

SKINNOVATE
Dermatology Clinic Management System

Institution: Metropolitan Tirana University

Department: Faculty of Computer Science & Information Technology

Course: Software Engineering II

Subject: Software Engineering Analysis & Design

PROJECT REPORT

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Skinnovate

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PROJECT OVERVIEW

The Dermatology Clinic Management System is a software application designed to help dermatology clinics manage patient care more efficiently. It includes AI-powered skin analysis, teledermatology, appointment scheduling, and electronic health records (EHR) to improve both medical and cosmetic dermatology services.

Target Users (The clients of our client)

- Patients with skin conditions like acne, eczema, and psoriasis
- People looking for cosmetic treatments such as Botox and laser skin resurfacing
- Patients needing mole and skin cancer screenings for early detection

Key Features

- **Easy Patient Registration & Profile Management**
 - Simple registration via email, social media, or OTP (One-Time Password)
 - Tracks medical history, allergies, and past treatments
 - Stores before & after photos to monitor treatment progress
- **AI-Powered Skin Analysis**
 - Patients upload images of their skin condition, and AI suggests possible diagnoses
 - AI recommends treatment plans based on medical history
 - Virtual dermatologist chatbot for quick advice on minor skin issues
- **Appointment Scheduling & Management**
 - Automatically schedules appointments based on doctor availability and case urgency
 - Supports video consultations for remote assessments
 - Emergency appointment requests for urgent skin conditions
- **Treatment & Procedure Tracking**
 - Keeps records of cosmetic treatments like Botox, fillers, and chemical peels
 - Tracks laser therapy sessions and upcoming appointments
 - Sends automated reminders for follow-up treatments
- **Electronic Health Records (EHR) & Prescription Management**
 - Securely stores patient records, prescriptions, and test results
 - E-prescription system for easy prescription renewals
 - Pharmacy integration for ordering skincare medications online
- **Teledermatology & Virtual Consultation**
 - Live video consultations for remote skin assessments
 - AI-powered chatbot for general skincare guidance
 - Patient portal for tracking treatments and self-care recommendations
- **Loyalty Program for Frequent Patients**
 - Patients can earn loyalty points for regular visits and treatments
 - Loyalty cards provide discounts, special offers, and exclusive promotions
 - Personalized offers based on patient treatment history and preferences

Technical Aspects

- Frontend
- Backend
- Database Integration
- AI & Machine Learning
- Authentication (for secure login and patient data protection)

Data Security & Compliance

To protect sensitive health data and comply with global and local regulations, the system implements:

- **End-to-end encryption** (TLS for in transit; AES-256 at rest)
- **Multi-factor authentication** for all user roles
- **Audit logging** of every access and modification, stored immutably
- **GDPR, HIPAA, and national data-protection compliance**, including **automated data-erasure workflows**
- **Role-based access control** to strictly separate patient, doctor, admin, and IT privileges

Purpose

Improve Patient Care: Enable faster, more accurate skin-condition assessments through AI image analysis and dermatologist oversight.

Boost Clinic Efficiency: Automate routine tasks—scheduling, reminders, record-keeping—so staff can focus on treatment rather than paperwork.

Expand Access: Provide teledermatology (video visits and chatbots) so patients in remote areas or with urgent needs receive timely care.

Ensure Compliance & Security: Centralize EHR and e-prescriptions in an encrypted, auditable system that meets healthcare regulations.

Conclusion

The Dermatology Clinic Management System makes patient care easier and more efficient by combining AI-driven diagnostics, remote consultations, and streamlined clinic management. With features like loyalty rewards, secure health records, and teledermatology, it enhances both medical care and patient experience.

REQUIREMENTS

System Requirements

Functional Requirements

ID	Requirement Name	Description	Rationale	Priority
FR1	User Registration & Authentication	The system shall allow users to register using email, OTP, or social login.	Ease of access for patients.	High
FR2	AI Image Upload	The system shall allow patients to upload images for AI analysis.	Supports remote diagnosis.	High
FR3	AI Skin Analysis & Diagnosis	The system shall analyze uploaded images and suggest diagnoses and treatments using AI.	Fast preliminary advice.	High
FR4	Dermatologist Review & Validation	The dermatologist shall review, confirm, or modify AI suggestions before applying treatments.	Prevents misdiagnosis and supports professional validation.	High
FR5	Appointment Scheduling & Management	The system shall enable patients to schedule, cancel, or reschedule appointments online.	Convenience for patients.	High
FR6	Emergency Appointment Handling	The system shall prioritize emergency appointment requests.	Supports urgent skin conditions.	High
FR7	Teledermatology & Video Consultation	The system shall support video consultations with dermatologists.	Enables teledermatology.	Medium
FR8	Patient Treatment Record Management	The dermatologist shall view and update patient treatment records.	Keeps patient data up to date.	High

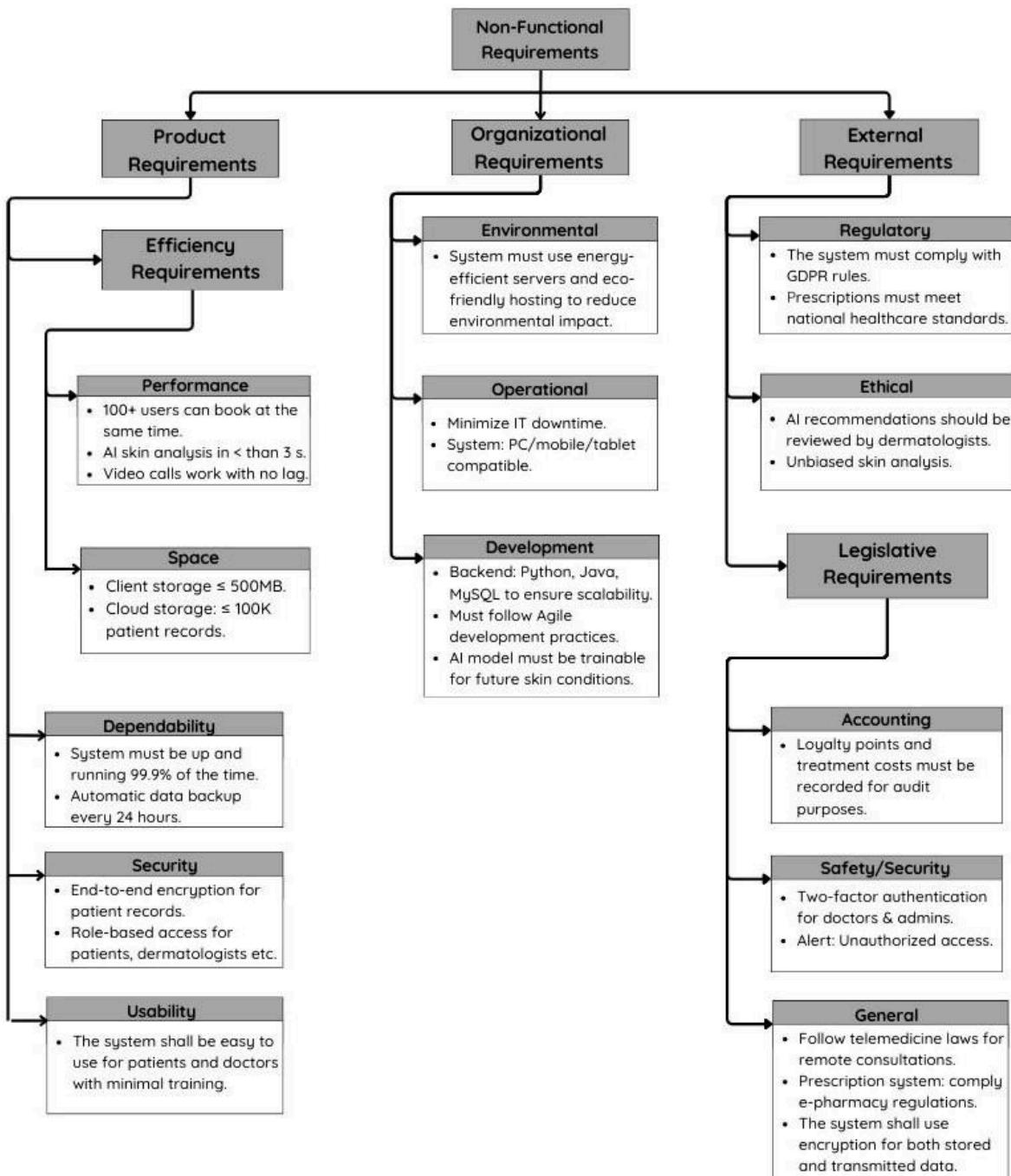
FR9	Automated Follow-up Reminders	The system shall send automated reminders for follow-ups and treatments.	Improves patient compliance.	High
FR10	Electronic Health Records (EHR) Management	The system shall store and manage electronic health records securely.	Legal and ethical responsibility.	High
FR11	E-Prescription & Pharmacy Integration	The system shall enable e-prescriptions and send them directly to partnered pharmacies.	Streamlines medication access.	High
FR12	Loyalty Program & Rewards	The system shall calculate and apply loyalty points to returning patients.	Encourages repeat visits.	Medium
FR13	Admin Appointment Dashboard	The system shall generate daily appointment dashboards for clinic admins.	Improves scheduling and resource use.	Medium
FR14	Role-Based Access Control	Each user shall have role-based access control (e.g., admin, patient, doctor, IT).	Maintains data confidentiality.	High
FR15	Audit Logs & Security Monitoring	The system shall log all access and modifications to sensitive data.	Ensures traceability and security.	High

Non - Functional Requirements

ID	Requirement	Type
NFR1	The system shall respond to AI analysis requests within 5 seconds.	Product requirement
NFR2	The system shall be available 99.9% of the time.	Product requirement
NFR3	The system shall encrypt all data at rest and in transit.	External requirement
NFR4	The system shall support up to 100 concurrent users.	Product requirement
NFR5	The user interface shall be accessible on both desktop and mobile devices.	Product requirement
NFR6	Patient data shall comply with GDPR and healthcare data protection laws.	External requirement
NFR7	Dermatologists shall be able to use the system effectively after 3 hours of training.	Usability
NFR8	The system shall auto-backup data every 6 hours.	Organizational
NFR9	Any system failure shall be recoverable within 15 minutes using automated backups.	Product requirement
NFR10	Compliance with Albania's Personal Data Protection Law to safeguard patient records.	External requirement
NFR11	Compliance with Ministry of Health guidelines for dermatological and telemedicine services.	External requirement
NFR12	Compliance with medical billing and tax regulations for healthcare institutions.	External requirement
NFR13	Adherence to insurance claim processing laws for dermatology treatments.	External requirement

Non-Functional Requirements Categorization Schema

Non-Functional Requirements



Domain Requirements

ID	Requirement	Description
DR1	Regulatory Compliance	The system must comply with GDPR, HIPAA, and national health data laws. It must follow telemedicine policies.
DR2	AI-Based Diagnostics and Risk Management	AI diagnoses must be validated by dermatologists. The system must track AI accuracy.
DR3	Electronic Health Records (EHR) & Prescription Management	Secure cloud storage for patient data. EHRs must be compatible with national systems.
DR4	Security and Data Protection	Uses encryption and MFA for secure logins and data protection.
DR5	Teledermatology & Remote Access	Supports video consultations and chatbots for basic skincare guidance.
DR6	Scalability and Performance	Handles high patient loads and supports future AI updates.
DR7	Audit and Reporting	Keeps detailed logs and generates compliance reports.
DR8	Customer Experience and Service	Offers a user-friendly interface, multi-language support, and self-service options.
DR9	Workflow and Automation	Sends appointment reminders and suggests treatments automatically.
DR10	Documentation and Training	Provides training materials for AI use and data security compliance.

User Requirements

User Scenarios

Scenario 1: Patient uses AI skin analysis

Persona: Sara, 25, experiencing sudden acne flare-ups

Goal: Get a quick idea of what's wrong without visiting the clinic

Steps:

1. Sara signs in from her phone.
2. She uploads a close-up photo of her skin.
3. Within 3 seconds, the AI shows a possible diagnosis (acne) and suggests treatment options.
4. Sara books a video consultation to confirm with a dermatologist

Scenario 2: Dermatologist reviews AI results and updates treatment

Persona: Dr. Elmas, senior dermatologist

Goal: Check AI suggestions and create a treatment plan

Steps:

1. Dr. Elmas logs into the dashboard.
2. He sees a new AI report for Sara's case.
3. He confirms the diagnosis and updates her treatment plan (topical cream, follow-up in 2 weeks).
4. The system auto-saves the update and sends Sara a reminder for her next appointment.

Scenario 3: Clinic administrator prevents overbooking

Persona: Nora, clinic administrator

Goal: Manage appointments and avoid schedule clashes

Steps:

1. Nora opens the daily appointment dashboard.
2. She sees that Dr. Elmas is fully booked tomorrow.
3. She moves less-urgent appointments to another day.
4. Patients are notified automatically, and the schedule updates in real-time.

Scenario 4: IT support restores the system after a crash

Persona: Denis, IT specialist

Goal: Restore the system quickly after unexpected failure

Steps:

1. Denis gets an alert that the server is down.
2. He logs into the admin panel and runs the automated backup restore.
3. Within 15 minutes, the system is running again.
4. He logs the issue and notifies the clinic team.

Scenario 5: Doctor prescribes medication with e-prescription**Persona:** Dr. Lira, dermatologist**Goal:** Prescribe medication digitally after video consultation**Steps:**

1. Dr. Lira completes a video consultation with a patient.
 2. She writes a prescription in the system.
 3. The prescription is sent to a partner pharmacy.
 4. The patient receives a text with pickup instructions.
-

Scenario 6: Patient earns and uses loyalty points**Persona:** Bela, 35, returning patient**Goal:** Save money using loyalty points**Steps:**

1. Bela books her 6th treatment at Skinnovate.
 2. The system adds 50 loyalty points to her account.
 3. At checkout, Bella chooses to redeem her points.
 4. Her final price is reduced automatically by 10%.
-

Scenario 7: Patient accesses records from home**Persona:** Ana, 41, long-term eczema patient**Goal:** Check treatment history and follow doctor's plan**Steps:**

1. Ana logs in from her tablet.
 2. She goes to "My Treatments" and reviews past prescriptions.
 3. She sees notes from her last visit and images showing improvement.
 4. She sets a reminder for her next cream refill.
-

Scenario 8: Doctor uses the system on mobile during travel**Persona:** Dr. Laura, traveling dermatologist**Goal:** Join consultations while away from the clinic**Steps:**

1. Dr. Laura logs in from her iPad at the airport.
 2. She starts a scheduled video consultation with a patient.
 3. After the call, she updates the treatment plan from the same device.
 4. The system syncs the update instantly.
-

Scenario 9: IT team runs a monthly security check**Persona:** Ilir, cybersecurity officer**Goal:** Make sure patient data is safe**Steps:**

1. Ilir reviews access logs for the past month.
 2. He checks for failed login attempts or unusual activity.
 3. He updates firewall settings and enforces 2FA for new users.
 4. A report is auto-generated and shared with the clinic manager.
-

Scenario 10: Admin processes reports for auditing**Persona:** Mira, finance/admin staff**Goal:** Prepare financial summary for management**Steps:**

1. Mira opens the finance section.
2. She downloads a report showing all treatments, prices, and loyalty redemptions.
3. She filters the data by month and prints a summary.
4. This is used for accounting and internal audit.

User Scenarios (Narrative Form)**Scenario 11: Booking an appointment**

Emma, a busy professional, has been struggling with persistent acne. She decides to visit the Skinnovate website and quickly creates an account. After logging in, she navigates to the appointment section and selects Dr. Smith, a well-rated dermatologist. The system shows available slots, and Emma picks one that fits her schedule. With a few clicks, she confirms her appointment, and almost instantly, she receives a confirmation email. Feeling relieved, she marks the date on her calendar.

Scenario 12: AI-Powered Skin Analysis

James has noticed unusual skin redness but isn't sure if it's serious. Instead of waiting weeks for a doctor's visit, he decides to try Skinnovate's AI-powered skin analysis. He uploads a clear picture of the affected area, and within seconds, the system provides a possible diagnosis. The AI suggests mild rosacea and recommends booking a consultation for further evaluation. Impressed by the fast response, James schedules a virtual appointment with a dermatologist through the system.

Scenario 13: Tracking a Treatment Plan

Maria, a regular patient at Skinnovate, recently started laser therapy for pigmentation issues. After each session, her doctor logs the treatment details into the system, allowing Maria to track her progress. A week before her next session, she receives an automated reminder to prepare her skin properly. When she logs into her profile, she can see her past treatments and upcoming procedures, making her skincare journey much easier to manage.

Scenario 14: Managing Electronic Health Records & Prescriptions

Daniel has been prescribed a medicated cream for his eczema. Instead of carrying paper prescriptions, he simply logs into Skinnovate and finds his e-prescription available in his profile. The system has already sent his prescription to a partner pharmacy, and all he needs to do is pick it up. If he ever needs a refill, the system allows him to request it in just a few clicks, making his treatment hassle-free.

Scenario 15: Earning Rewards with the Loyalty Program

Sophie frequently visits Skinnovate for cosmetic procedures. She is thrilled to learn about the loyalty program, where she earns points for every visit. After accumulating enough points, she receives a discount on her next Botox treatment. The system even suggests special promotions tailored to her treatment history. Feeling valued as a loyal customer, Sophie continues to use Skinnovate for all her dermatology needs.

User Stories (INVEST Format)

Feature: User Registration & Profile Management

Patient

- As a patient, I want to register and create my profile easily, so that I can manage my appointments and treatment history.
- As a patient, I want to upload and store before & after photos, so that I can track my skin improvement over time.
- As a patient, I want to update my medical history and allergies, so that my dermatologist can provide the best treatment for me.

Dermatologist

- As a dermatologist, I want to create and update my profile, so that patients can view my specialization and book appointments with me.
- As a dermatologist, I want to update my specialization and availability, so that my information stays current.

Clinic Administrators

- As a clinic administrator, I want to manage user accounts (patients, dermatologists, and staff), so that only verified users can access the system.
- As a clinic administrator, I want to register new staff members and assign roles, so that the clinic team can access their respective dashboards.

IT & System Support

- As an IT support staff, I want to register IT staff accounts, so that we can manage system access and updates.

Feature: AI Skin Analysis

Patient

- As a patient, I want to upload an image of my skin, so that AI can suggest possible diagnoses and treatment options.
- As a patient, I want to receive AI-based skincare recommendations, so that I can follow a routine tailored to my skin condition.

Dermatologist

- As a dermatologist, I want to review AI-generated skin analysis assessments, so that I can validate and refine the suggested treatment plans.
- As a dermatologist, I want to highlight potential skin cancer risks based on patient images, so that I can prioritize detection and diagnosis.

IT & System Support

- As a data analyst, I want to track data accuracy in diagnostic skin conditions, so that we can improve the model's performance over time.
- As a data analyst, I want to generate reports on patient treatment trends, so that dermatologists can refine their skincare recommendations.

Feature: Appointment Scheduling & Management

Patient

- As a patient, I want to book an appointment online, so that I don't have to visit the clinic in person just to schedule one.
- As a patient, I want to request an emergency appointment, so that I can receive urgent treatment if my skin condition worsens.
- As a patient, I want to schedule a video consultation, so that I can consult a dermatologist remotely without visiting the clinic.
- As a patient, I want to receive automated reminders for my upcoming appointments, so that I don't forget my scheduled visits.

Dermatologist

- As a dermatologist, I want to view my daily appointment schedule, so that I can manage my time effectively and reduce waiting times.
- As a dermatologist, I want to mark a patient's appointment as completed, so that my schedule stays organized.

Clinic Administrators

- As a clinic administrator, I want to manage doctor availability, so that patients can book appointments only when doctors are free.
- As a clinic administrator, I want to approve or reject emergency appointments, so that urgent cases are handled efficiently.

Feature: Treatment & Procedure Tracking

Patient

- As a patient, I want to view my past and upcoming treatments, so that I can stay informed about my skincare progress.

Dermatologist

- As a dermatologist, I want to create automated treatment plans, so that patients can follow them easily.
- As a dermatologist, I want to update and track patient treatment history, so that I can monitor progress and adjust future procedures accordingly.

Feature: Electronic Health Records & Prescription Management

Patient

- As a patient, I want to access my medical records online, so that I can review my past diagnoses and prescriptions anytime.
- As a patient, I want to receive e-prescriptions, so that I can easily purchase my medications from a pharmacy without a paper prescription.

Dermatologist

- As a dermatologist, I want to access patient records quickly, so that I can make informed decisions about their treatment plans.
- As a dermatologist, I want to update patient medical history and treatment records, so that I can track improvements and adjust treatments accordingly.
- As a dermatologist, I want to prescribe medications electronically, so that patients can receive their prescriptions digitally and avoid paperwork.

Clinic Administrators

- As a clinic administrator, I want to keep patient records safe and up to date, so that doctors can find the right information when treating patients.
- As a clinic administrator, I want to record prescriptions correctly, so that patients receive the right medication without errors.

Feature: System Performance & Security

Clinic Administrators

- As a clinic administrator, I want to control user access levels, so that only authorized personnel can access patient records.
- As a clinic administrator, I want the system to comply with GDPR and healthcare regulations, so that patient data remains secure and protected.

IT & System Support

- As an IT support staff, I want to monitor system uptime and security, so that patient data remains protected and the system is always available.
- As an IT support staff, I want to perform regular data backups, so that patient records are not lost in case of system failure.
- As an IT support staff, I want to create secure administrator accounts for system management, so that only authorized users can configure settings.

Feature: Loyalty Program

Patient

- As a patient, I want to earn loyalty points when I book appointments or treatments, so that I can receive discounts and rewards for being a regular client.
- As a patient, I want to track my earned points and available discounts, so that I can use them when booking my next treatment.

Clinic Administrators

- As a clinic administrator, I want to send promotional offers to patients, so that we can increase engagement and clinic visits.
- As a clinic administrator, I want to manage loyalty points and discounts, so that we can encourage repeat visits and reward loyal patients.

