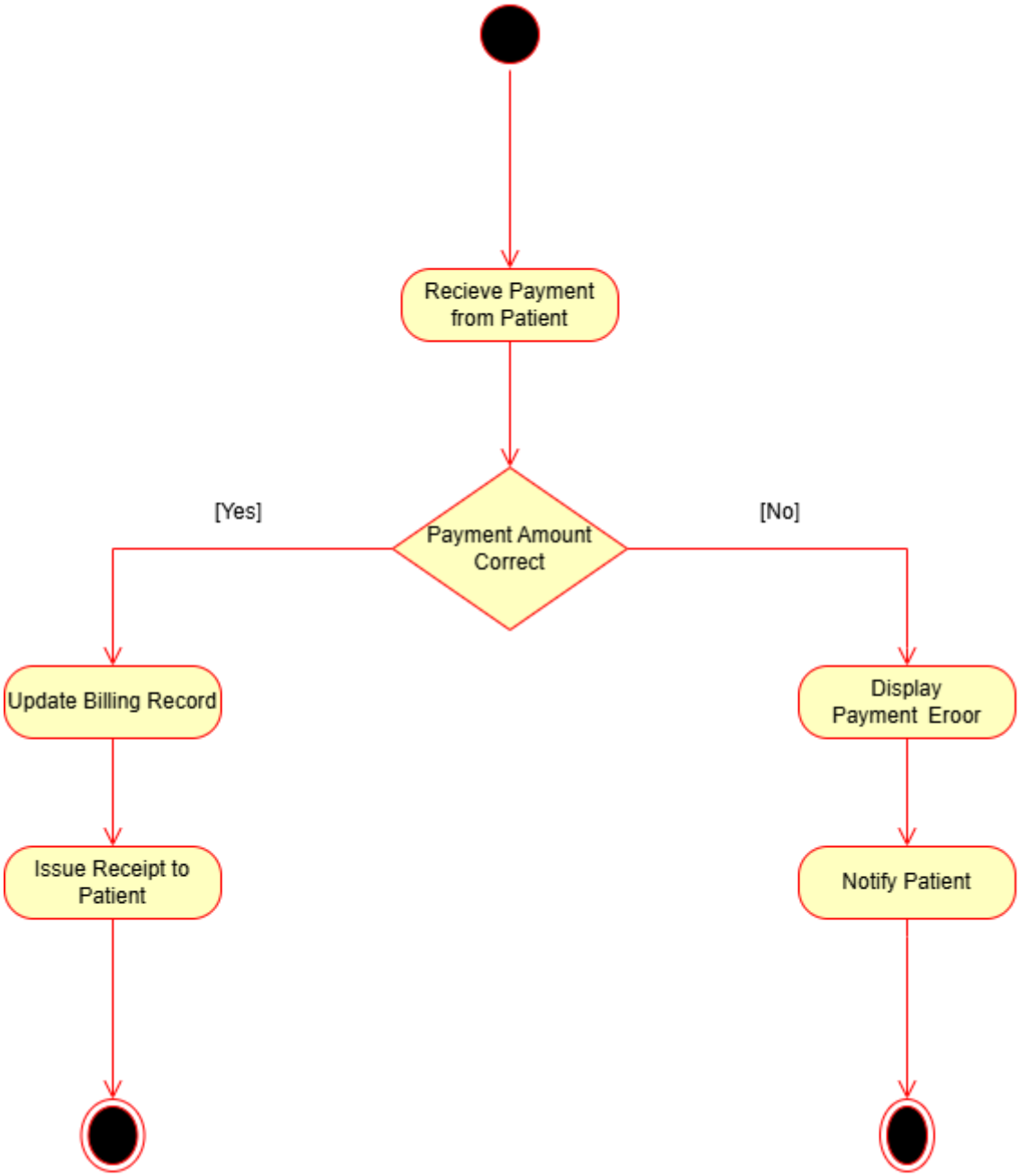
5. Manage Inventory and Procurement



6. Record Service Charges

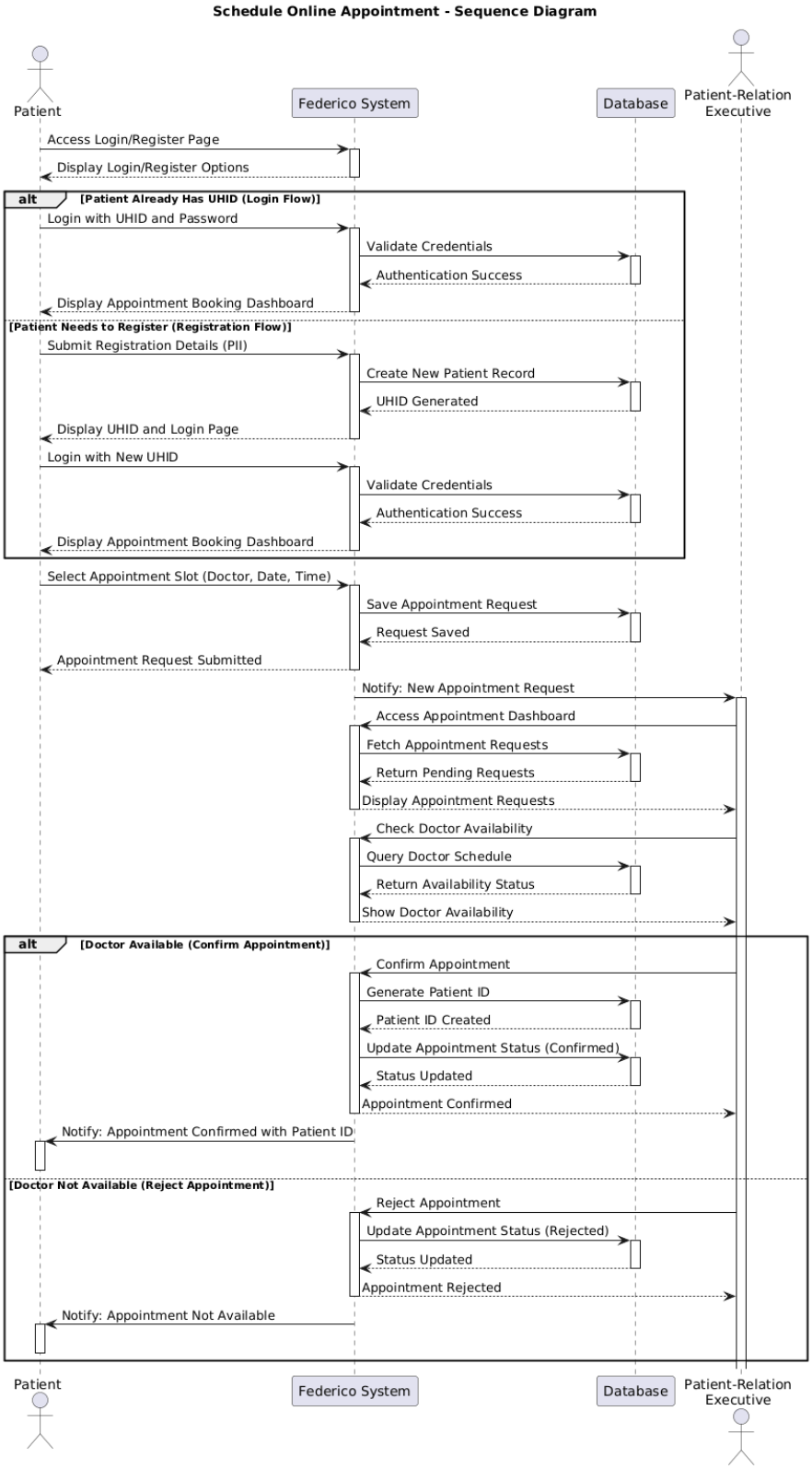


7. Process Payment