User Story Map

	Patient	Dermatologist	Clinic Administrators	IT & System Support	
User Registration & Profile Management	<p>As a patient, I want to register and create my profile easily, so that I can manage my appointments and treatment history.</p> <p>As a patient, I want to upload treatment photos, so that I can track my skin improvement over time.</p> <p>As a patient, I want to update my medical history and allergies, so that my dermatologist can provide the best treatment for me.</p>	<p>As a dermatologist, I want to create and update profiles, so that patients can view my specialization and book appointments with me.</p>	<p>As a dermatologist, I want to update my specialization and availability, so that my information stays current.</p>	<p>As a clinic administrator, I want to update my specialization and availability, so that only verified users can access the system.</p> <p>As a clinic administrator, I want to manage new staff members and assign roles, so that the team can access their respective dashboards.</p>	<p>As an IT support staff, I want to register new staff accounts, so that we can manage system access and updates.</p>
AI Skin Analysis	<p>As a patient, I want to upload an image of my skin, so that AI can suggest possible diagnoses and treatment options.</p> <p>As a patient, I want to receive AI-based skincare recommendations, so that I can follow a routine tailored to my skin condition.</p>	<p>As a dermatologist, I want to review AI-generated skin condition assessments, so that I can validate and refine the suggested treatment plans.</p>	<p>As a dermatologist, I want AI to highlight potential skin cancer risks and patient images, so that I can prioritize early detection and diagnosis.</p>		<p>As a data analyst, I want to track AI diagnostic accuracy and generate reports on patient treatment trends, so that dermatologists can refine their skincare recommendations.</p>
Appointment Scheduling & Management	<p>As a patient, I want to book an appointment online, so that I don't have to visit the clinic in person just to schedule one.</p> <p>As a patient, I want to request an emergency appointment, so that I can receive urgent treatment if my skin condition worsens.</p> <p>As a patient, I want to schedule a video consultation, so that I can consult a dermatologist remotely without visiting the clinic.</p> <p>As a patient, I want to receive automated reminders for my upcoming appointments, so that I don't forget my scheduled visits.</p>	<p>As a dermatologist, I want to view my daily appointment schedule, so that I can manage my time effectively and reduce patient waiting times.</p>	<p>As a dermatologist, I want to mark a patient's appointment as completed, so that my schedule stays updated and organized.</p>	<p>As a clinic administrator, I want to manage doctor availability, so that patients can book appointments only when doctors are free.</p> <p>As a clinic administrator, I want to approve or reschedule emergency appointments, so that urgent cases are handled efficiently.</p>	
Treatment & Procedure Tracking	<p>As a patient, I want to view my past and upcoming treatments, so that I can stay informed about my skincare progress.</p> <p>As a patient, I want to receive reminders for follow-up treatments, so that I don't miss important procedures like Botox or laser therapy.</p>	<p>As a dermatologist, I want to create automated treatment plans, so that patients can follow them easily.</p>	<p>As a dermatologist, I want to update and track patient treatment progress, so that I can monitor progress and adjust future procedures accordingly.</p>		
Electronic Health Records & Prescription Management	<p>As a patient, I want to access my medical records online, so that I can review my past diagnoses and prescriptions anytime.</p> <p>As a patient, I want to receive e-prescriptions, so that I can easily purchase medications from a pharmacy without a paper prescription.</p>	<p>As a dermatologist, I want to access patient medical records quickly, so that I can make informed decisions about their treatment plans.</p>	<p>As a dermatologist, I want to update patient medical history and treatment progress, so that I can track improvements and adjust treatments accordingly.</p>	<p>As a clinic administrator, I want to keep patient records safe and up-to-date, so that doctors can find the right information when treating patients.</p> <p>As a clinic administrator, I want to record prescriptions correctly, so that patients receive the right medication without errors.</p>	
System Performance & Security			<p>As a clinic administrator, I want to control user access levels, so that only authorized personnel can access patient records.</p> <p>As a clinic administrator, I want the system to comply with GDPR and healthcare regulations, so that patient data remains secure and protected.</p>	<p>As an IT support staff, I want to perform regular system updates and security checks, so that patient data remains protected and the system is always available.</p> <p>As an IT support staff, I want to create secure administrator accounts for system management, so that only authorized users can configure settings.</p>	<p>As an IT support staff, I want to perform regular data backups, so that patient records are not lost in case of system failure.</p>
Loyalty Program	<p>As a patient, I want to earn loyalty points for booking appointments or treatments, so that I can receive discounts and rewards for being a regular client.</p> <p>As a patient, I want to track my earned points and available discounts, so that I can use them when booking my next treatment.</p>		<p>As a clinic administrator, I want to send promotional offers to patients, so that we can increase engagement and clinic visits.</p>	<p>As a clinic administrator, I want to manage loyalty points and discounts, so that we can encourage repeat visits and reward loyal patients.</p>	

Use Case Description Tables

Use case name:	UC01 - User Registration & Login					
Scenario:	A new or returning user wants to access their Skinnovate dashboard.					
Triggering event:	User clicks “Register” or “Login” on the Skinnovate home page.					
Brief description:	Enables new users to create an account (via email/OTP or social login) and existing users to authenticate, then redirects them to their personalized dashboard.					
Actors:	<ul style="list-style-type: none"> • Patient • Dermatologist • Administrator 					
Related use cases:	<ul style="list-style-type: none"> • UC02 – AI Skin Analysis (requires user to be authenticated) • UC03 – Appointment Booking & Management • UC04 – Dermatologist Review & Treatment Update 					
Stakeholders:	<ul style="list-style-type: none"> • End users (patients, doctors, admins) • Clinic operations team 					
Preconditions:	<ul style="list-style-type: none"> • System is online and accessible. • For registration: user email not already in database. • For login: user already has valid credentials. 					
Postconditions:	<ul style="list-style-type: none"> • The user is logged in and gains access to their personalized dashboard. • Access control is applied based on the user’s role (e.g., patient, doctor, administrator). 					
Flow of activities:	<table border="1"> <thead> <tr> <th>Actor</th> <th>System</th> </tr> </thead> <tbody> <tr> <td> 1. Accesses Skinnovate portal 2. Selects Register 3. Enters registration details 4. — 5. Or selects Login 6. Enters credentials 7. — </td> <td> Displays “Register” and “Login” Prompts for email, OTP/social login, and profile data Validates inputs; if valid, creates new User record; sends confirmation Redirects to dashboard Prompts for email/password Validates credentials On success, redirects to dashboard </td> </tr> </tbody> </table>	Actor	System	1. Accesses Skinnovate portal 2. Selects Register 3. Enters registration details 4. — 5. Or selects Login 6. Enters credentials 7. —	Displays “Register” and “Login” Prompts for email, OTP/social login, and profile data Validates inputs; if valid, creates new User record; sends confirmation Redirects to dashboard Prompts for email/password Validates credentials On success, redirects to dashboard	
Actor	System					
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Exception conditions:	<ul style="list-style-type: none"> • Invalid credentials: display error “Email or password incorrect”—allow retry. • Registration error: for missing/invalid fields, highlight errors and block submission until corrected. 					

Figure 1: Fully developed use case description for **User Registration & Login**

Use case name:	UC02 – AI Skin Analysis					
Scenario:	A logged-in patient wants a quick preliminary diagnosis of a skin condition using the AI engine.					
Triggering event:	Patient selects “AI Skin Analysis” from their dashboard.					
Brief description:	Patient uploads a skin image; the system checks quality, sends it to AI, then displays the AI’s diagnosis and confidence score.					
Actors:	<ul style="list-style-type: none"> • Primary: Patient • Secondary: AI System (automated) 					
Related use cases:	<ul style="list-style-type: none"> • UC01 – User Registration & Login (must be logged in) • UC03 – Appointment Booking & Management (if AI suggests consultation) 					
Stakeholders:	<ul style="list-style-type: none"> • Patients seeking fast insights • Dermatologists (for follow-up review) 					
Preconditions:	<ul style="list-style-type: none"> • Patient is authenticated (UC01). • Device can capture/upload high-resolution images. 					
Postconditions:	<ul style="list-style-type: none"> • A preliminary AI diagnosis (with confidence) is recorded. • Patient can choose to book a consultation based on results. 					
Flow of activities:	<table border="1"> <thead> <tr> <th>Actor</th> <th>System</th> </tr> </thead> <tbody> <tr> <td> 1. Clicks “AI Skin Analysis” 2. Uploads skin image 3. — 4. — 5. — 6. — </td> <td> Prompts for image upload Validates image quality If valid, forwards image to AI engine If poor, returns error “Please upload clearer image” Runs AI analysis (≤ 5 sec) and returns diagnosis + confidence Displays results with option “Book Consultation” if confidence $<$ threshold </td> </tr> </tbody> </table>	Actor	System	1. Clicks “AI Skin Analysis” 2. Uploads skin image 3. — 4. — 5. — 6. —	Prompts for image upload Validates image quality If valid, forwards image to AI engine If poor, returns error “Please upload clearer image” Runs AI analysis (≤ 5 sec) and returns diagnosis + confidence Displays results with option “Book Consultation” if confidence $<$ threshold	
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Exception conditions:	<ul style="list-style-type: none"> • Poor image quality: reject and prompt re-upload. • Low AI confidence: show “Low confidence—please book consultation.” 					

Figure 2: Fully developed use case description for ***AI Skin Analysis***

Use case name:	UC03 – Appointment Booking & Management					
Scenario:	A patient schedules, reschedules, or cancels a clinic appointment; admins monitor and adjust bookings.					
Triggering event:	Patient navigates to “Appointments” or admin opens the daily dashboard.					
Brief description:	Allows patients to view available slots, book/reschedule/cancel appointments, and triggers emergency handling when needed; administrators oversee and adjust schedules.					
Actors:	<ul style="list-style-type: none"> • Primary: Patient • Secondary: Clinic Administrator 					
Related use cases:	<ul style="list-style-type: none"> • UC01 – User Registration & Login • UC02 – AI Skin Analysis (may prompt booking) • UC04 – Dermatologist Review & Treatment Update 					
Stakeholders:	<ul style="list-style-type: none"> • Patients • Clinic staff (admins, doctors) 					
Preconditions:	<ul style="list-style-type: none"> • User is authenticated (UC01). • Scheduling system is online and reflects real-time availability. 					
Postconditions:	<ul style="list-style-type: none"> • Appointment is created, updated, or canceled. <p>Notifications sent to patient, admin, and dermatologist as appropriate.</p>					
Flow of activities:	<table border="1"> <thead> <tr> <th>Actor</th> <th>System</th> </tr> </thead> <tbody> <tr> <td> <ol style="list-style-type: none"> 1. Opens “Appointments” page 2. Selects desired slot 3. Confirms booking 4. Or selects “Reschedule” 5. Or selects “Cancel” 6. Admin views dashboard 7. Admin adjusts slot (if needed) </td> <td> <p>Displays calendar with available time slots</p> <p>Checks slot availability</p> <p>Creates Appointment record; sends confirmation notification</p> <p>Prompts new slot selection; updates record; notifies parties</p> <p>Marks appointment canceled; notifies parties</p> <p>Displays all today’s appointments and statuses</p> <p>Updates appointment records; notifies impacted patients</p> </td> </tr> </tbody> </table>	Actor	System	<ol style="list-style-type: none"> 1. Opens “Appointments” page 2. Selects desired slot 3. Confirms booking 4. Or selects “Reschedule” 5. Or selects “Cancel” 6. Admin views dashboard 7. Admin adjusts slot (if needed) 	<p>Displays calendar with available time slots</p> <p>Checks slot availability</p> <p>Creates Appointment record; sends confirmation notification</p> <p>Prompts new slot selection; updates record; notifies parties</p> <p>Marks appointment canceled; notifies parties</p> <p>Displays all today’s appointments and statuses</p> <p>Updates appointment records; notifies impacted patients</p>	
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Exception conditions:	<ul style="list-style-type: none"> • Slot already booked: show “Selected slot unavailable—choose another.” • Emergency booking: if patient marks “Emergency,” triggers emergency workflow (reprioritize slots, bump non-urgent bookings, notify). 					

Figure 3: Fully developed use case description for *Appointment Booking & Management*

Use case name:	UC04 – Dermatologist Review & Treatment Update					
Scenario:	A dermatologist examines AI-generated skin analysis results, confirms or modifies the diagnosis, and records a treatment plan.					
Triggering event:	An AI diagnosis report becomes available for a patient's uploaded skin image (or a video consultation concludes).					
Brief description:	Enables the dermatologist to review AI suggestions, adjust the diagnosis if needed, and document a treatment plan in the patient's record.					
Actors:	<ul style="list-style-type: none"> • Primary: Dermatologist • Secondary: AI System (automated process) 					
Related use cases:	<ul style="list-style-type: none"> • UC02 – AI Skin Analysis • UC03 – Appointment Booking & Management 					
Stakeholders:	<ul style="list-style-type: none"> • Patients (for accurate treatment) • Clinic staff (for scheduling follow-ups) • IT/QA (for ensuring AI accuracy) 					
Preconditions:	<ul style="list-style-type: none"> • The patient's AI analysis report exists and is accessible (UC02). • The dermatologist is authenticated and has appropriate role privileges. 					
Postconditions:	<ul style="list-style-type: none"> • The finalized diagnosis and treatment plan are saved to the patient's record. • Automated follow-up reminders are scheduled if required. 					
Flow of activities:	<table border="1"> <thead> <tr> <th>Actor</th> <th>System</th> </tr> </thead> <tbody> <tr> <td> 1. Opens patient's AI report 2. Reviews diagnosis suggestion 3. Adjusts or confirms diagnosis 4. Selects or enters treatment plan details 5. Saves treatment plan </td> <td> Retrieves AI suggestions and patient history Displays confidence score and recommended options Validates and logs the dermatologist's decision Presents treatment template and input fields Persists data to EHR and schedules follow-up </td> </tr> </tbody> </table>	Actor	System	1. Opens patient's AI report 2. Reviews diagnosis suggestion 3. Adjusts or confirms diagnosis 4. Selects or enters treatment plan details 5. Saves treatment plan	Retrieves AI suggestions and patient history Displays confidence score and recommended options Validates and logs the dermatologist's decision Presents treatment template and input fields Persists data to EHR and schedules follow-up	
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Exception conditions:	<ul style="list-style-type: none"> • AI report missing: system displays "Report unavailable—please retry later." • Validation error: if required treatment fields are blank, system highlights missing items and blocks save. 					

Figure 4: Fully developed use case description for **Dermatologist Review & Treatment Update**

Use case name:	UC05 – E-Prescription					
Scenario:	After a dermatologist finalizes a treatment plan, the system generates an electronic prescription and sends it to the patient's chosen pharmacy and insurer.					
Triggering event:	Dermatologist clicks “Issue e-Prescription” at the end of a consultation.					
Brief description:	Allows a dermatologist to create, sign, and transmit a digital prescription; the system then forwards it to the pharmacy for fulfillment and to the insurance provider for claims processing.					
Actors:	<ul style="list-style-type: none"> • Primary: Dermatologist • Secondary: Pharmacy System, Insurance System 					
Related use cases:	<ul style="list-style-type: none"> • UC04 – Dermatologist Review & Treatment Update • UC22 – Request E-Prescription Refill 					
Stakeholders:	<ul style="list-style-type: none"> • Patients (for timely medication access) • Partner pharmacies (for order fulfillment) • Insurance providers (for claim adjudication) 					
Preconditions:	<ul style="list-style-type: none"> • The patient's consultation record exists with a confirmed diagnosis and treatment plan. • Dermatologist is authenticated and authorized to prescribe. • Pharmacy and insurance endpoints are reachable. 					
Postconditions:	<ul style="list-style-type: none"> • A signed e-prescription is stored in the patient's EHR. • Pharmacy receives the order and begins fulfillment. • Insurance provider receives claim data for coverage. 					
Flow of activities:	<table border="1"> <thead> <tr> <th>Actor</th> <th>System</th> </tr> </thead> <tbody> <tr> <td> 1. Clicks “Issue e-Rx” Presents e-prescription form 2. Enters medication, dosage, instructions Validates drug availability and dosing 3. Clicks “Sign & Send” 4. — 5. — 6. — 7. — </td> <td> Presents e-prescription form Validates drug availability and dosing Applies electronic signature Transmits XML/HL7 message to Pharmacy System Transmits claim data to Insurance System Updates patient's EHR with prescription record Sends confirmation notice to dermatologist </td> </tr> </tbody> </table>	Actor	System	1. Clicks “Issue e-Rx” Presents e-prescription form 2. Enters medication, dosage, instructions Validates drug availability and dosing 3. Clicks “Sign & Send” 4. — 5. — 6. — 7. —	Presents e-prescription form Validates drug availability and dosing Applies electronic signature Transmits XML/HL7 message to Pharmacy System Transmits claim data to Insurance System Updates patient's EHR with prescription record Sends confirmation notice to dermatologist	
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Exception conditions:	<ul style="list-style-type: none"> • Formulary mismatch: system displays “Selected medication not on formulary—choose alternative.” • Transmission failure: if pharmacy or insurer endpoint is down, system retries (up to 3×) and alerts IT on persistent errors. • Authorization denied: insurance returns a denial code → system notifies dermatologist to adjust prescription. 					

Figure 5: Fully developed use case description for **E-Prescription**

Use case name:	UC06 – System Recovery & Maintenance					
Scenario:	IT staff detect or respond to system disruptions by running backups, restoring data, and ensuring overall platform health.					
Triggering event:	A scheduled maintenance window arrives or an alert reports a service outage.					
Brief description:	Enables IT/administrators to perform routine backups, archive data, restore from backups in case of failure, and monitor system health to meet availability targets.					
Actors:	<ul style="list-style-type: none"> • Primary: IT Support / System Administrator • Secondary: Backup Service, Monitoring Service 					
Related use cases:	<ul style="list-style-type: none"> • UC41 – On Demand Data Backup • UC45 – Restore from Backup 					
Stakeholders:	<ul style="list-style-type: none"> • All Skinnovate users (for uptime) • Compliance auditors (for data retention policies) 					
Preconditions:	<ul style="list-style-type: none"> • Admin is authenticated with elevated privileges. • Backup storage and monitoring services are available. 					
Postconditions:	<ul style="list-style-type: none"> • System data is safely backed up and archived. • Any failed components are restored to a healthy state. • System uptime SLA of 99.9% is maintained. 					
Flow of activities:	<table border="1"> <thead> <tr> <th>Actor</th> <th>System</th> </tr> </thead> <tbody> <tr> <td> 1. Logs into Admin Console 2. Triggers “Run Backup Now” 3. — 4. Receives alert of service failure 5. Confirms restore action 6. — 7. Opens Monitoring Dashboard 8. — </td> <td> Displays Recovery & Maintenance options Initiates snapshot to Backup Service Moves older backups to cold storage (archival) Presents “Restore from Backup” option Coordinates with Backup Service to retrieve data Restarts failed components; runs integrity checks Shows system health metrics and alerts Logs all maintenance tasks for audit </td> </tr> </tbody> </table>	Actor	System	1. Logs into Admin Console 2. Triggers “Run Backup Now” 3. — 4. Receives alert of service failure 5. Confirms restore action 6. — 7. Opens Monitoring Dashboard 8. —	Displays Recovery & Maintenance options Initiates snapshot to Backup Service Moves older backups to cold storage (archival) Presents “Restore from Backup” option Coordinates with Backup Service to retrieve data Restarts failed components; runs integrity checks Shows system health metrics and alerts Logs all maintenance tasks for audit	
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Exception conditions:	<ul style="list-style-type: none"> • Backup failure: system logs error, retries once, and emails IT if still failing. • Restore integrity error: if restored data fails checksum, system aborts and alerts senior admin. • Monitoring service down: system falls back to local logs and alerts on startup. 					

Figure 6: Fully developed use case description for **System Recovery & Maintenance**

Use case name:	UC08 – Two-Factor Authentication Setup					
Scenario:	A user enhances account security by enabling two-factor authentication (2FA), choosing a delivery method, and verifying ownership.					
Triggering event:	User selects “Enable Two-Factor Authentication” from their account security settings.					
Brief description:	Guides the user through selecting a 2FA method (SMS, email, or authenticator app), verifying the chosen channel, and activating 2FA for subsequent logins.					
Actors:	<ul style="list-style-type: none"> • Primary: User (Patient, Dermatologist, Administrator) • Secondary: Email/SMS Service 					
Related use cases:	<ul style="list-style-type: none"> • UC01 – User Registration & Login • UC07a – Forgot Password 					
Stakeholders:	<ul style="list-style-type: none"> • All users (for account security) • IT security team 					
Preconditions:	<ul style="list-style-type: none"> • The user is authenticated and on their security settings page. • The user’s contact information (email or phone) is verified and up-to-date. 					
Postconditions:	<ul style="list-style-type: none"> • Two-factor authentication is enabled on the user’s account. • Future logins will require a second factor. 					
Flow of activities:	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Actor</th> <th style="text-align: center;">System</th> </tr> </thead> <tbody> <tr> <td style="vertical-align: top;"> 8. Navigates to Security Settings 9. Clicks “Enable Two-Factor Authentication” 10. Selects preferred method (e.g., SMS) 11. Confirms contact info 12. Retrieves code (or scans QR in Auth App) 13. Enters setup code (or confirms app token) 14. Clicks “Activate 2FA” 15. — </td> <td style="vertical-align: top;"> Displays “Enable Two-Factor Authentication” option Presents choice of methods: SMS, Email, Auth App Prompts for/validates phone number Sends 2FA setup code or provisioning QR code — Verifies code/token Updates security settings; marks 2FA as active Displays “2FA Enabled” confirmation and backup codes </td> </tr> </tbody> </table>	Actor	System	8. Navigates to Security Settings 9. Clicks “Enable Two-Factor Authentication” 10. Selects preferred method (e.g., SMS) 11. Confirms contact info 12. Retrieves code (or scans QR in Auth App) 13. Enters setup code (or confirms app token) 14. Clicks “Activate 2FA” 15. —	Displays “Enable Two-Factor Authentication” option Presents choice of methods: SMS, Email, Auth App Prompts for/validates phone number Sends 2FA setup code or provisioning QR code — Verifies code/token Updates security settings; marks 2FA as active Displays “2FA Enabled” confirmation and backup codes	
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Exception conditions:	<ul style="list-style-type: none"> • Invalid contact info: “Phone number/email not recognized—please update profile.” • Delivery failure: on SMS/email bounce, system offers “Resend Code” and logs the failure. • Invalid setup code: “Code incorrect—try again” (up to 3 attempts), then abort back to method selection. • Timeout: if no code entered within 5 minutes, session expires and user must restart setup. 					

Figure 8: Fully developed use case description for **Two-Factor Authentication Setup**

Use case name:	UC09 – Update User Profile					
Scenario:	A user wishes to change their personal information such as name, phone number, contact method, or skin type preferences within their Skinnovate account.					
Triggering event:	The user navigates to the “Profile Settings” section and selects “Edit Profile.”					
Brief description:	Allows users to securely update personal information stored in their account. The system validates and stores the changes, ensuring all linked records reflect the updated data.					
Actors:	<ul style="list-style-type: none"> • User (Patient, Dermatologist, Admin) 					
Related use cases:	<ul style="list-style-type: none"> • UC01 – User Registration & Login • UC09 – Two Factor Authentication Setup • UC33 – Loyalty Points Award (some updates may affect preferences) 					
Stakeholders:	<ul style="list-style-type: none"> • Users (for data accuracy and personalization) • System Admin (to ensure user info is current and secure) 					
Preconditions:	<ul style="list-style-type: none"> • The user is authenticated and has access to their profile dashboard. • Profile data is available and loaded from the database. 					
Postconditions:	<ul style="list-style-type: none"> • The user’s updated profile information is stored successfully. • A timestamped log of the changes is maintained. • A confirmation is shown to the user. 					
Flow of activities:	<table border="1"> <thead> <tr> <th>Actor</th> <th>System</th> </tr> </thead> <tbody> <tr> <td> 1. Navigates to Profile Settings 2. Clicks “Edit” 3. Enters updated data 4. Clicks “Save Changes” 5. – </td> <td> Loads existing profile data into form fields Enables editable fields Validates fields (format, required info, email uniqueness) Saves updates to database and creates audit log Shows success message and updated profile view </td> </tr> </tbody> </table>	Actor	System	1. Navigates to Profile Settings 2. Clicks “Edit” 3. Enters updated data 4. Clicks “Save Changes” 5. –	Loads existing profile data into form fields Enables editable fields Validates fields (format, required info, email uniqueness) Saves updates to database and creates audit log Shows success message and updated profile view	
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Exception conditions:	<ul style="list-style-type: none"> • Missing required fields: System prompts user to fill in all required details. • Invalid formats (e.g., email, phone): System displays validation errors. • Database update failure: System shows an error and logs the issue. • No internet/server timeout: System informs the user to retry later. 					

Figure 9: Fully developed use case description for ***Update User Profile***

Use case name:	UC010 – Track Skin Condition Progress	
Scenario:	A patient logs recurring skin entries (photos and notes) to monitor their condition over time.	
Triggering event:	The patient selects “Track My Skin” from their dashboard.	
Brief description:	Enables the patient to upload periodic photos and text notes, view a timeline chart of improvements or flare-ups, and set reminders for future check-ins.	
Actors:	<ul style="list-style-type: none"> • Primary: Patient • Secondary: Dermatologist 	
Related use cases:	<ul style="list-style-type: none"> • UC02 – AI Skin Analysis • UC12 – Manual Image Correction 	
Stakeholders:	<ul style="list-style-type: none"> • Patients (for self-monitoring) • Dermatologists (for remote progress review) 	
Preconditions:	<ul style="list-style-type: none"> • The patient is logged in. • At least one prior skin entry exists (optional). 	
Postconditions:	<ul style="list-style-type: none"> • A new skin entry (photo + notes) is saved. • Timeline chart updates to reflect the latest entry. • If configured, reminder for next entry is scheduled. 	
Flow of activities:	Actor	System
	1. Clicks “Track My Skin” 2. Uploads new skin photo 3. Enters notes (e.g., date, symptoms) 4. Clicks “Save Entry”	Displays history timeline and “Add New Entry” form Validates image format and size Saves entry metadata and image to patient record Updates timeline chart; persists reminder setting Shows confirmation and next-entry due date
Exception conditions:	<ul style="list-style-type: none"> • Invalid image format: prompt “Please upload JPG/PNG under 5 MB.” • Missing note fields: highlight empty fields and block save. • Storage failure: show “Unable to save entry—try again later.” 	

Figure 10: Fully developed use case description for **Track Skin Condition Progress**

Use case name:	UC011 – Manual Image Correction	
Scenario:	When the system's initial quality check flags a photo as inadequate, the patient crops, rotates, or retakes the image to meet analysis standards.	
Triggering event:	System returns a “Poor Image Quality” error after upload.	
Brief description:	Allows patients to correct or replace a photo that failed automatic validation, then resubmit for AI analysis.	
Actors:	<ul style="list-style-type: none"> • Primary: Patient 	
Related use cases:	<ul style="list-style-type: none"> • UC02 – AI Skin Analysis • UC12 – Validate Image Quality 	
Stakeholders:	<ul style="list-style-type: none"> • Patients (for accurate analysis) • System (to minimize false negatives) 	
Preconditions:	<ul style="list-style-type: none"> - A recent image upload attempt was rejected by QC. 	
Postconditions:	<ul style="list-style-type: none"> • The corrected image is accepted by the QC step. • The workflow returns to “Send to AI Engine.” 	
Flow of activities:	Actor	System
	5. Sees “Poor Quality” alert 6. Edits image or selects “Retake”	Displays image correction tools (crop/rotate) Validate corrected image size/resolution If valid: proceeds to “Send to AI Engine” If still invalid: shows same error and tools
Exception conditions:	<ul style="list-style-type: none"> • Repeated failures: after 3 attempts, offer “Contact Support.” • User cancels correction: abort flow and return to dashboard. 	