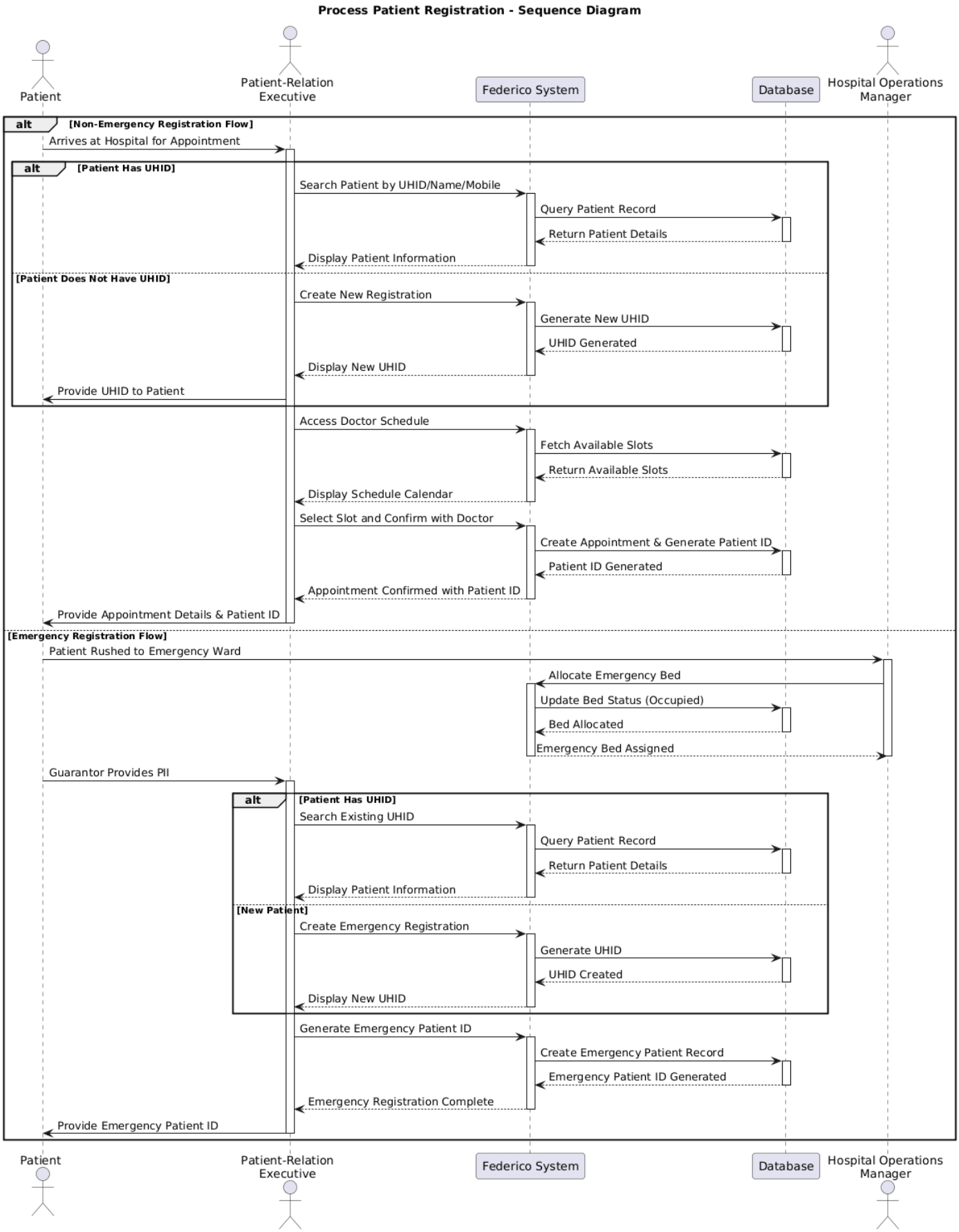


4.4 Sequence diagrams

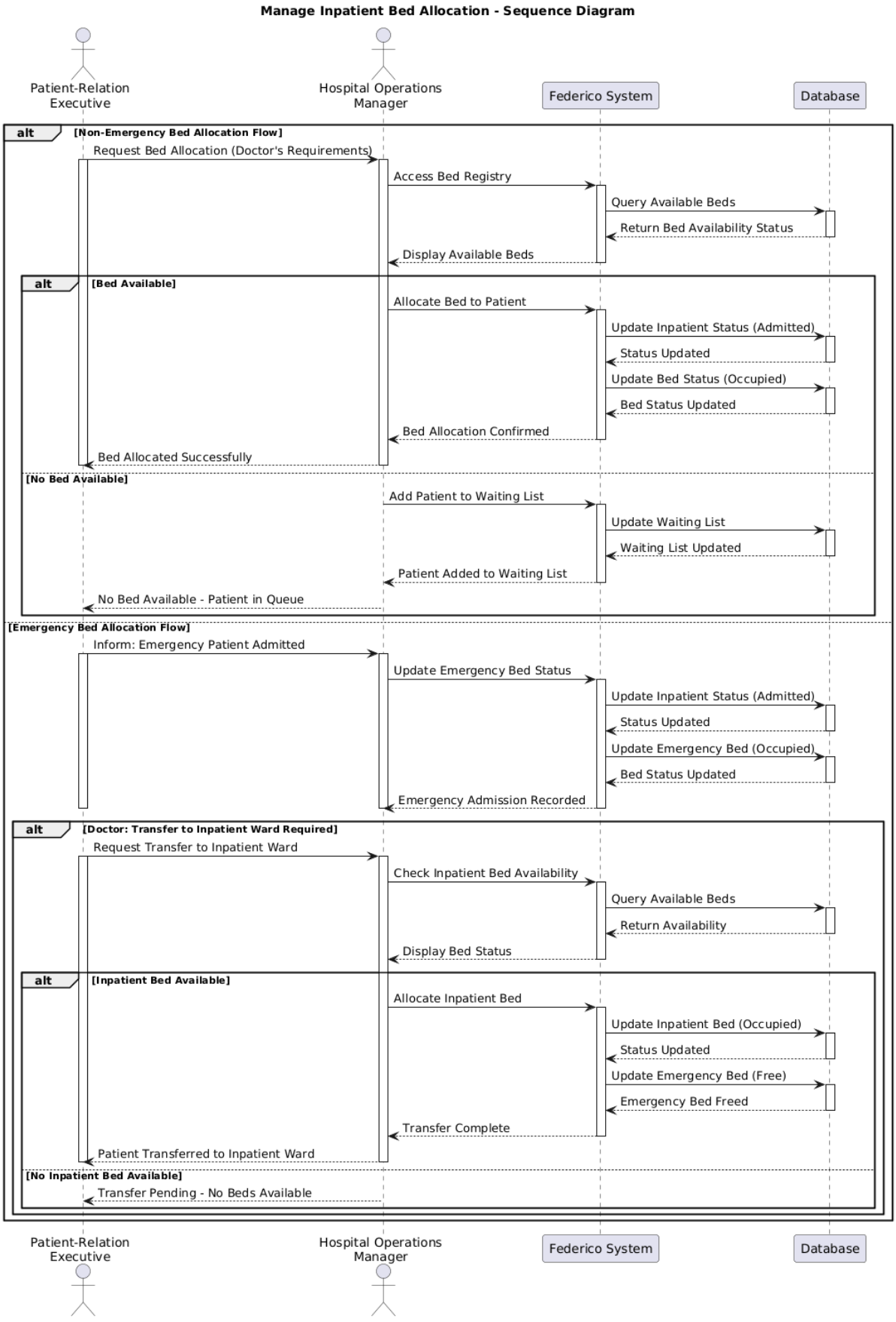