Figure 11: Fully developed use case description for ***Manual Image Correction***

Use case name:	UC012 – Download Analysis Report					
Scenario:	A patient or dermatologist wants an offline copy of the AI skin analysis results, including images, diagnosis summary, and confidence data.					
Triggering event:	User clicks “Download Report” on the analysis results page.					
Brief description:	Generates a PDF (or CSV bundle) of the AI’s findings and provides it for download or email delivery.					
Actors:	<ul style="list-style-type: none"> • Primary: Patient, Dermatologist 					
Related use cases:	<ul style="list-style-type: none"> • UC02 – AI Skin Analysis • UC02d – View AI Confidence Trends 					
Stakeholders:	<ul style="list-style-type: none"> • Patients (for personal records) • Dermatologists (for sharing with other providers) 					
Preconditions:	<ul style="list-style-type: none"> • An AI analysis report exists for the selected image. • The user is authenticated. 					
Postconditions:	<ul style="list-style-type: none"> • A report file (PDF/CSV) is generated. • Download is initiated or emailed as per user choice. 					
Flow of activities:	<table border="1"> <thead> <tr> <th>Actor</th> <th>System</th> </tr> </thead> <tbody> <tr> <td> 1. Clicks “Download Report” 2. Selects format and clicks “OK” 3. — 4. — 5. Sees “Download Complete” alert </td> <td> Prompts format choice (PDF vs. CSV) Gathers analysis data, images, and metadata Renders report file Initiates browser download or emails link to user — </td> </tr> </tbody> </table>	Actor	System	1. Clicks “Download Report” 2. Selects format and clicks “OK” 3. — 4. — 5. Sees “Download Complete” alert	Prompts format choice (PDF vs. CSV) Gathers analysis data, images, and metadata Renders report file Initiates browser download or emails link to user —	
Actor	System					
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Exception conditions:	<ul style="list-style-type: none"> • Report generation error: show “Unable to generate report—please try again.” • File size too large: offer “Email link instead.” • Email delivery failure: notify user and log for support. 					

Figure 12: Fully developed use case description for ***Download Analysis Report***

Use case name:	UC014 – Browse Dermatologists	
Scenario:	A patient explores available dermatologists' profiles to select one for consultation based on specialty, ratings, and availability.	
Triggering event:	The patient navigates to or clicks “Find a Dermatologist” from the dashboard.	
Brief description:	Enables patients to search, filter, and view dermatologists' profiles—complete with specialties, years of experience, ratings, and available time slots.	
Actors:	<ul style="list-style-type: none"> • Primary: Patient • Secondary: Clinic Admin (for managing profiles) 	
Related use cases:	<ul style="list-style-type: none"> • UC03 – Appointment Booking & Management • UC15 – Telederm Video Consultation 	
Stakeholders:	<ul style="list-style-type: none"> • Patients (for choice of provider) • Clinic Administrators (for profile accuracy) • Dermatologists (for visibility) 	
Preconditions:	<ul style="list-style-type: none"> • The patient is logged in. • Dermatologist profiles and availability data are up-to-date. 	
Postconditions:	<ul style="list-style-type: none"> • The patient has identified one or more dermatologists to book. • The system logs the browsing activity for analytics. 	
Flow of activities:	Actor	System
	1. Clicks “Find a Dermatologist” 2. Enters search or applies filters 3. — 4. Scrolls or refines filters 5. Clicks on a profile card 6. Chooses “Book Appointment”	Displays search/filter UI (specialty, rating, location) Queries database for matching profiles Presents list of dermatologists with summary cards Updates list dynamically Shows full dermatologist profile (bio, reviews, slots) Transfers to Appointment Booking flow (UC03)
Exception conditions:	<ul style="list-style-type: none"> • No matches found: system displays “No dermatologists match your criteria.” • Profile load failure: shows “Unable to load profile—please retry.” 	

Figure 14: Fully developed use case description for **Browse Dermatologists**

Use case name:	UC015 – Telederm Video Consultation																			
Scenario:	A patient connects with a dermatologist via a secure video link for a remote consultation.																			
Triggering event:	The patient clicks “Start Video Consultation” on a confirmed telederm appointment.																			
Brief description:	Manages the end-to-end video session: launching the meeting room, handling connection issues, providing in-session tools (screen share, image capture), and wrapping up with post-consult notes.																			
Actors:	<ul style="list-style-type: none"> • Primary: Patient, Dermatologist • Secondary: Video Service Provider 																			
Related use cases:	<ul style="list-style-type: none"> • UC03 – Appointment Booking & Management • UC04 – Dermatologist Review & Treatment Update 																			
Stakeholders:	<ul style="list-style-type: none"> • Patients (for remote care) • Dermatologists (for telehealth delivery) • IT Support (for video infrastructure) 																			
Preconditions:	<ul style="list-style-type: none"> • A telederm appointment exists and is scheduled for “now.” • Both patient and dermatologist have compatible devices and network connectivity. 																			
Postconditions:	<ul style="list-style-type: none"> • Session is logged (start/end times, participants). • Any captured screenshots or in-session notes are saved to the patient’s record. • Follow-up actions (e.g., prescriptions, referrals) are queued. 																			
Flow of activities:	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Actor</th> <th style="text-align: center;">System</th> </tr> </thead> <tbody> <tr> <td>1. Clicks “Start Video Consultation”</td> <td>Generates secure meeting link Opens embedded video window</td> </tr> <tr> <td>2. —</td> <td>Connects both parties; displays “Waiting for other”</td> </tr> <tr> <td>3. Joins meeting</td> <td>Enable in-session tools: screen share, snapshot</td> </tr> <tr> <td>4. Both present</td> <td>System tries auto-reconnect (3 attempts)</td> </tr> <tr> <td>5. If network drop</td> <td>Alerts user on persistent failure</td> </tr> <tr> <td>6. —</td> <td>Closes video link; logs session metadata</td> </tr> <tr> <td>7. Clicks “End Session”</td> <td>Returns both to Skinnovate UI</td> </tr> <tr> <td>8. —</td> <td></td> </tr> </tbody> </table>	Actor	System	1. Clicks “Start Video Consultation”	Generates secure meeting link Opens embedded video window	2. —	Connects both parties; displays “Waiting for other”	3. Joins meeting	Enable in-session tools: screen share, snapshot	4. Both present	System tries auto-reconnect (3 attempts)	5. If network drop	Alerts user on persistent failure	6. —	Closes video link; logs session metadata	7. Clicks “End Session”	Returns both to Skinnovate UI	8. —		
Actor	System																			
1. Clicks “Start Video Consultation”	Generates secure meeting link Opens embedded video window																			
2. —	Connects both parties; displays “Waiting for other”																			
3. Joins meeting	Enable in-session tools: screen share, snapshot																			
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5. If network drop	Alerts user on persistent failure																			
6. —	Closes video link; logs session metadata																			
7. Clicks “End Session”	Returns both to Skinnovate UI																			
8. —																				
Exception conditions:	<ul style="list-style-type: none"> • Connection failure: after retries, system prompts “Switch to audio only” or “Reschedule.” • User drops session early: system logs partial session and sends recap link. • Tool error (e.g. screen share fail): displays contextual error message and continues call. 																			

Figure 15: Fully developed use case description for **Telederm Video Consultation**

Use case name:	UC16 – Appointment Check-In					
Scenario:	A patient arrives at the clinic and checks in for their scheduled appointment.					
Triggering event:	Patient scans QR code or taps “Check In” from their appointment reminder.					
Brief description:	The system confirms the patient’s arrival, updates the appointment status to “In Progress,” notifies the dermatologist, and displays any pre-visit forms.					
Actors:	<ul style="list-style-type: none"> ● Primary: Patient ● Secondary: ClinicAdmin (for manual overrides), ReceptionSystem 					
Related use cases:	<ul style="list-style-type: none"> ● UC13 Appointment Booking & Management ● UC15 Telederm Video Consultation 					
Stakeholders:	<ul style="list-style-type: none"> ● Patient (wants timely care) ● Clinic staff (needs accurate arrival tracking) ● Dermatologist (prepares for visit) 					
Preconditions:	<ul style="list-style-type: none"> ● Appointment exists and is in “Scheduled” status. ● Patient has a valid appointment ID or QR check-in code. 					
Postconditions:	<ul style="list-style-type: none"> ● Appointment status = In Progress ● Notification sent to dermatologist and waiting room display. ● Any required pre-visit surveys presented to patient. 					
Flow of activities:	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Actor</th> <th style="text-align: center;">System</th> </tr> </thead> <tbody> <tr> <td style="vertical-align: top;"> 1. Tap “Check In” on mobile app 2. – 3. – 4. – 5. – 6. Complete pre-visit form(s) </td> <td style="vertical-align: top;"> 1. - 2. Validate appointment ID / QR code 3. Update appointment status → In Progress 4. Send notification to dermatologist 5. Display pre-visit form(s) to patient 6. - 7. Save form responses and confirm check-in </td> </tr> </tbody> </table>	Actor	System	1. Tap “Check In” on mobile app 2. – 3. – 4. – 5. – 6. Complete pre-visit form(s)	1. - 2. Validate appointment ID / QR code 3. Update appointment status → In Progress 4. Send notification to dermatologist 5. Display pre-visit form(s) to patient 6. - 7. Save form responses and confirm check-in	
Actor	System					
1. Tap “Check In” on mobile app 2. – 3. – 4. – 5. – 6. Complete pre-visit form(s)	1. - 2. Validate appointment ID / QR code 3. Update appointment status → In Progress 4. Send notification to dermatologist 5. Display pre-visit form(s) to patient 6. - 7. Save form responses and confirm check-in					
Exception conditions:	<ul style="list-style-type: none"> ● Invalid code/ID: show “Invalid appointment” error and prompt retry. ● Already checked in: inform patient “You have already checked in.” ● System offline: display “Please wait, system unavailable” and queue check-in. 					

Figure 16: Fully developed use case description for **Appointment Check-In**

Use case name:	UC17 – Emergency Appointment Handling					
Scenario:	A patient requests an urgent (“walk-in”) appointment outside normal scheduling.					
Triggering event:	Patient clicks “Emergency Appointment” or calls clinic emergency hotline.					
Brief description:	The system evaluates provider availability, suggests the next available slot (or places patient on emergency queue), confirms booking, and notifies clinic staff.					
Actors:	<ul style="list-style-type: none"> • Primary: Patient • Secondary: ClinicAdmin, Dermatologist 					
Related use cases:	<ul style="list-style-type: none"> • UC13 Appointment Booking & Management • UC18 Automated Appointment Reminders 					
Stakeholders:	<ul style="list-style-type: none"> • Patient (needs urgent care) • Clinic staff (manages urgent cases) • Dermatologist (responds to emergencies) 					
Preconditions:	<ul style="list-style-type: none"> • Patient is registered and logged in • Emergency slots or queue defined in system 					
Postconditions:	<ul style="list-style-type: none"> • Emergency appointment created (status = Scheduled or Queued) • Notifications sent to patient and clinic staff • Slot reserved or patient queued 					
Flow of activities:	<table border="1"> <thead> <tr> <th>Actor</th> <th>System</th> </tr> </thead> <tbody> <tr> <td> 1. Tap “Emergency Appointment” 2. Enter symptoms/details 3. — 4. — 5. — 6. Patient receives confirmation </td> <td> 3. Check for free emergency slots <ul style="list-style-type: none"> • If slot available → create appointment (Scheduled) • Else → add to emergency queue 4. Send confirmation to patient 5. Notify ClinicAdmin & Dermatologist </td> </tr> </tbody> </table>	Actor	System	1. Tap “Emergency Appointment” 2. Enter symptoms/details 3. — 4. — 5. — 6. Patient receives confirmation	3. Check for free emergency slots <ul style="list-style-type: none"> • If slot available → create appointment (Scheduled) • Else → add to emergency queue 4. Send confirmation to patient 5. Notify ClinicAdmin & Dermatologist	
Actor	System					
1. Tap “Emergency Appointment” 2. Enter symptoms/details 3. — 4. — 5. — 6. Patient receives confirmation	3. Check for free emergency slots <ul style="list-style-type: none"> • If slot available → create appointment (Scheduled) • Else → add to emergency queue 4. Send confirmation to patient 5. Notify ClinicAdmin & Dermatologist					
Exception conditions:	<ul style="list-style-type: none"> • Not logged in: redirect to UC01 Login • No emergency slots & queue full: display “All urgent slots filled—please call clinic.” • System error: show “Unable to process emergency request, please call directly.” 					

Figure 17: Fully developed use case description for ***Emergency Appointment Handling***

Use case name:	UC18 – Automated Appointment Reminders	
Scenario:	The system automatically sends reminder notifications ahead of upcoming appointments.	
Triggering event:	Cron scheduler reaches reminder-lead time (e.g. 24 hrs before appointment).	
Brief description:	The system identifies upcoming appointments, builds notification pipelines (email/SMS/push), and dispatches reminders to patients and optionally to dermatologists.	
Actors:	<ul style="list-style-type: none"> • Primary: System Scheduler • Secondary: Patient, Dermatologist 	
Related use cases:	<ul style="list-style-type: none"> • UC13 Appointment Booking & Management • UC17 Emergency Appointment Handling 	
Stakeholders:	<ul style="list-style-type: none"> • Patient (avoids no-shows) • ClinicAdmin (reduces empty slots) • Dermatologist (prepares schedule) 	
Preconditions:	<ul style="list-style-type: none"> • Appointment status = Scheduled • Patient contact information on file • Notification channels configured 	
Postconditions:	<ul style="list-style-type: none"> • Reminder record logged • Notifications dispatched via configured channels 	
Flow of activities:	Actor	System
	1. Trigger reminder job (e.g. at 8 AM)	<ol style="list-style-type: none"> 1. - 2. Query appointments where startTime = now + 24 hrs 3. For each appointment: <ol style="list-style-type: none"> a. Instantiate Notification pipeline b. send("Reminder: your appointment at ...") 4. Log each sent reminder
Exception conditions:	<ul style="list-style-type: none"> • Missing contact info: skip reminder, log warning “No contact for patient X.” • Notification send failure: retry up to 3×, then log error and alert admin. 	

Figure 18: Fully developed use case description for **Automated Appointment Reminders**

Use case name:	UC19 – Dermatologist Evaluation	
Scenario:	A dermatologist reviews a patient's skin data and provides diagnostic evaluation.	
Triggering event:	A scheduled or in-progress appointment is opened by the dermatologist.	
Brief description:	The dermatologist accesses the patient's appointment record, reviews clinical history, uploaded/AI-analyzed skin images, and inputs clinical notes and diagnosis.	
Actors:	<ul style="list-style-type: none"> • Primary: Dermatologist • Secondary: Patient (indirect), EHR system 	
Related use cases:	<ul style="list-style-type: none"> • UC13 Appointment Booking & Management • UC14 AI-Powered Skin Analysis • UC20 Annotate Skin Images • UC24 Approve AI suggestions 	
Stakeholders:	<ul style="list-style-type: none"> • Dermatologist (needs full context to evaluate) • Patient (expects accurate diagnosis and care) • Clinic (ensures quality of care) 	
Preconditions:	<ul style="list-style-type: none"> • Appointment status = In Progress • Patient data and images are available in the system 	
Postconditions:	<ul style="list-style-type: none"> • Evaluation notes saved • Diagnosis added to patient record • Next action triggered (e.g. annotate, prescribe, schedule follow-up) 	
Flow of activities:	Actor	System
	1. Opens current patient session 2. — 3. Reviews and interprets data 4. Inputs diagnostic evaluation	1. - 2. Loads patient record, skin images, history, AI report 3. - 4. - 5. Saves clinical notes & diagnosis 6. Logs evaluation time and user ID
Exception conditions:	<ul style="list-style-type: none"> • Data unavailable: show “Patient data not found – contact admin.” • Session timeout: request re-login. • Save failure: notify “Evaluation not saved – try again.” 	

Figure 19: Fully developed use case description for **Dermatologist Evaluation**

Use case name:	UC20 – Annotate Skin Images															
Scenario:	A dermatologist adds visual annotations to patient skin images for diagnostic, educational, or treatment purposes.															
Triggering event:	During or after evaluation, dermatologist clicks “Annotate” on a skin image.															
Brief description:	The system allows the dermatologist to highlight, mark, and label specific areas of skin images, storing them in the patient’s EHR for reference or further analysis.															
Actors:	<ul style="list-style-type: none"> • Primary: Dermatologist • Secondary: AI Analyzer (optional) 															
Related use cases:	<ul style="list-style-type: none"> • UC14 AI-Powered Skin Analysis • UC19 Dermatologist Evaluation 															
Stakeholders:	<ul style="list-style-type: none"> • Dermatologist (documents findings) • Patient (benefits from clarity) • Medical reviewers (for quality and second opinions) 															
Preconditions:	<ul style="list-style-type: none"> • At least one image available in the system • User has annotation privileges 															
Postconditions:	<ul style="list-style-type: none"> • Annotated image saved in patient record • Linked to evaluation or diagnosis 															
Flow of activities:	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Actor</th> <th style="text-align: center;">System</th> </tr> </thead> <tbody> <tr> <td>1. Clicks “Annotate” on image</td> <td>1. -</td> </tr> <tr> <td>2. Draws on/labels areas of image</td> <td>2. -</td> </tr> <tr> <td>3. -</td> <td>3. Tracks and stores annotation shapes & metadata</td> </tr> <tr> <td>4. Clicks “Save Annotations”</td> <td>4. -</td> </tr> <tr> <td></td> <td>5. Saves annotated version and links to patient’s EHR</td> </tr> <tr> <td></td> <td>6. Displays confirmation message</td> </tr> </tbody> </table>		Actor	System	1. Clicks “Annotate” on image	1. -	2. Draws on/labels areas of image	2. -	3. -	3. Tracks and stores annotation shapes & metadata	4. Clicks “Save Annotations”	4. -		5. Saves annotated version and links to patient’s EHR		6. Displays confirmation message
Actor	System															
1. Clicks “Annotate” on image	1. -															
2. Draws on/labels areas of image	2. -															
3. -	3. Tracks and stores annotation shapes & metadata															
4. Clicks “Save Annotations”	4. -															
	5. Saves annotated version and links to patient’s EHR															
	6. Displays confirmation message															
Exception conditions:	<ul style="list-style-type: none"> • Annotation tool error: display “Tool not responding – refresh.” • Save failure: “Annotation not saved – check your connection.” • Image locked/read-only: “Image cannot be annotated – contact admin.” 															

Figure 20: Fully developed use case description for **Annotate Skin Images**

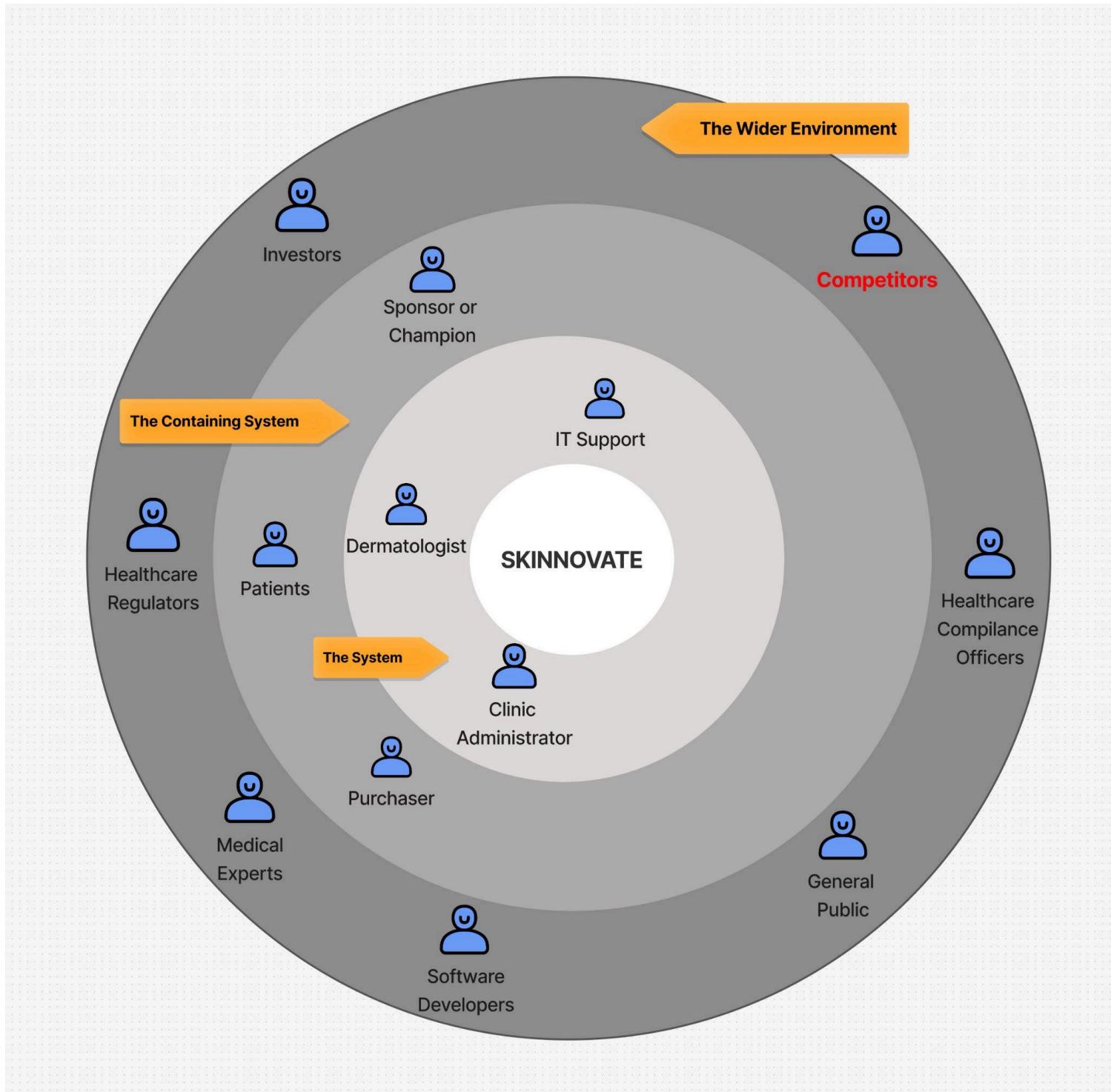
STAKEHOLDERS

Stakeholder Table

Skinnovate STAKEHOLDER IDENTIFICATION TABLE

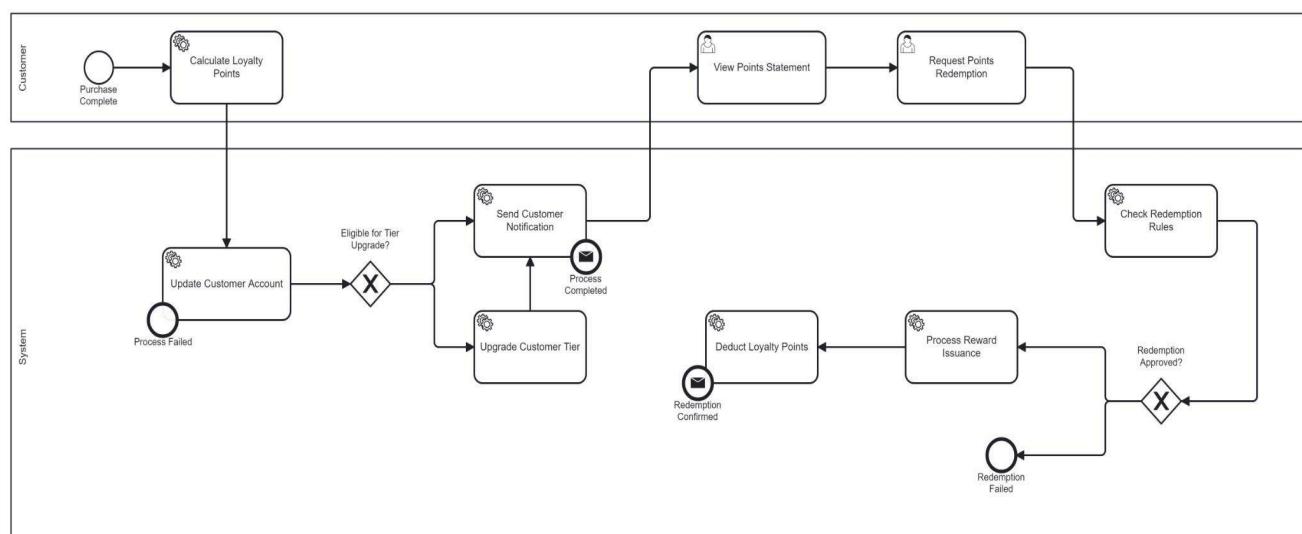
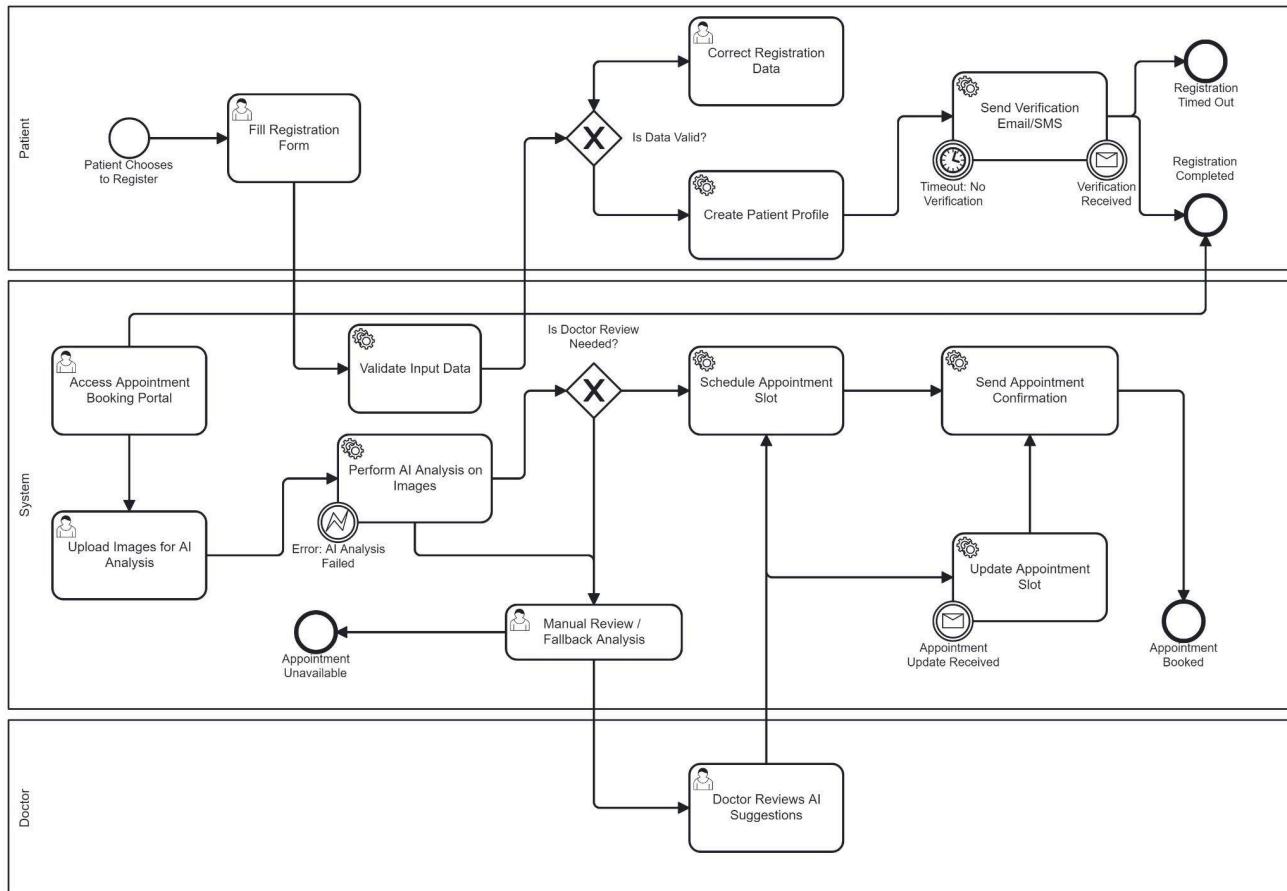
STAKEHOLDER	ROLE/ RESPONSIBILITY	IMPORTANCE	INFLUENCE	INTERESTS/ POSITIVE IMPACTS	CONCERNS
PATIENTS	Book appointments, track treatments, and access records.	High (Main users)	High (Feedback)	Easy access to dermatology services and treatment tracking.	Data security, availability, treatment accuracy.
DERMATOLOGISTS	Diagnose and treat patients, update medical records.	High (Work/Patients)	High (Features)	Patient management, less paperwork, AI-assisted diagnosis.	AI misdiagnosis, legal responsibility.
CLINIC ADMINISTRATORS	Manage clinic operations, scheduling, and privacy risks.	High (Key operations)	High (Policies)	Improved scheduling, workflow, compliance.	Overbooking, compliance risks, technical issues.
IT SUPPORT	Maintain system security, functionality, and backups.	High (System stability)	Medium (Limited control)	System security, stable performance.	Cybersecurity, technical failures, data loss.
HEALTHCARE REGULATORS	Ensure that the clinic follows medical regulations and protects patient data privacy.	Medium (Legal standards)	High (Regulations)	Legal compliance, patient data protection.	Potential legal issues.
PHARMACY PARTNERS	Process prescriptions and medication orders.	Medium (Treatments)	Medium (No decisions)	Smooth prescription handling, fewer errors.	Prescription mistakes
MEDICAL EQUIPMENT SUPPLIERS	Provide dermatology tools and skincare equipment.	Medium (Indirect reliance)	Medium (Availability)	Steady demand, reliable supply.	Delays, high demand, contract issues.
INSURANCE PROVIDERS	Process insurance claims and reimbursements.	Medium (Payment flow)	High (Financial ctrl)	Smooth claims and billing process.	Delayed payments, incorrect claims, fraud risks.
INVESTORS	Fund and supervise business growth.	High (Funding)	High (Decisions)	Business growth, return on investment.	Slow profits, system failures, competition.
MARKETING & OUTREACH TEAM	Promote the clinic and attract patients.	Medium (Growth)	Medium (Branding)	Brand visibility, patient engagement.	Low engagement.

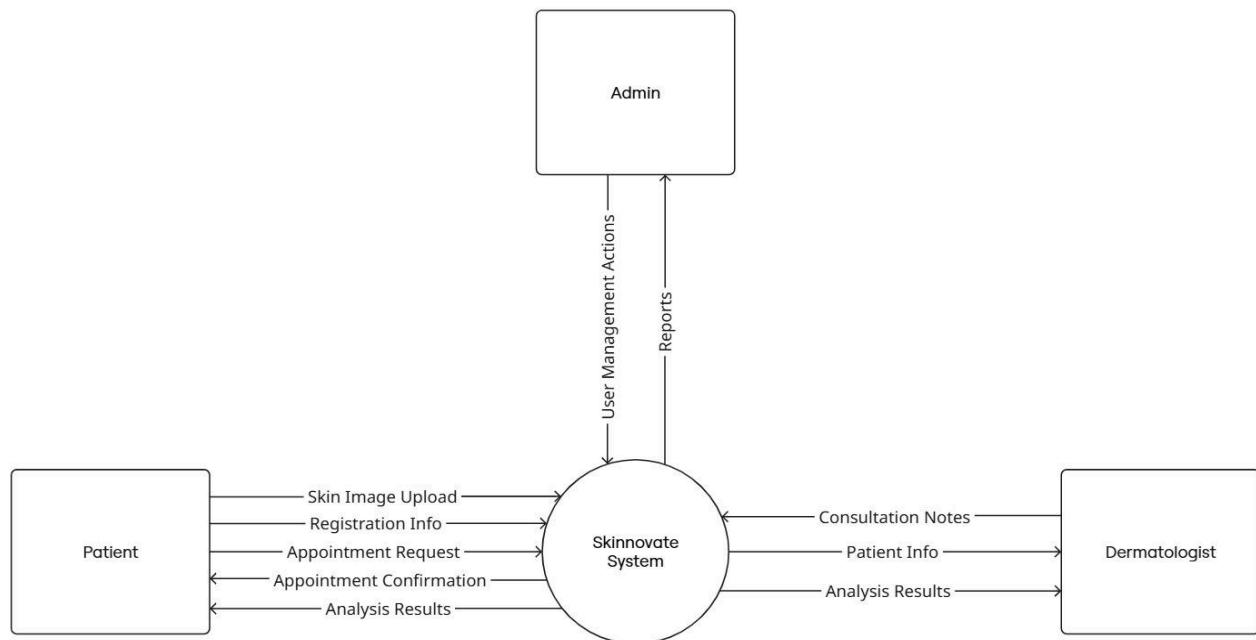
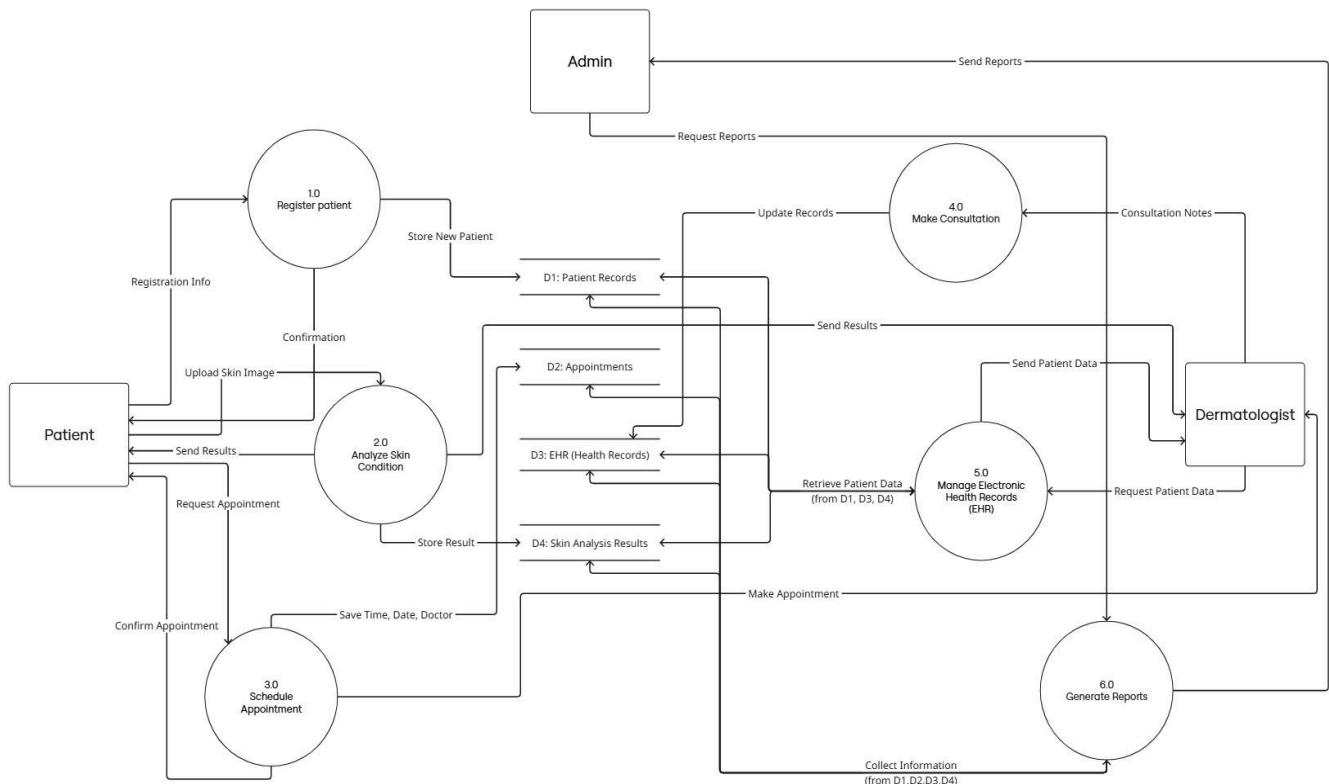
Onion Diagram



REQUIREMENTS MODELLING DIAGRAMS

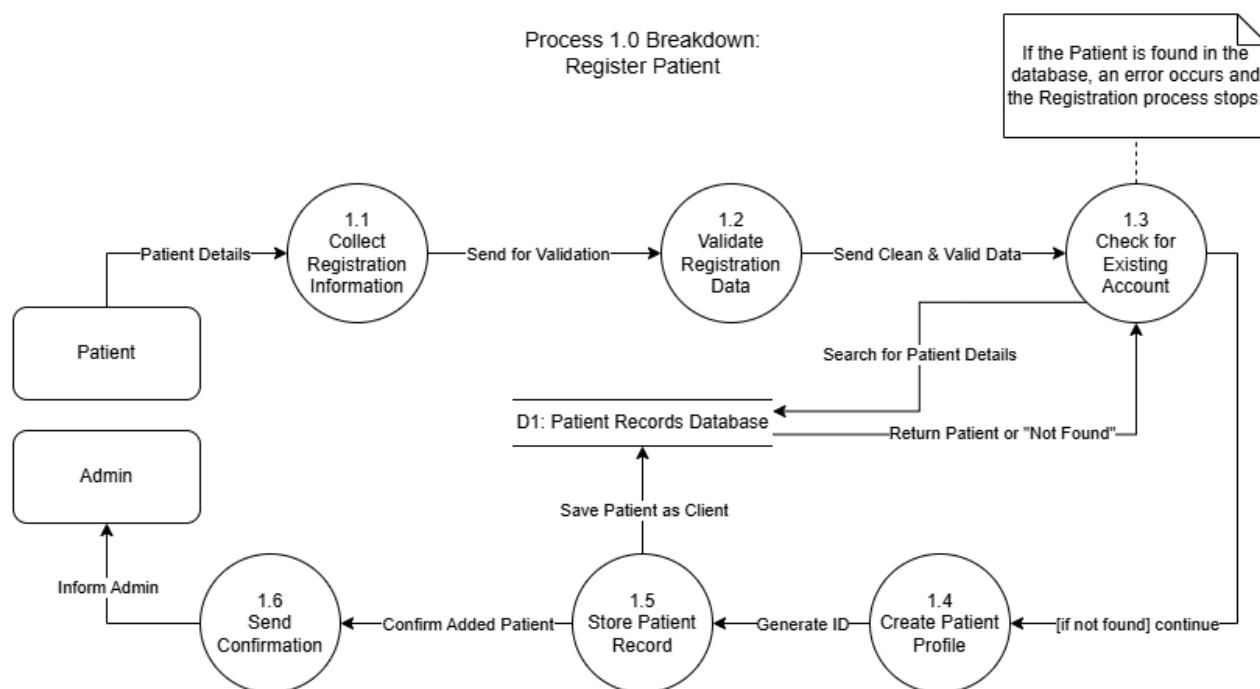
BPMN Diagrams



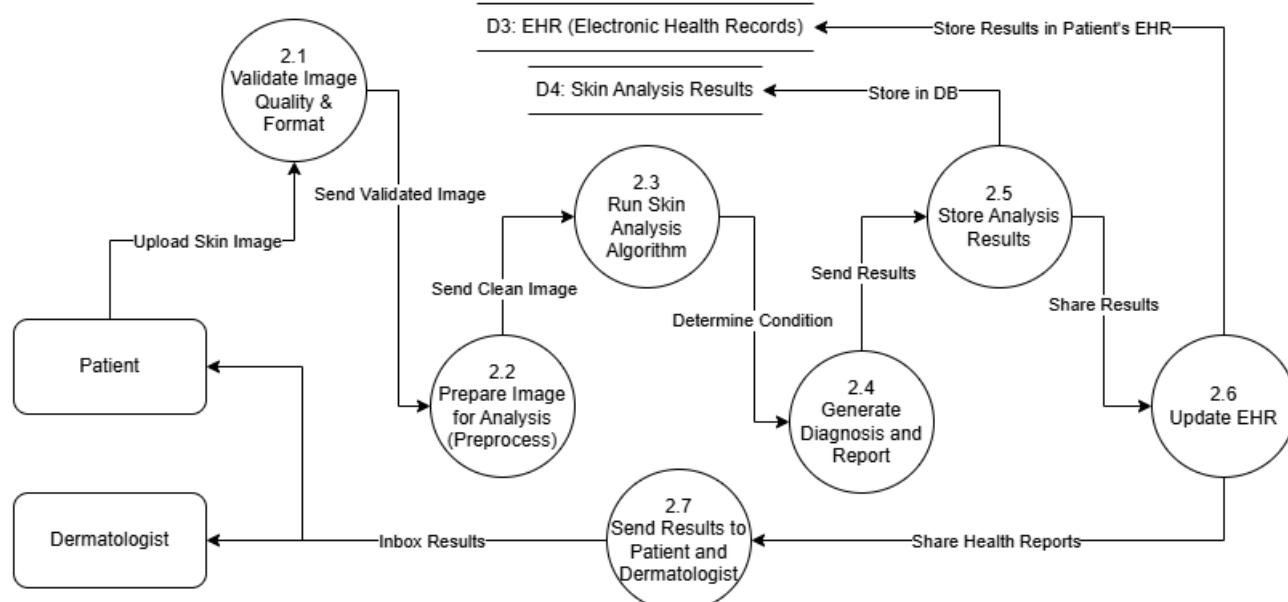
Data Flow Diagrams (DFD)**LEVEL 0****LEVEL 1**

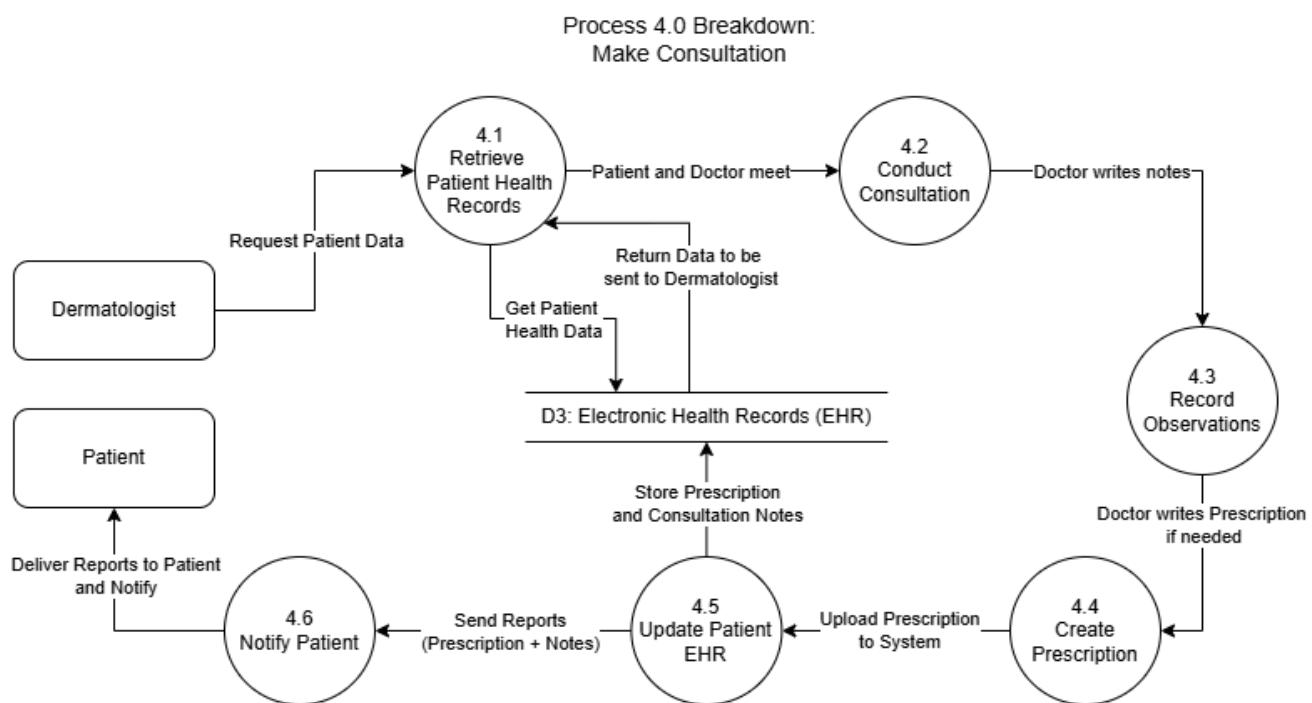
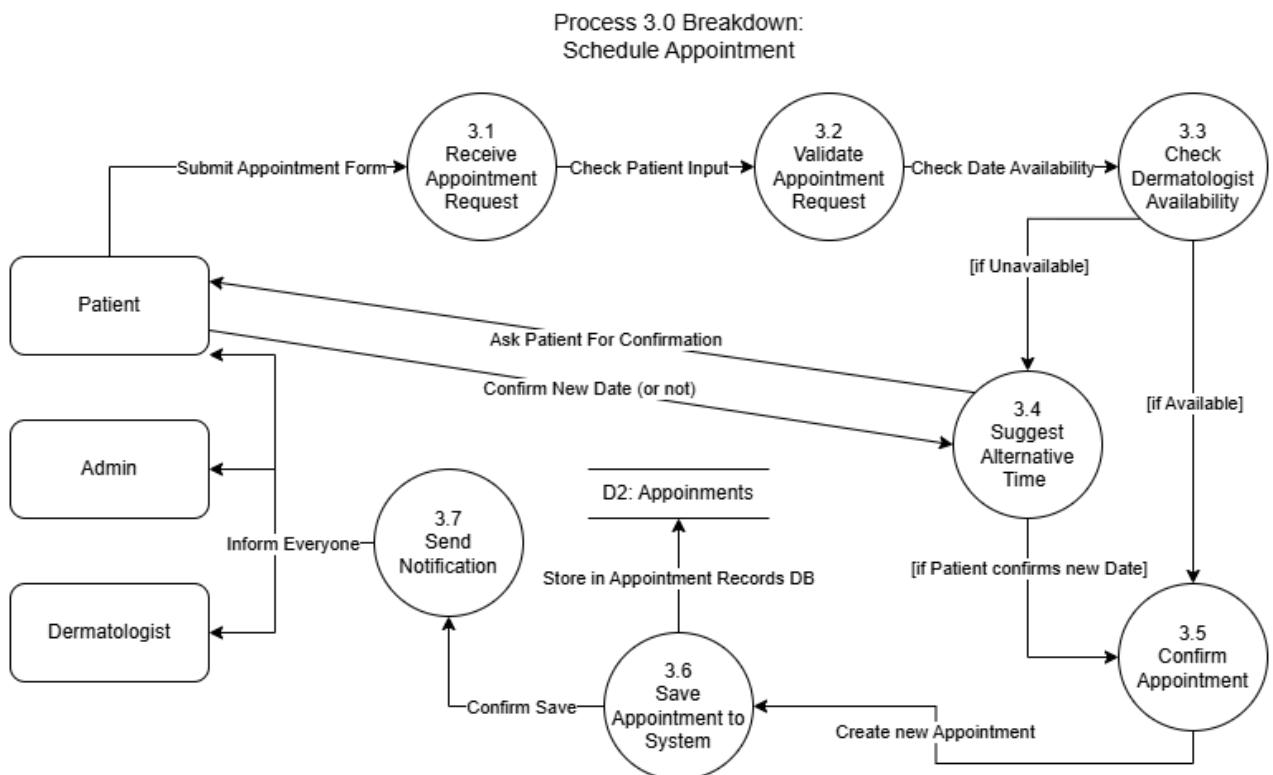
LEVEL 2

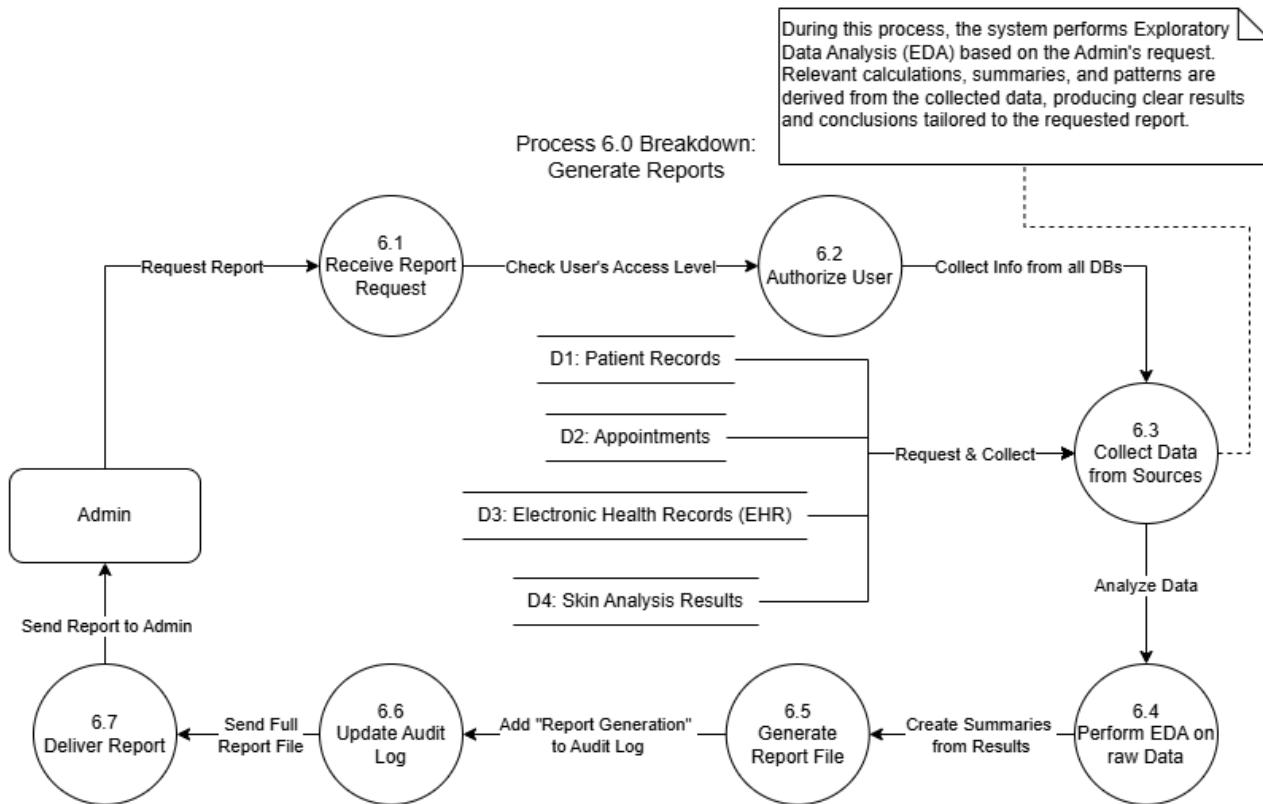
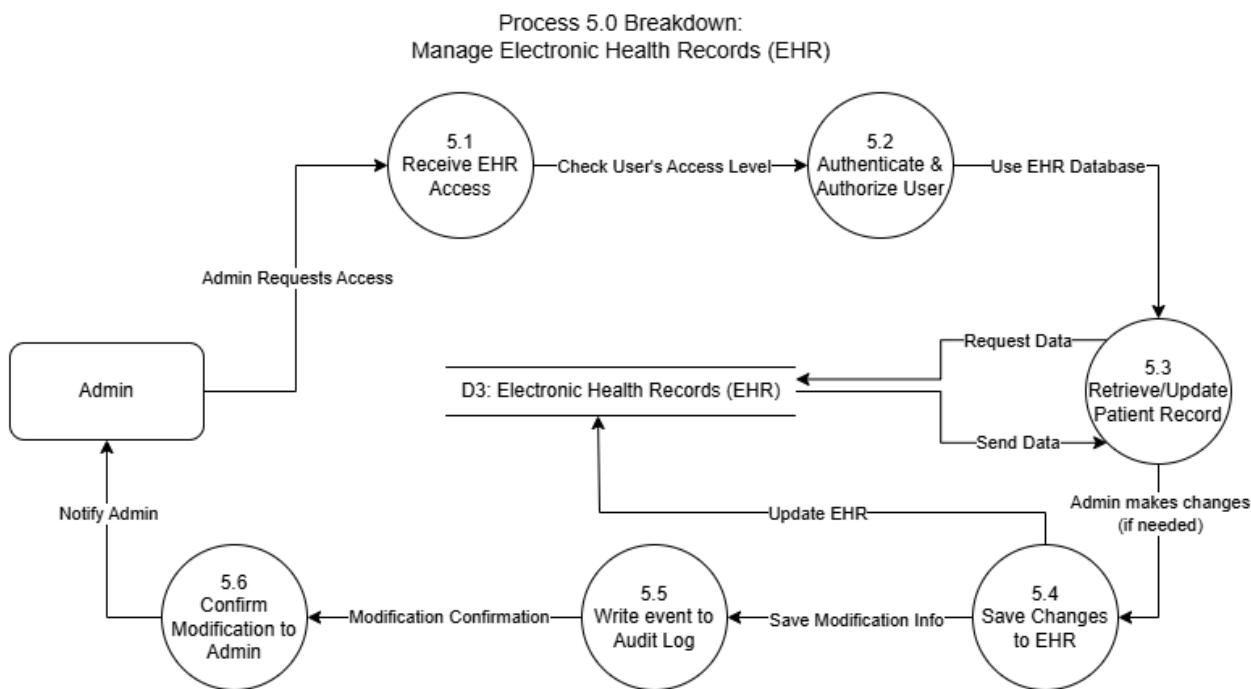
Process 1.0 Breakdown:
Register Patient