1. Schedule Online Appointment :



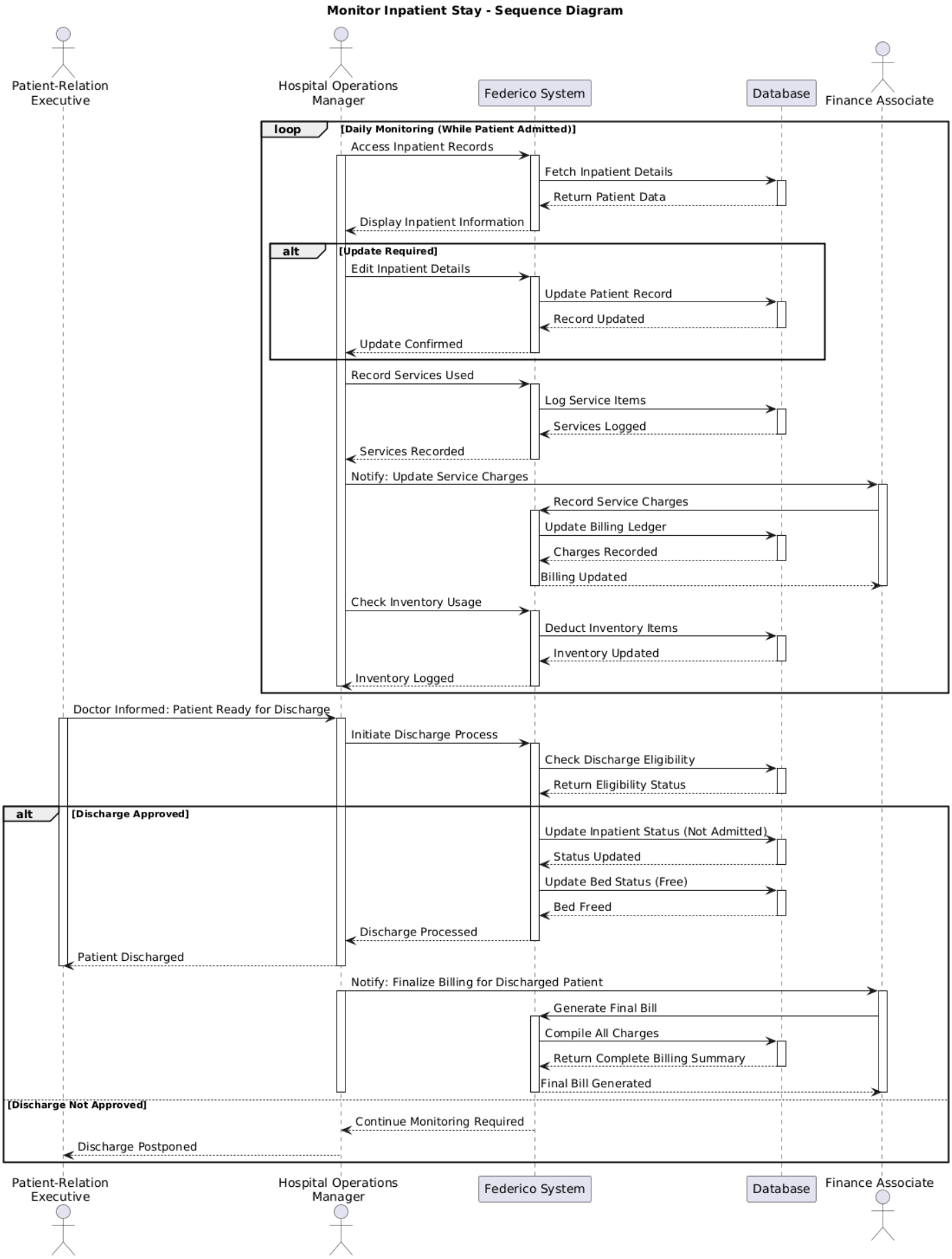
2. Process Patient