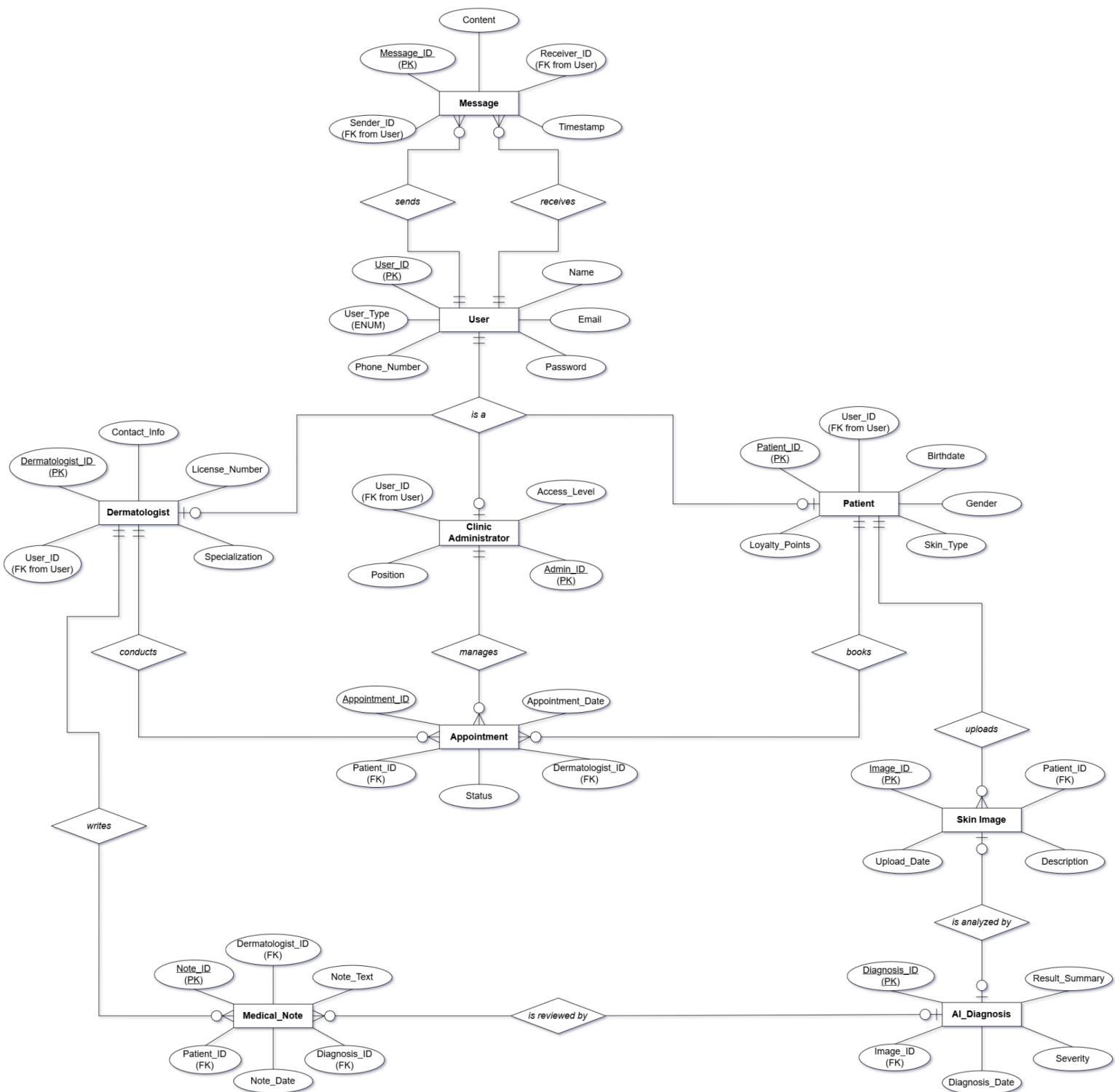
Process 2.0 Breakdown:
Analyze Skin Condition







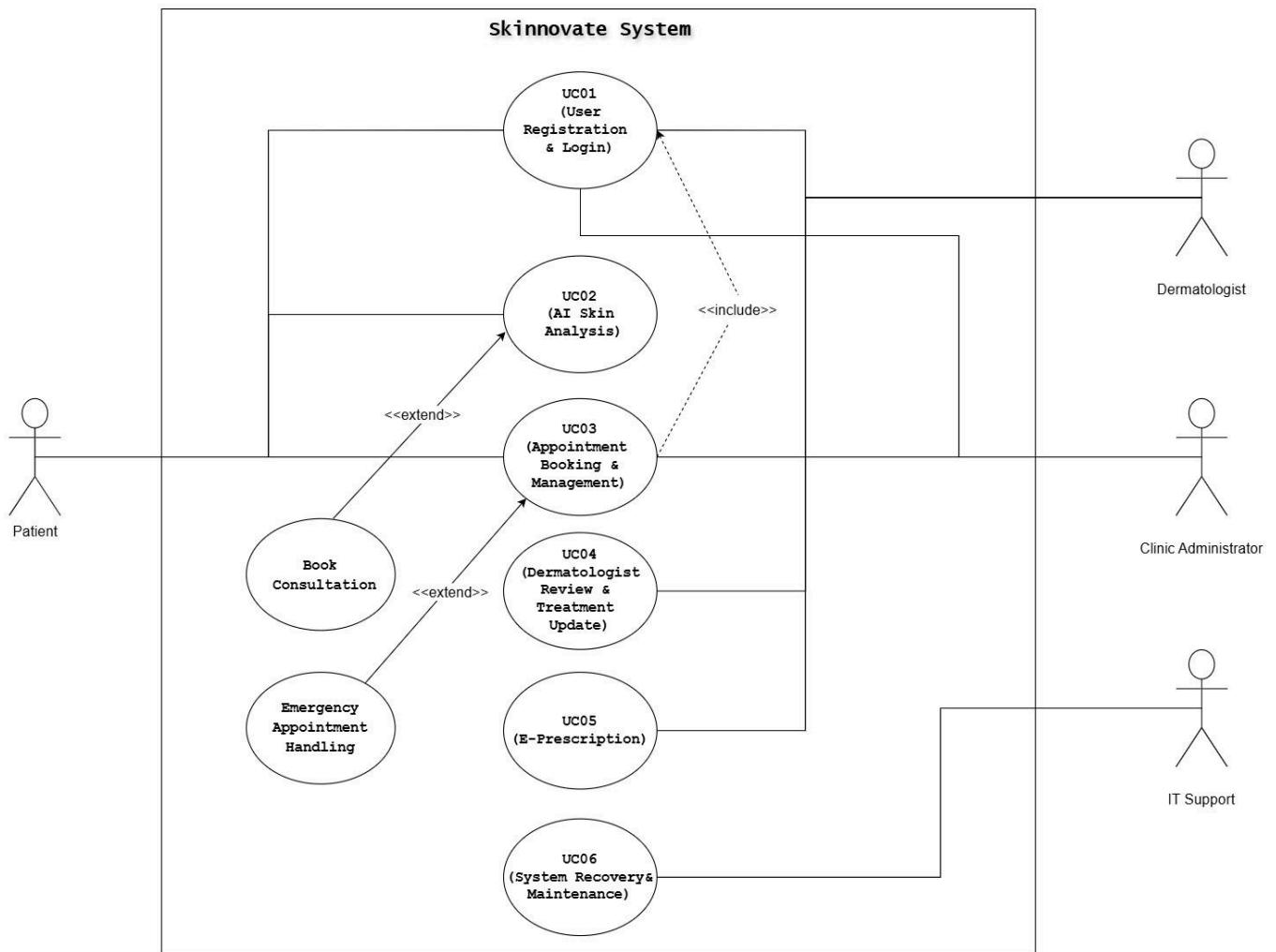
Entity-Relationship Diagram (ERD)

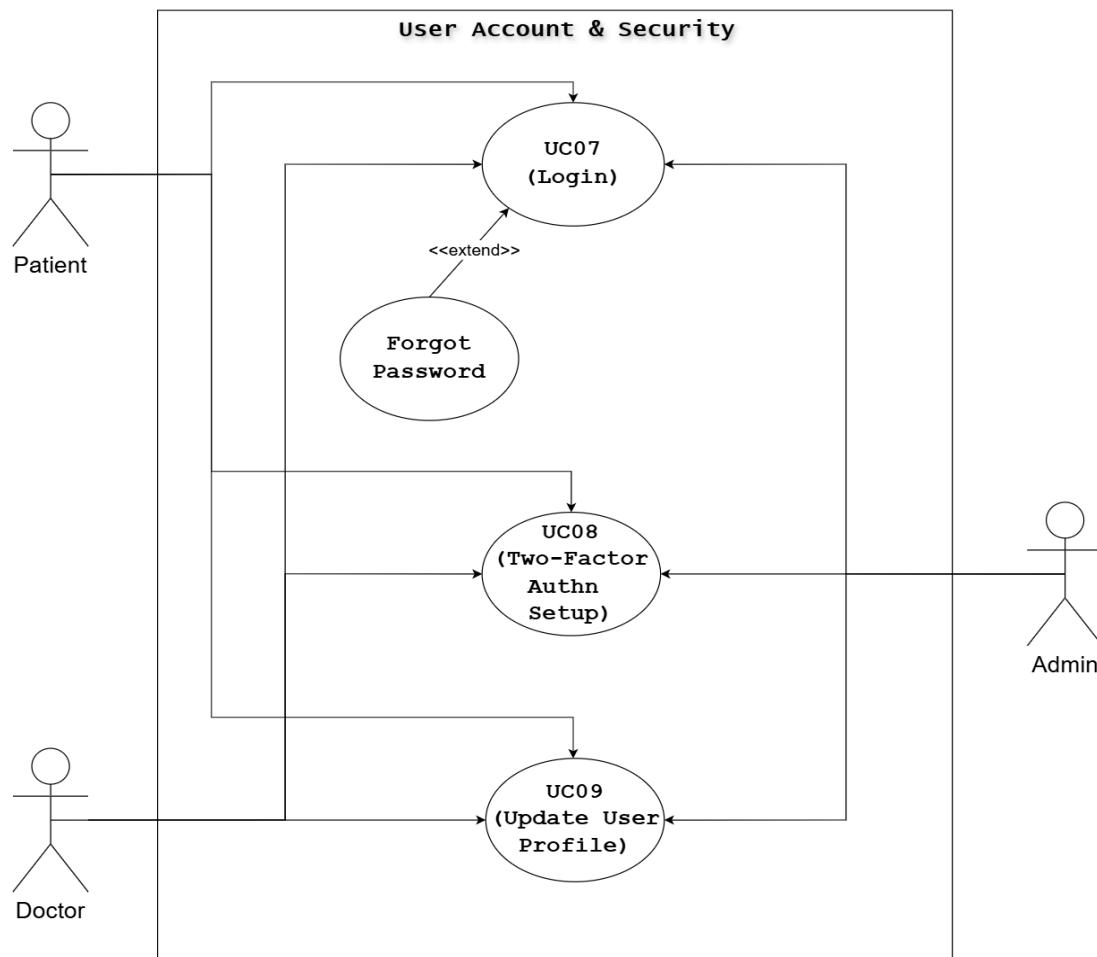


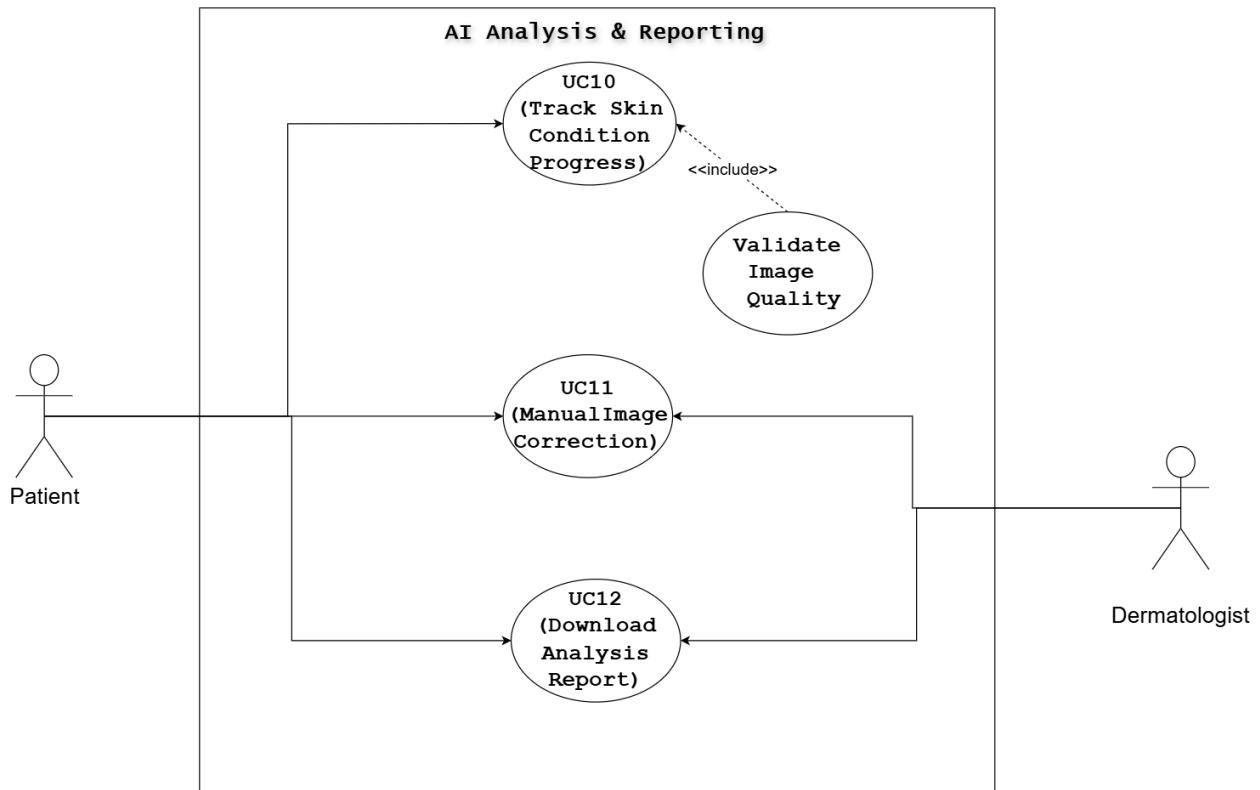
UML DIAGRAMS

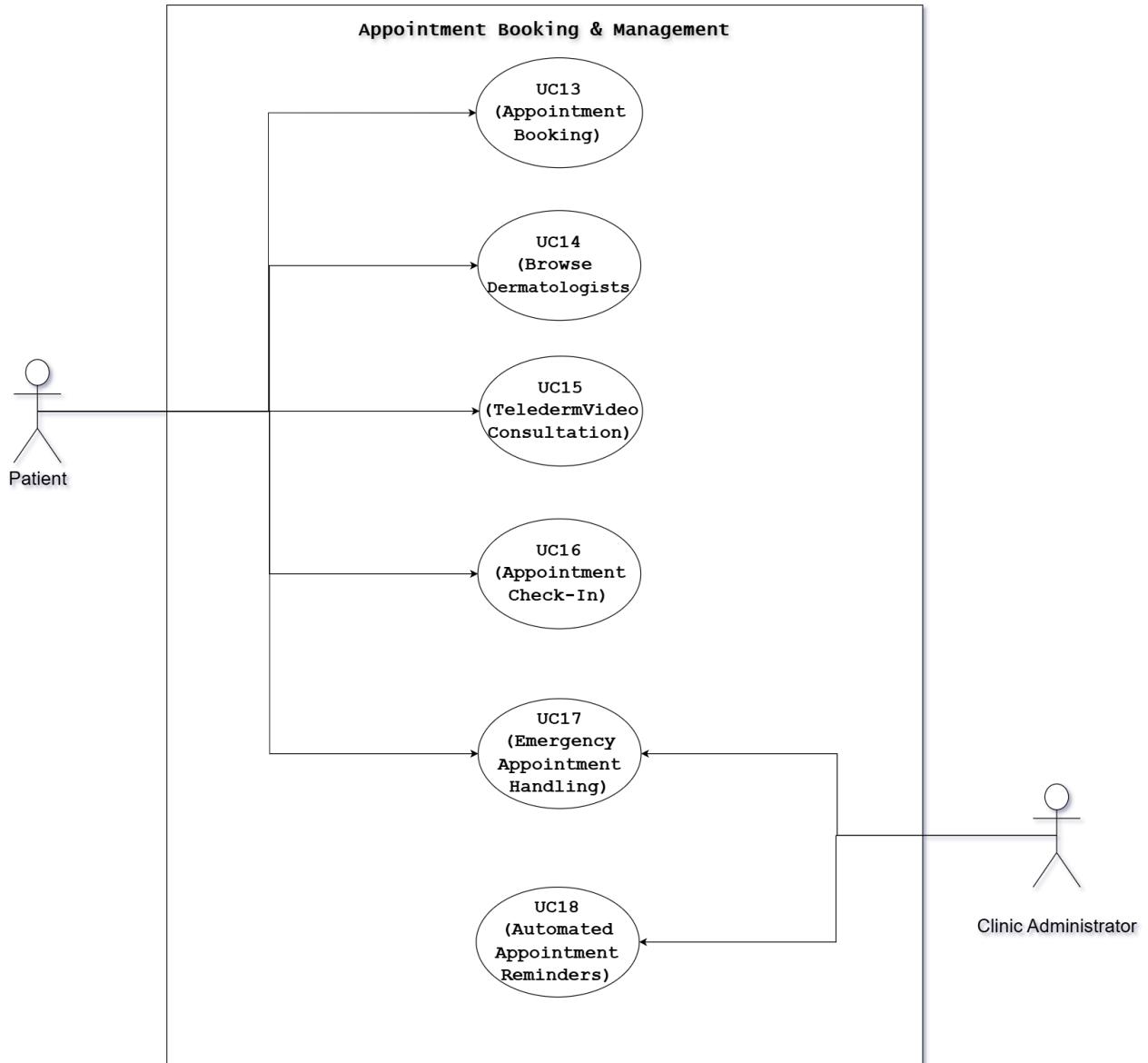
Behavioral Diagrams

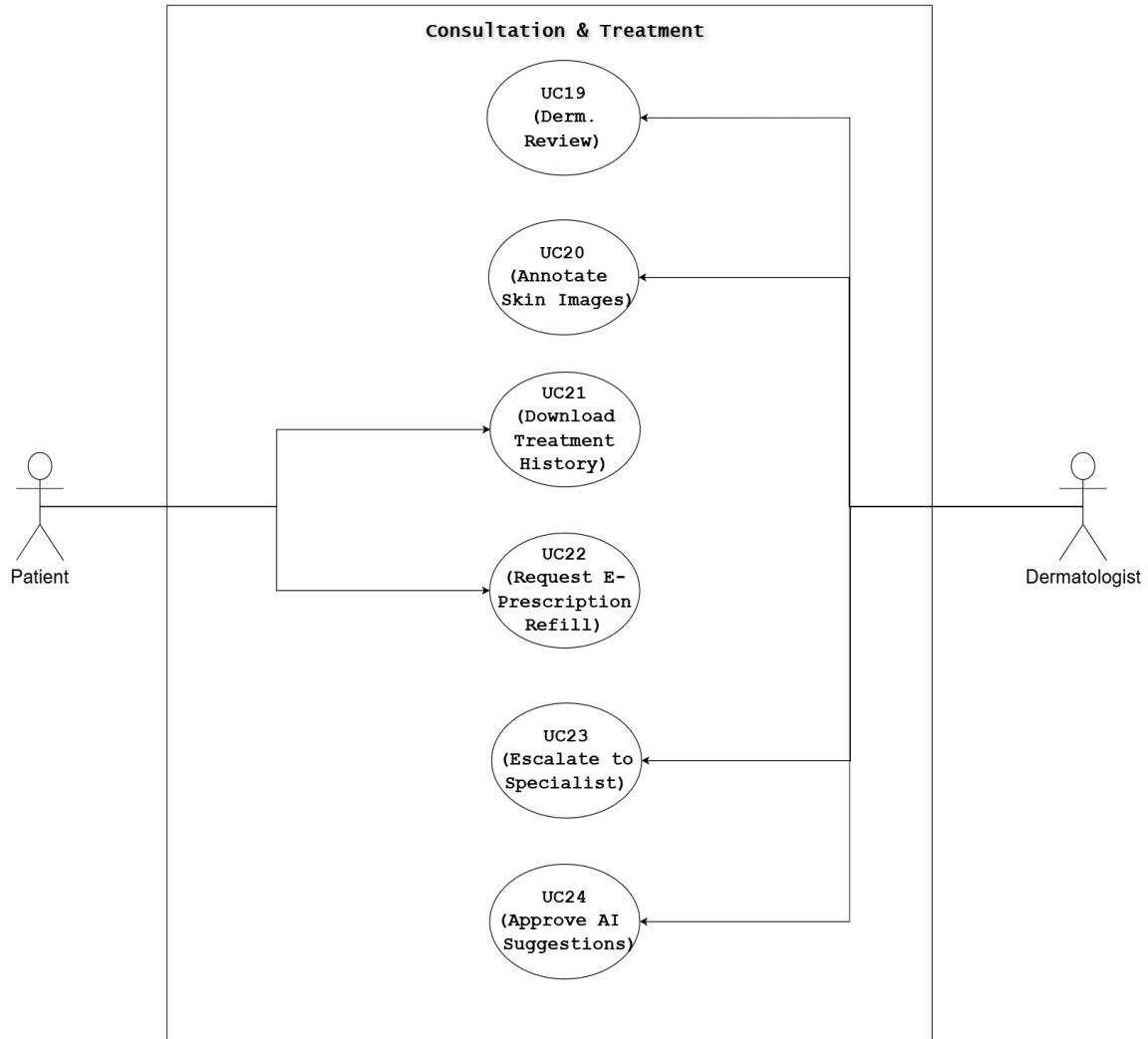
Use Case Diagrams

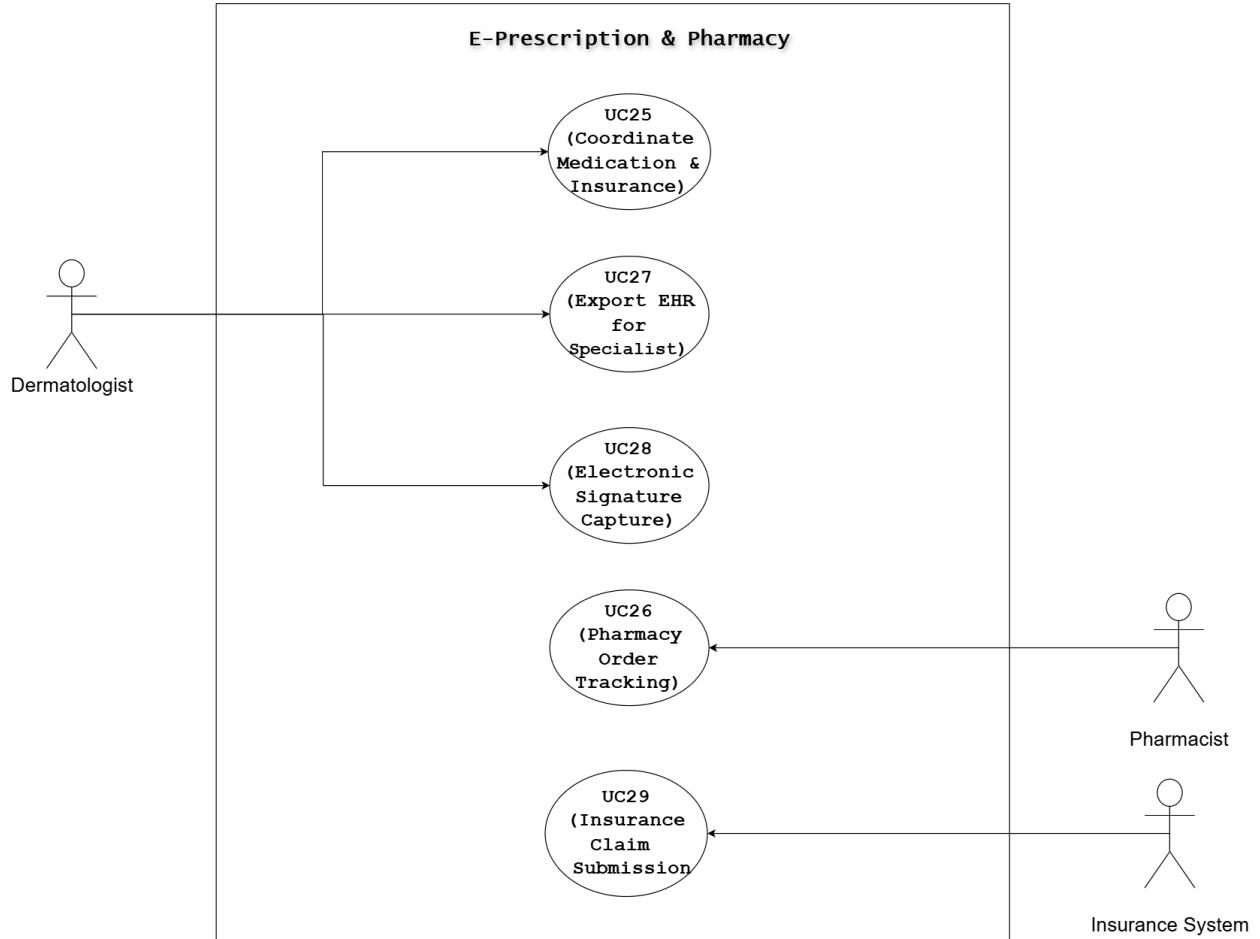


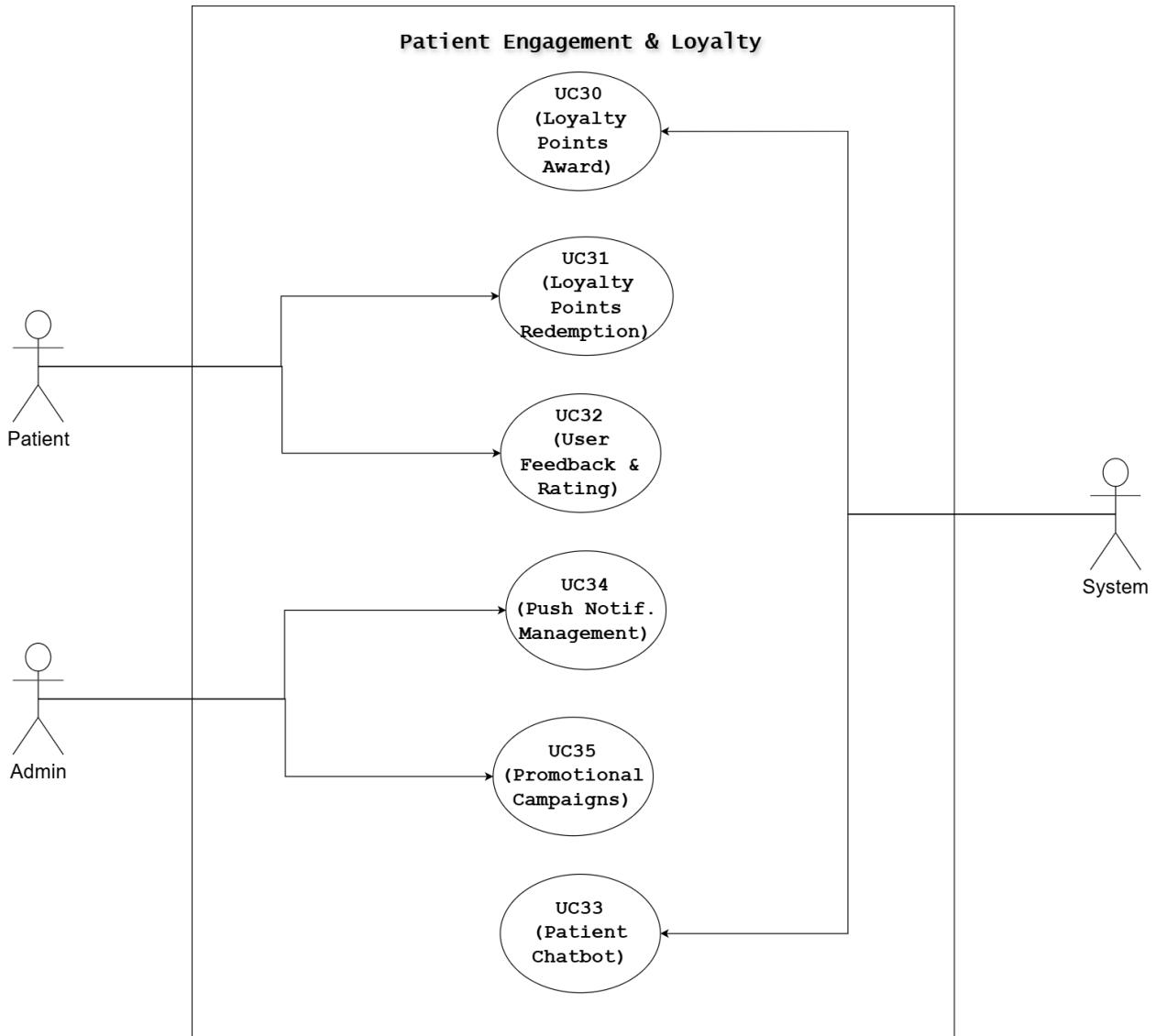


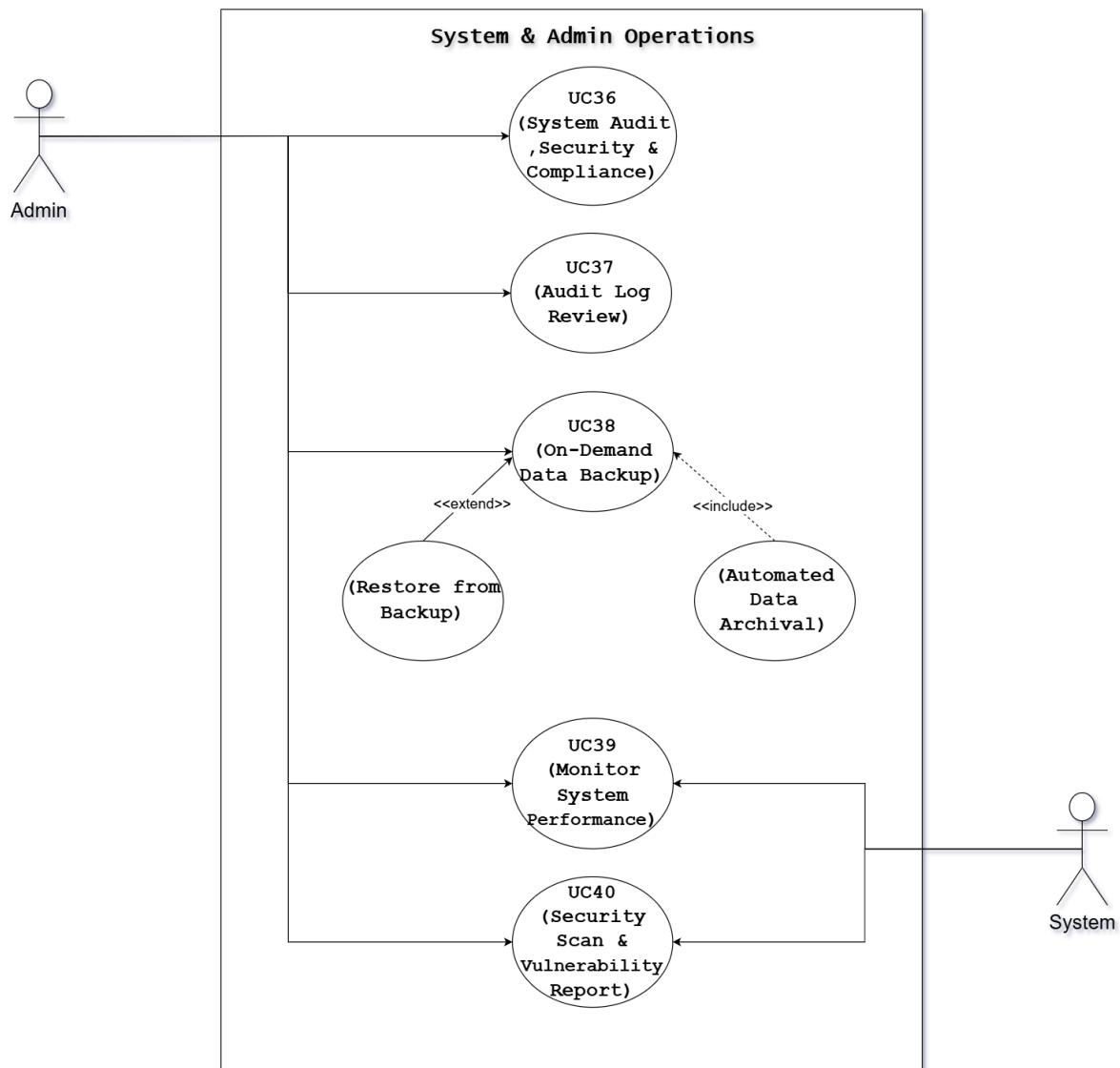






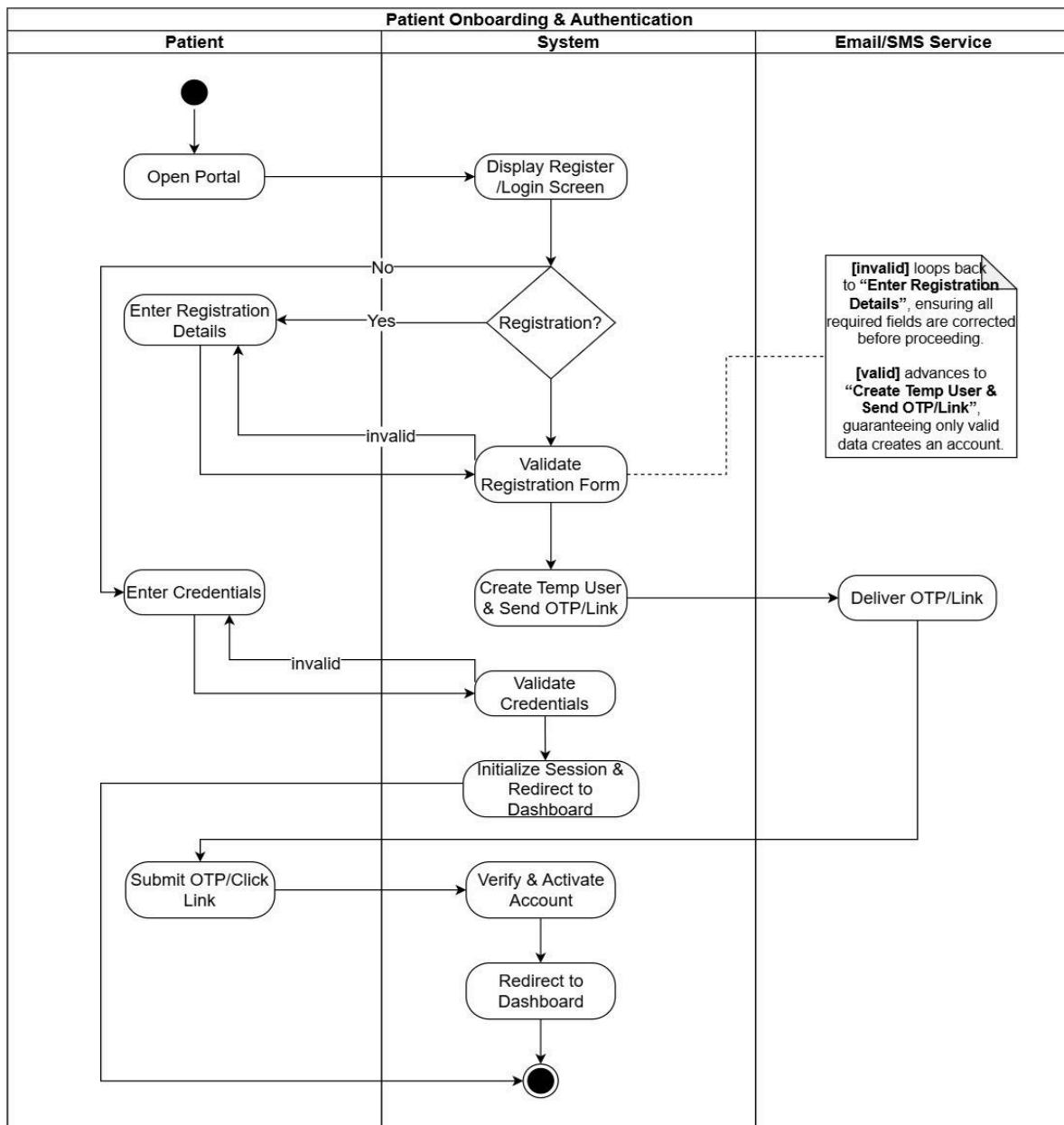


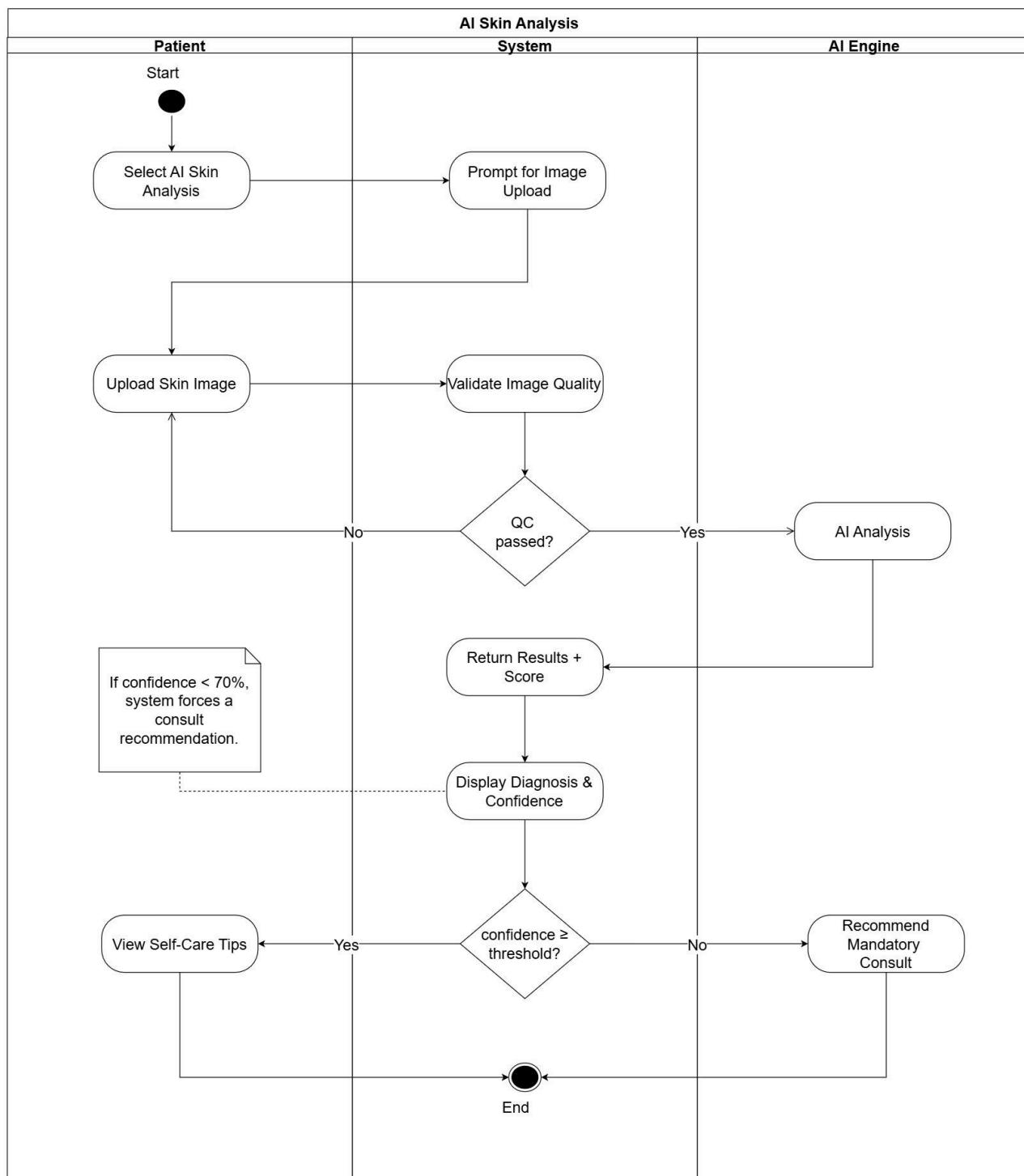


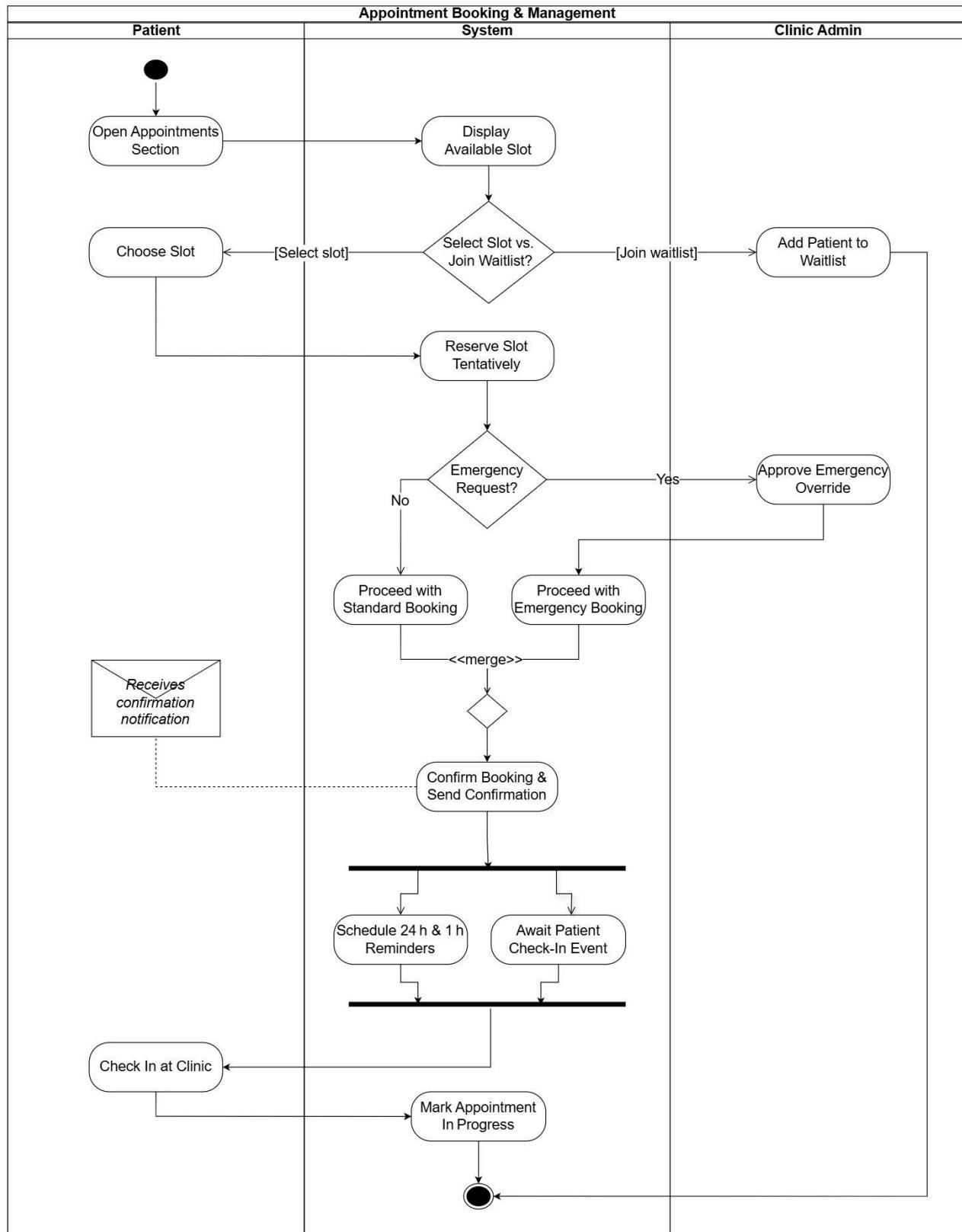


Activity Diagrams

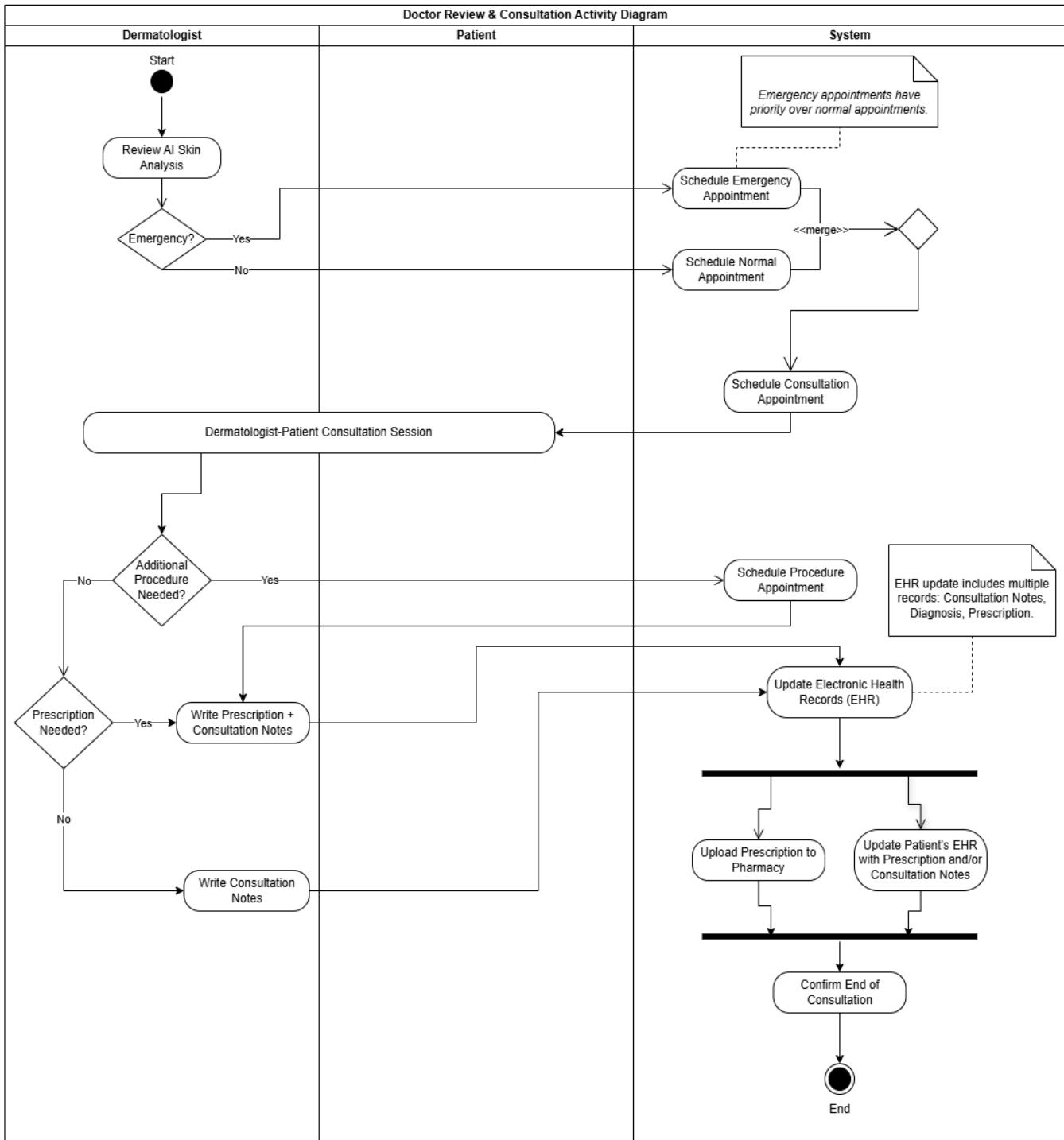
Activity Diagram (UC1)