Registration



3. Manage Inpatient Bed Allocation



4. Monitor Inpatient Stay



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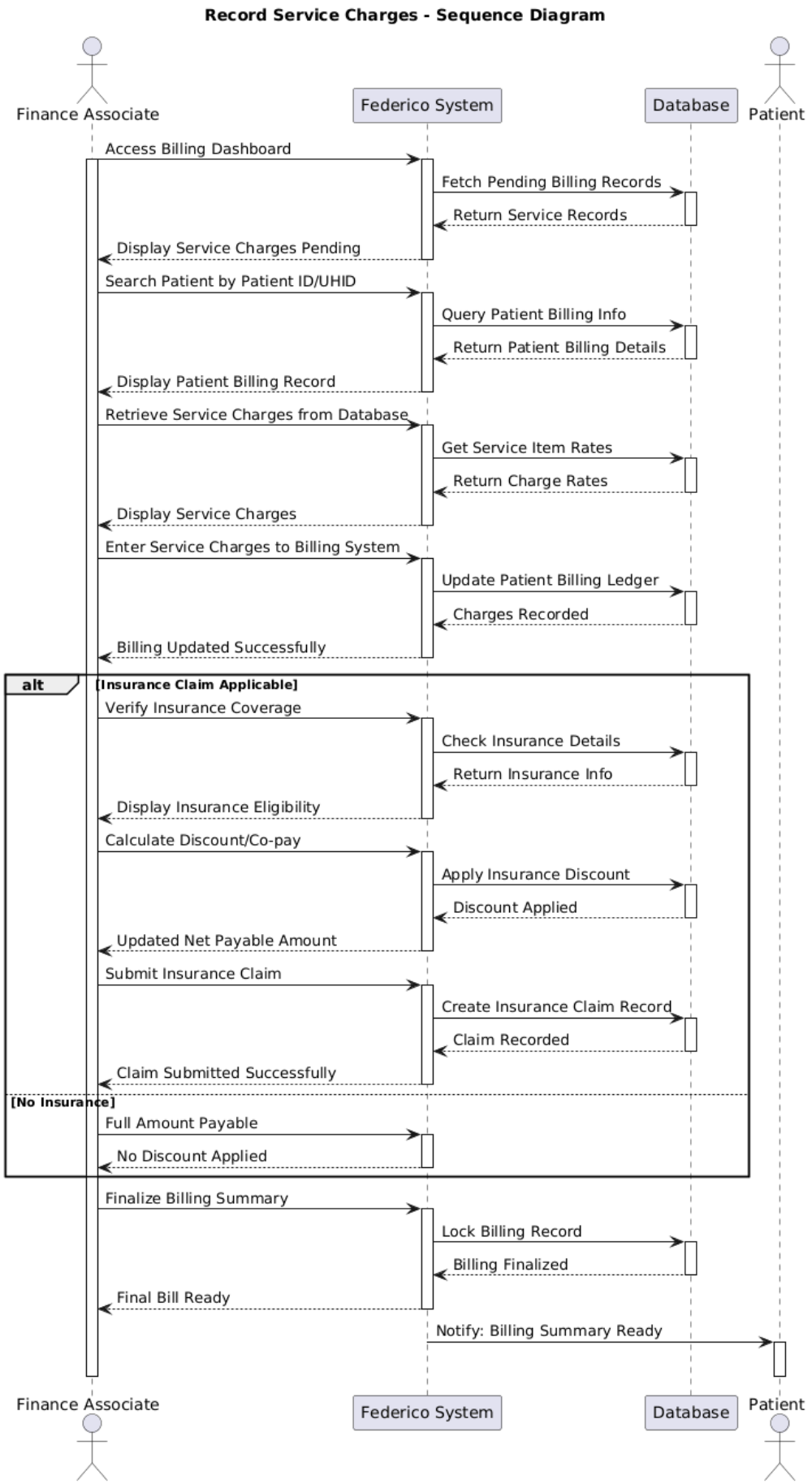