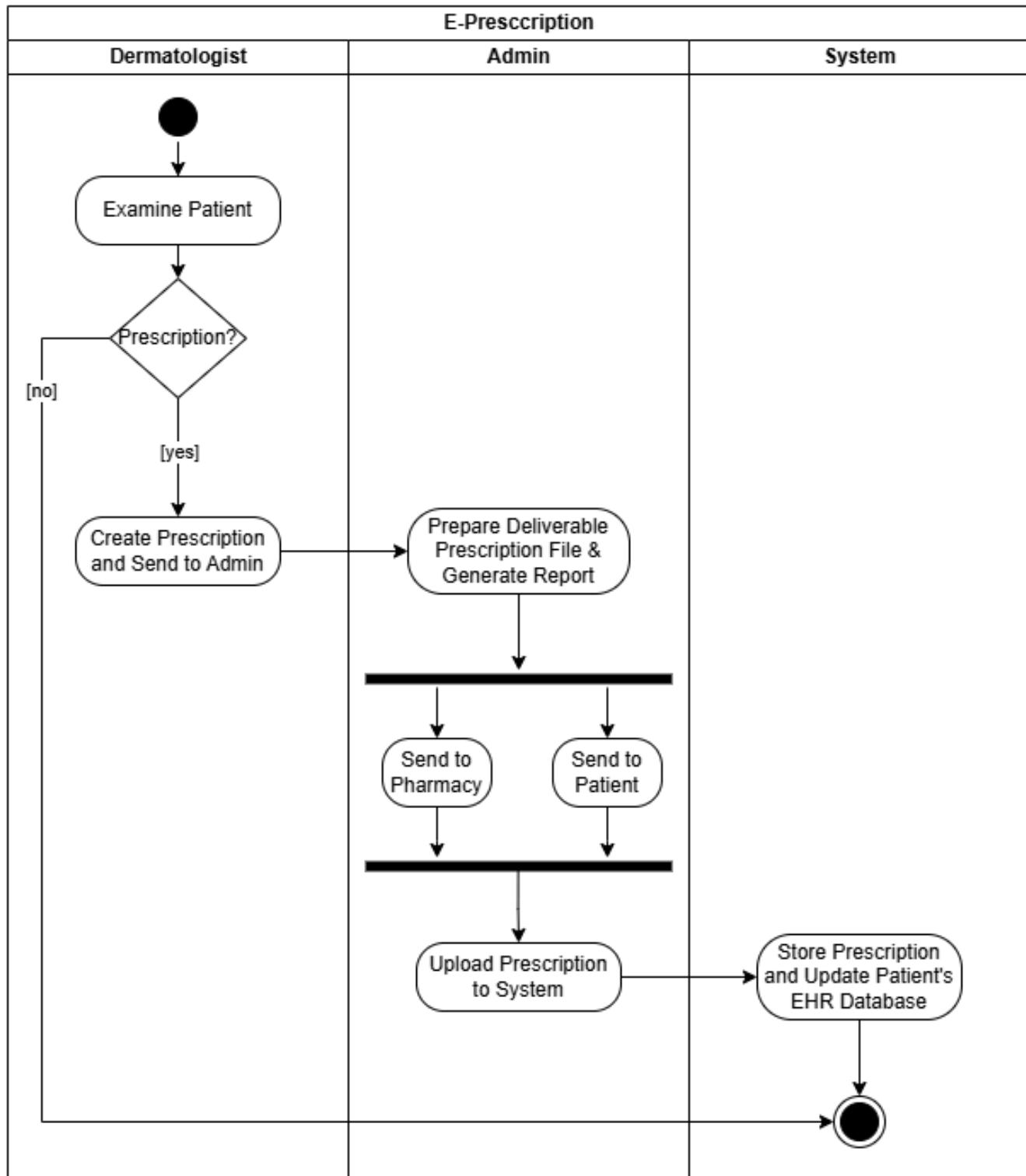


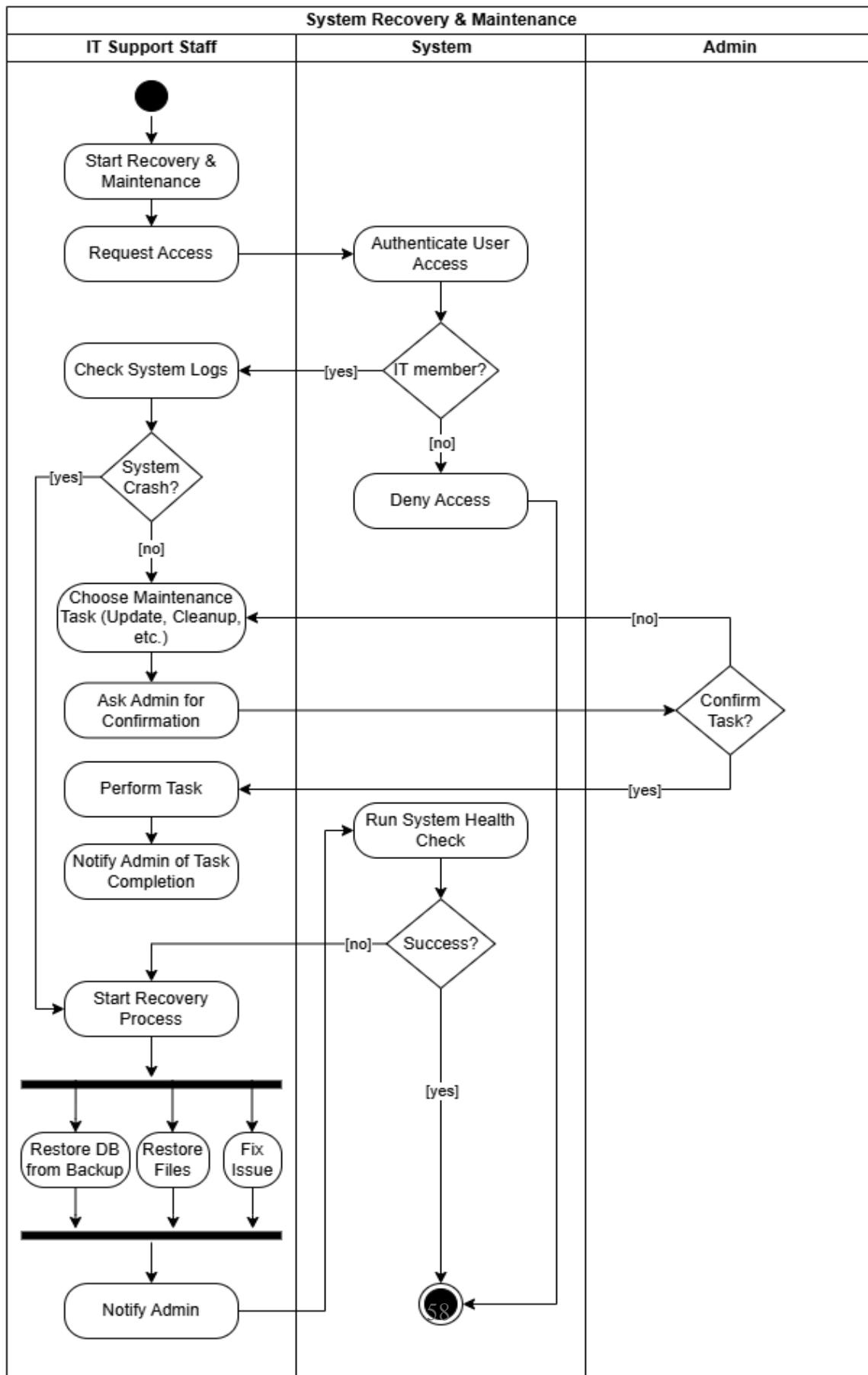
Activity Diagram (UC2)

Activity Diagram (UC3)

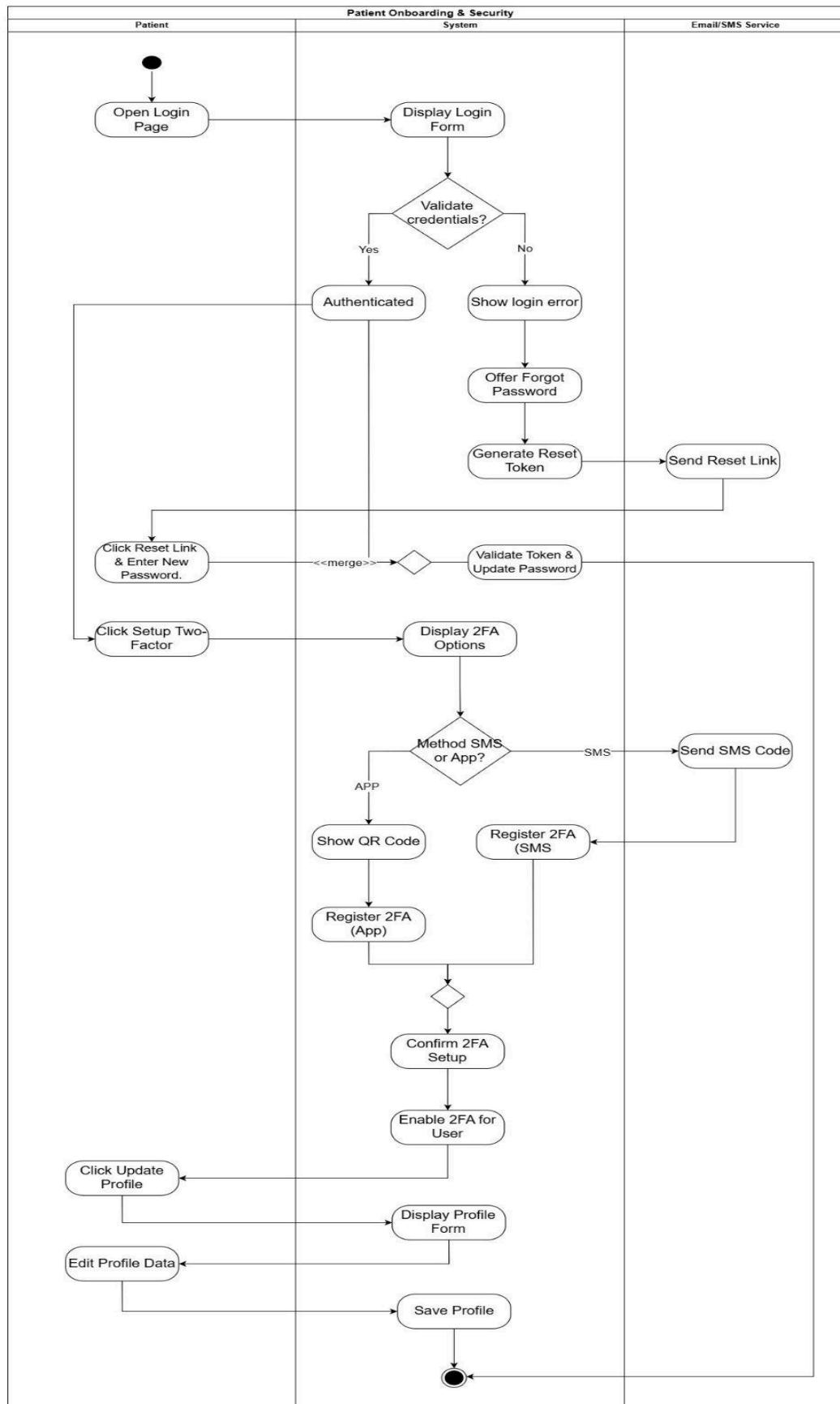
Activity Diagram (UC4)

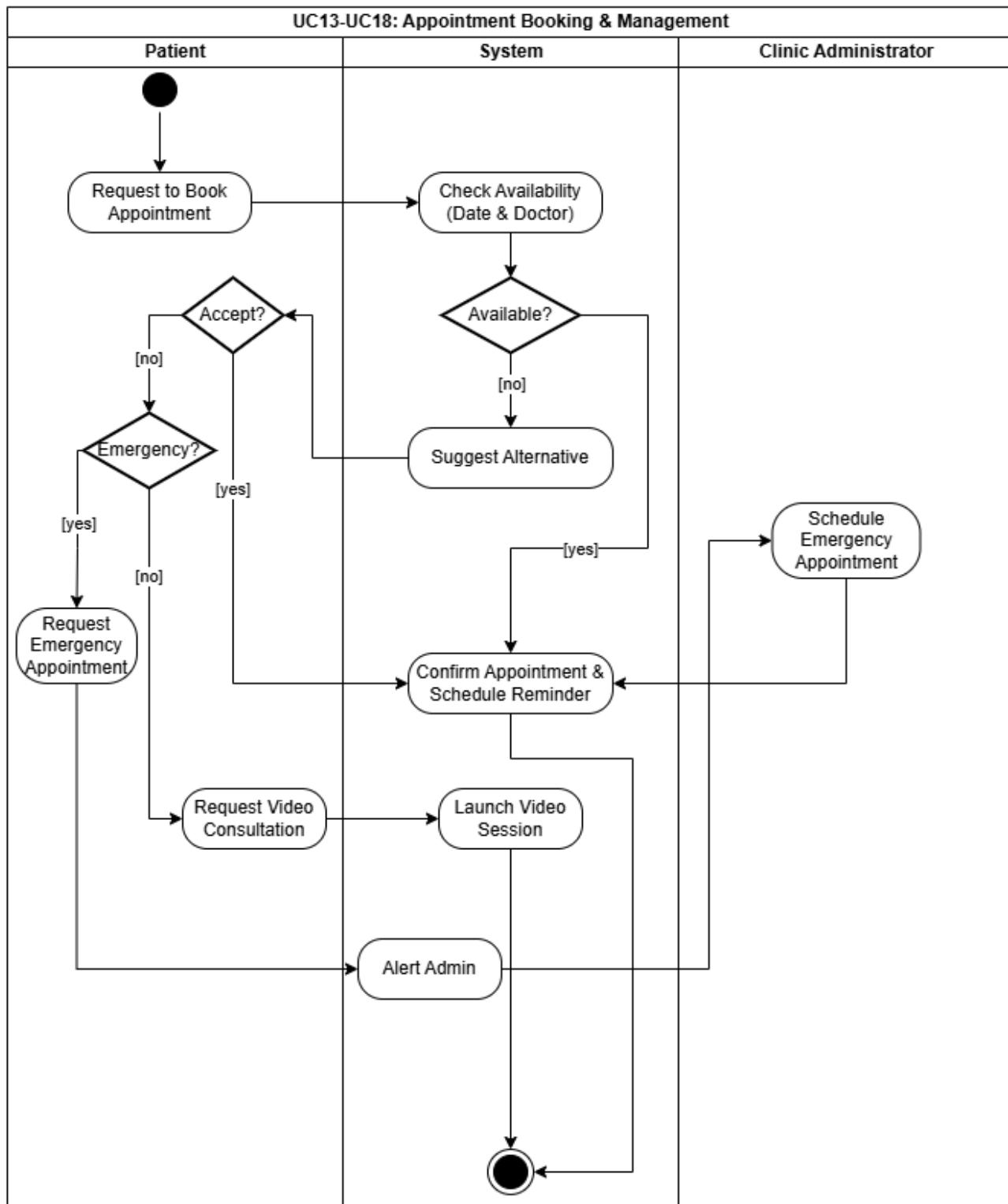


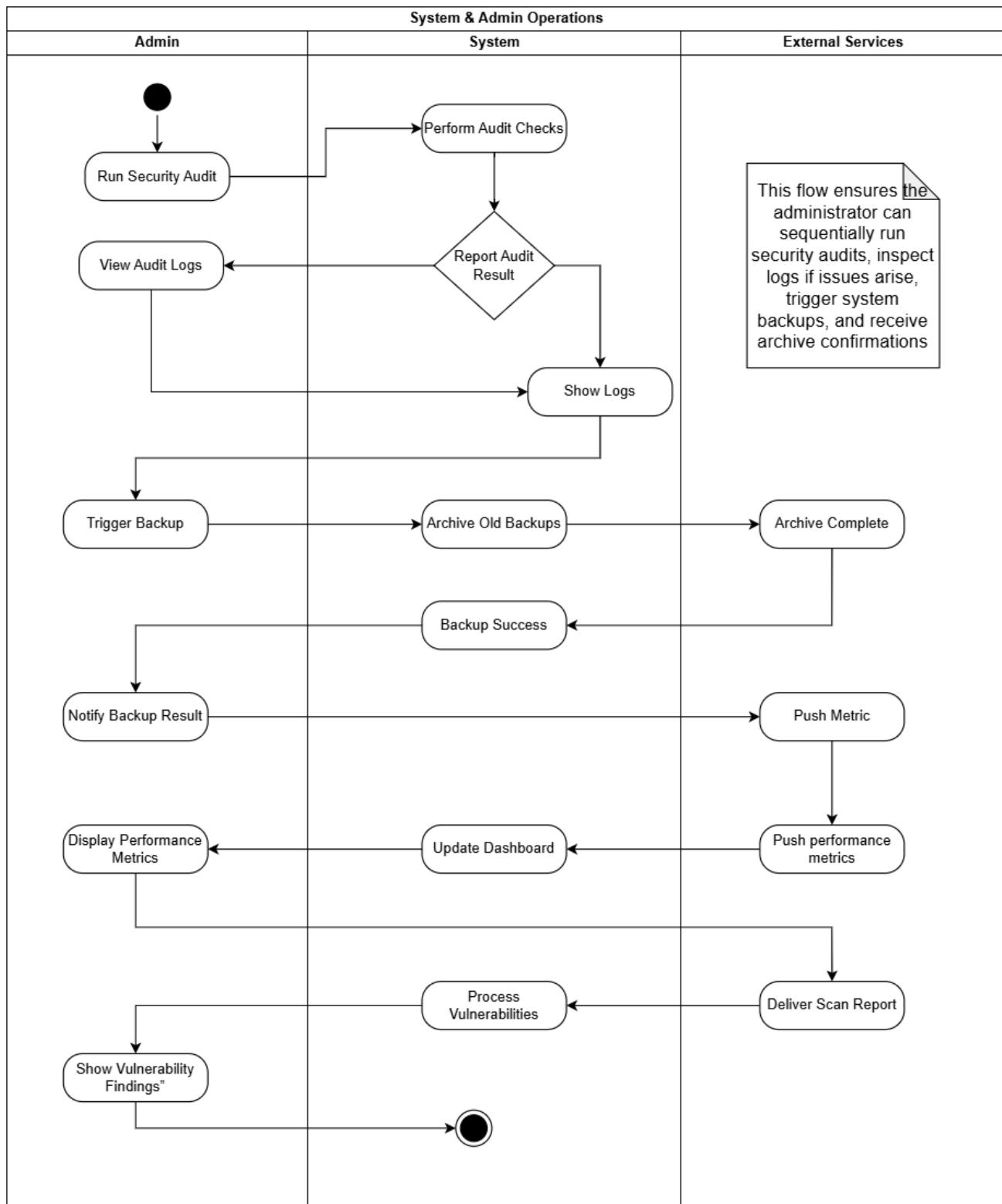
Activity Diagram (UC5)

Activity Diagram (UC6)

Activity Diagram (UC7 - UC9)

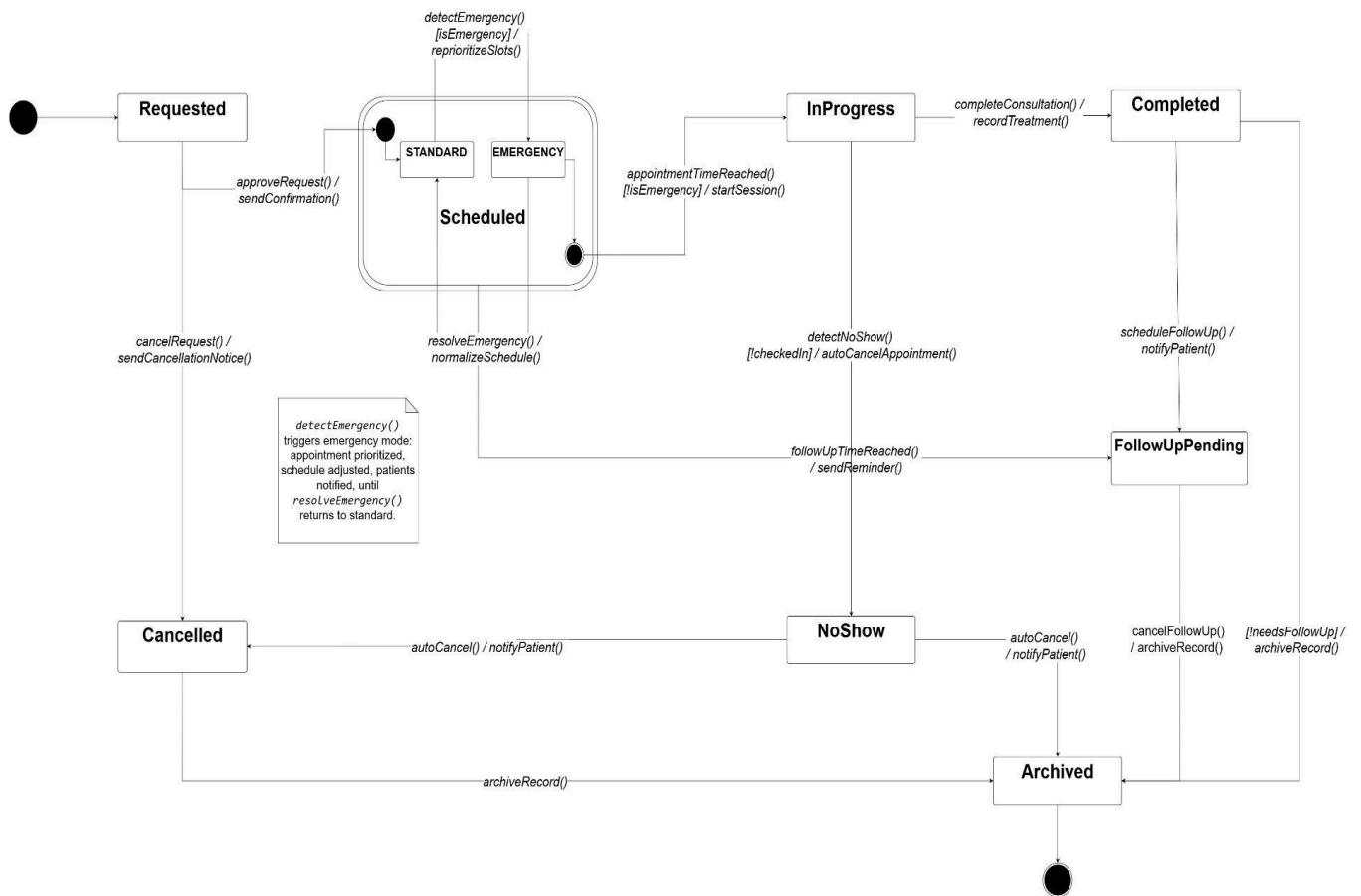


Activity Diagram (UC13 - UC18)

Activity Diagram (UC36 - UC40)