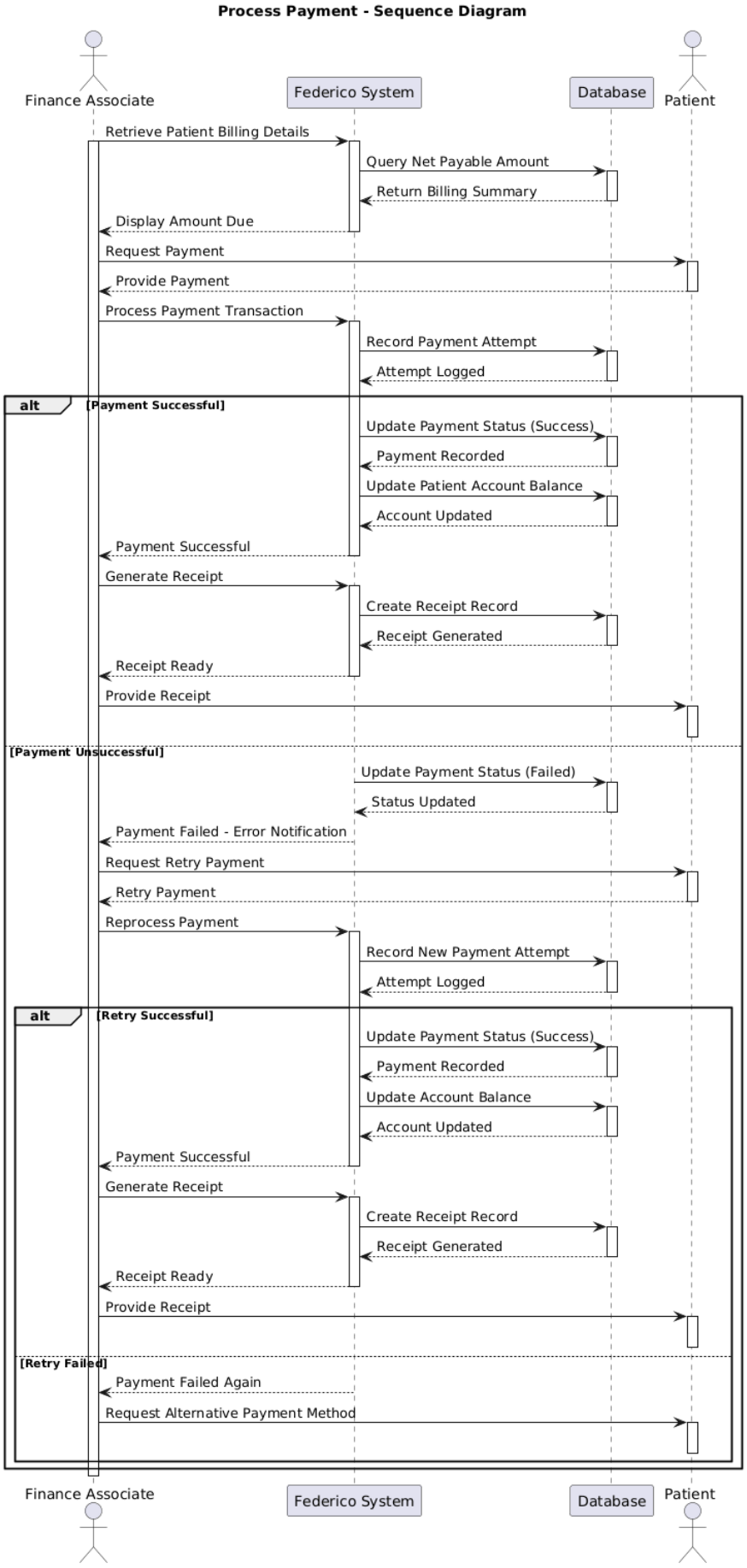


6. Process payment



7. Manage Inventory and Procurement