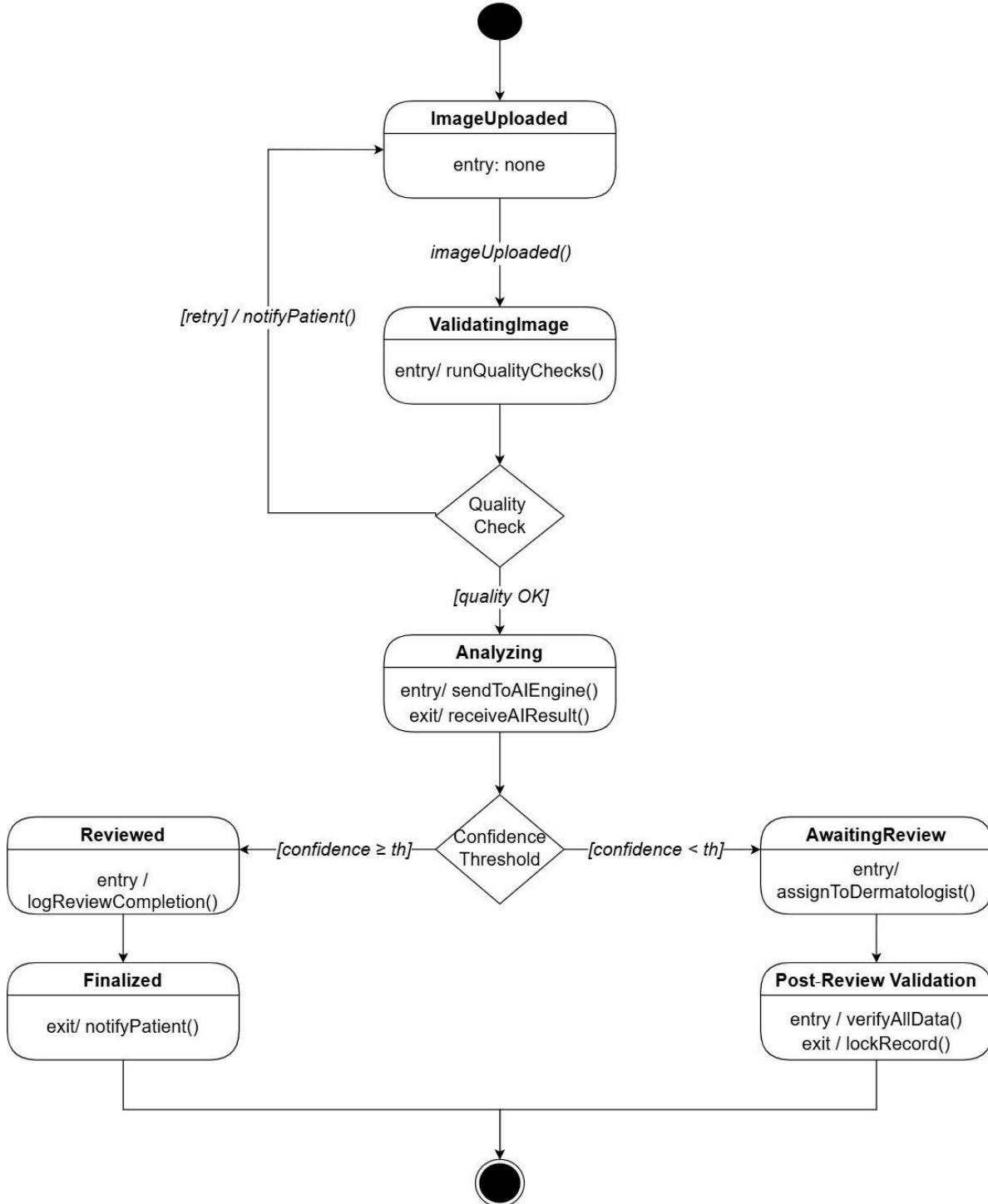
State Diagrams

Appointment



AI Diagnosis

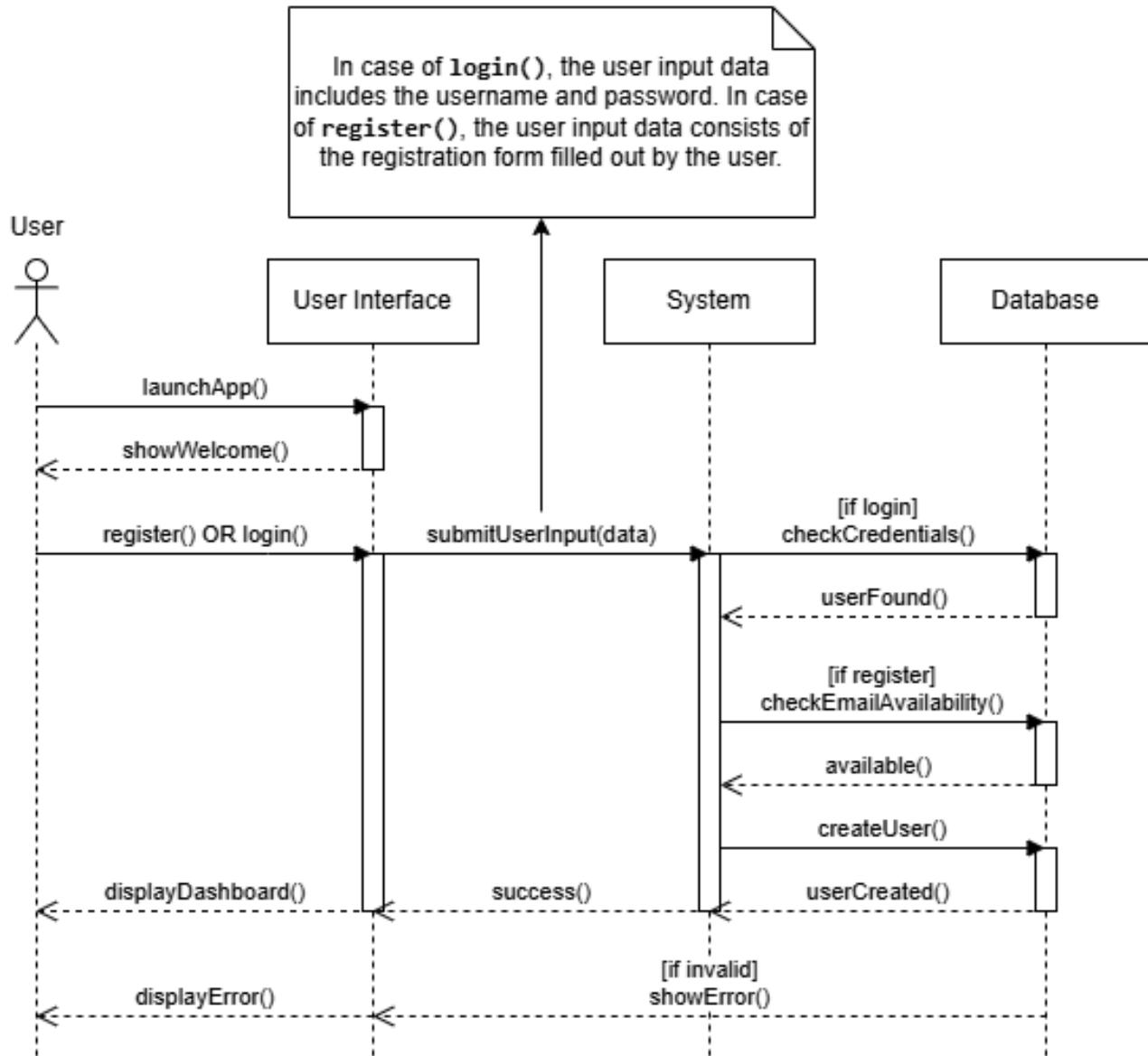
AI_Diagnosis State Diagram



Interaction Diagrams

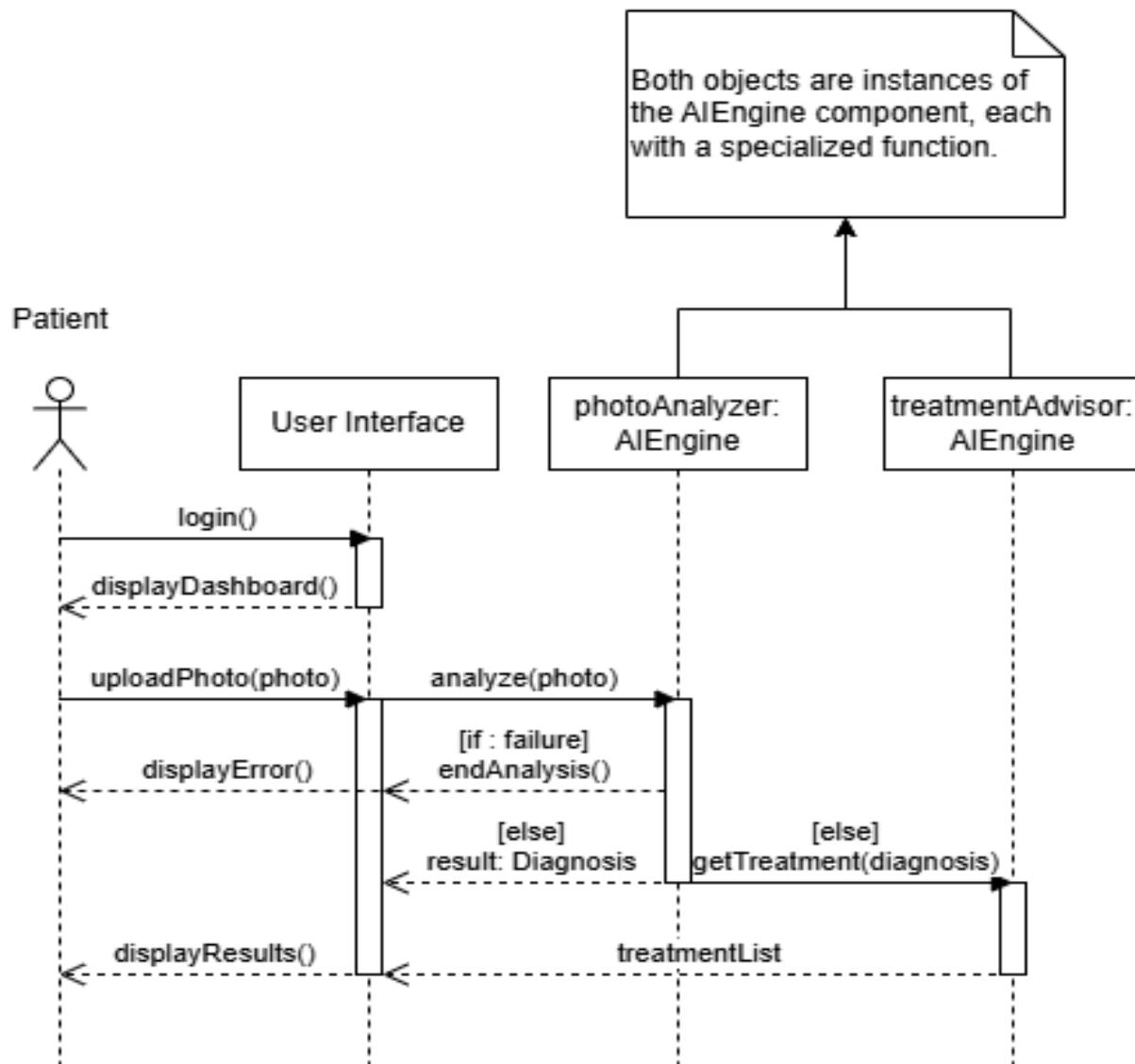
Sequence Diagrams

User Registration & Login



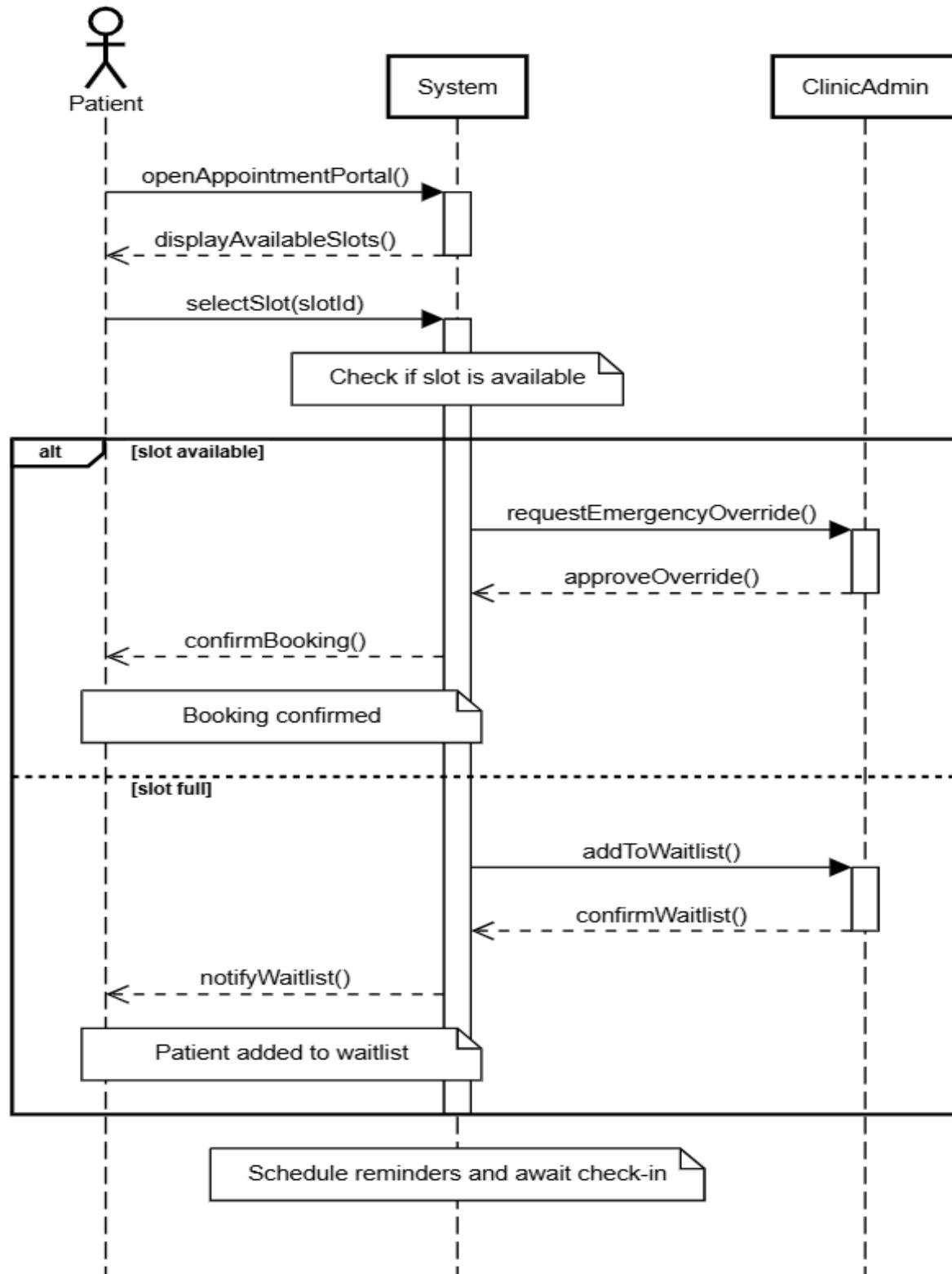
Sequence Diagram (UC1)

AI Skin Analysis



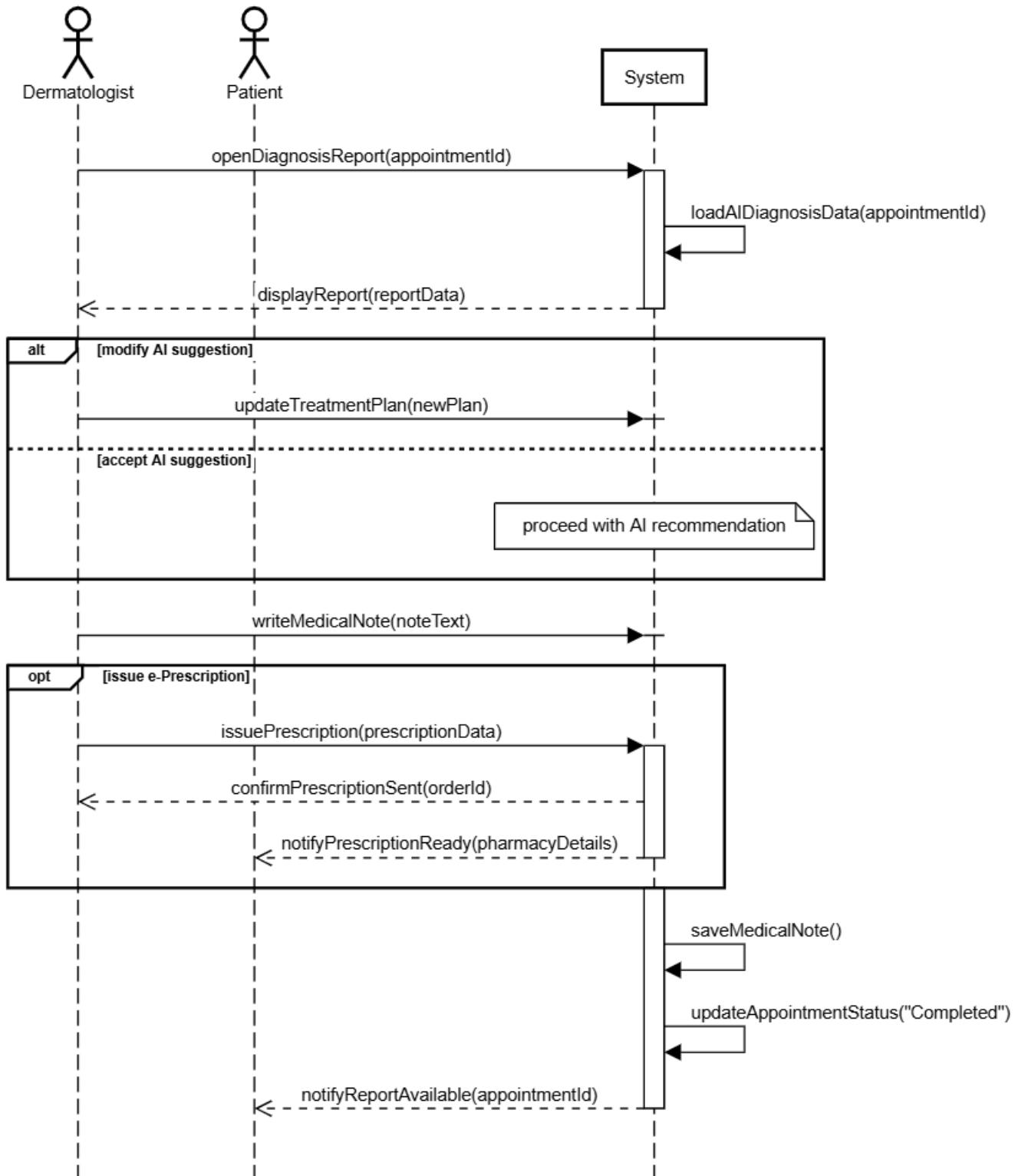
Sequence Diagram (UC2)

Appointment Booking & Management



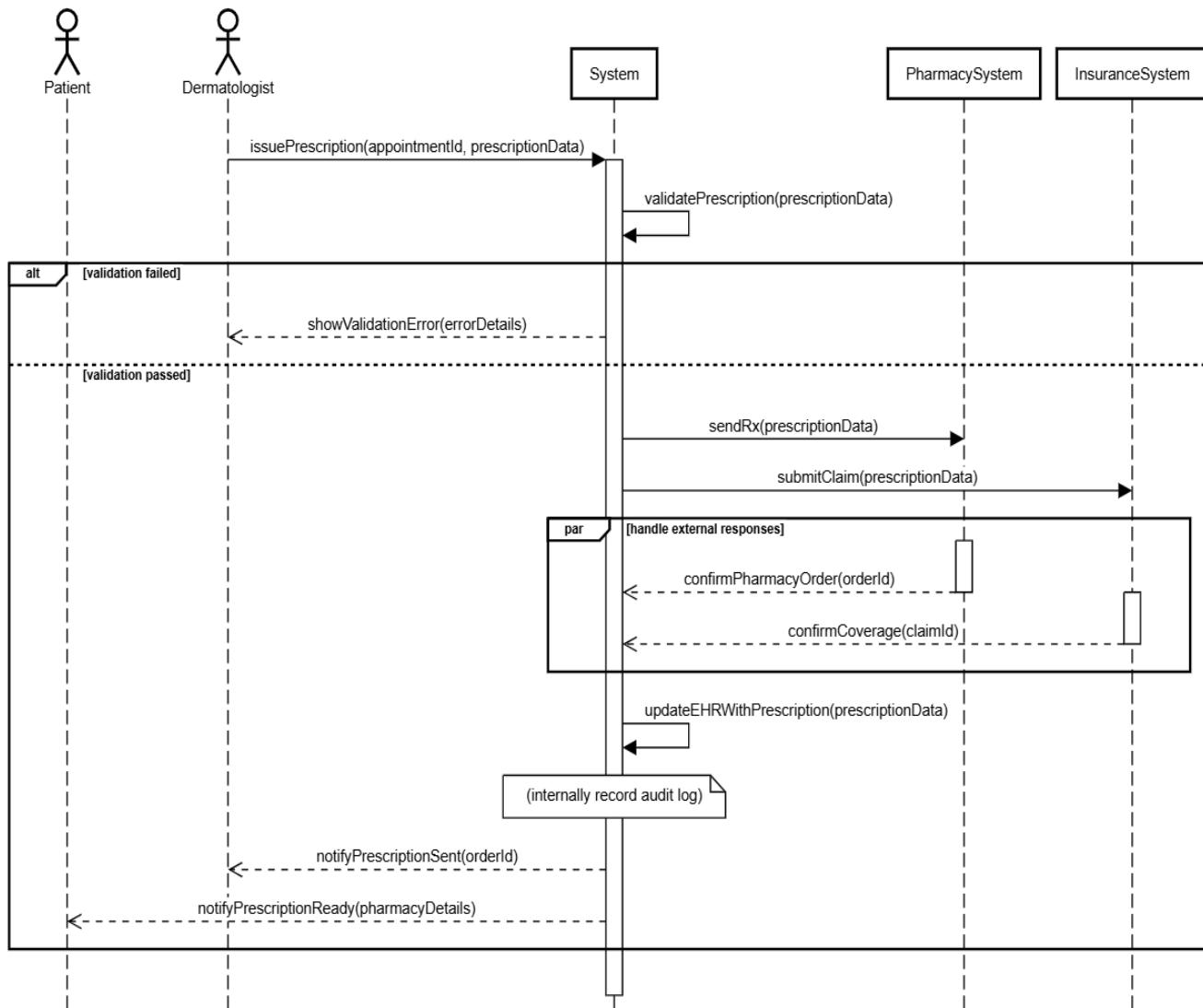
Sequence Diagram (UC3)

Dermatologist Review & Treatment Update

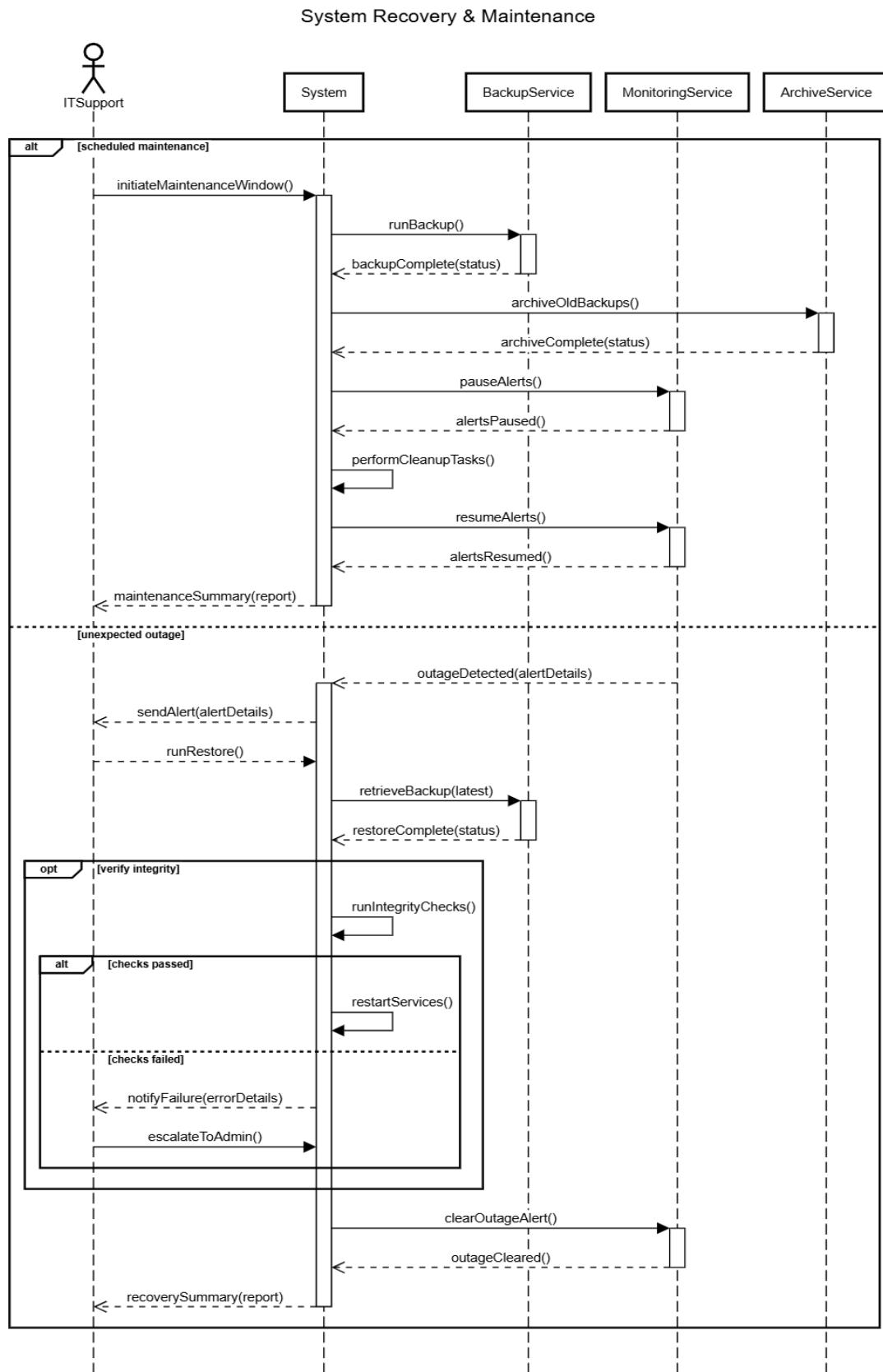


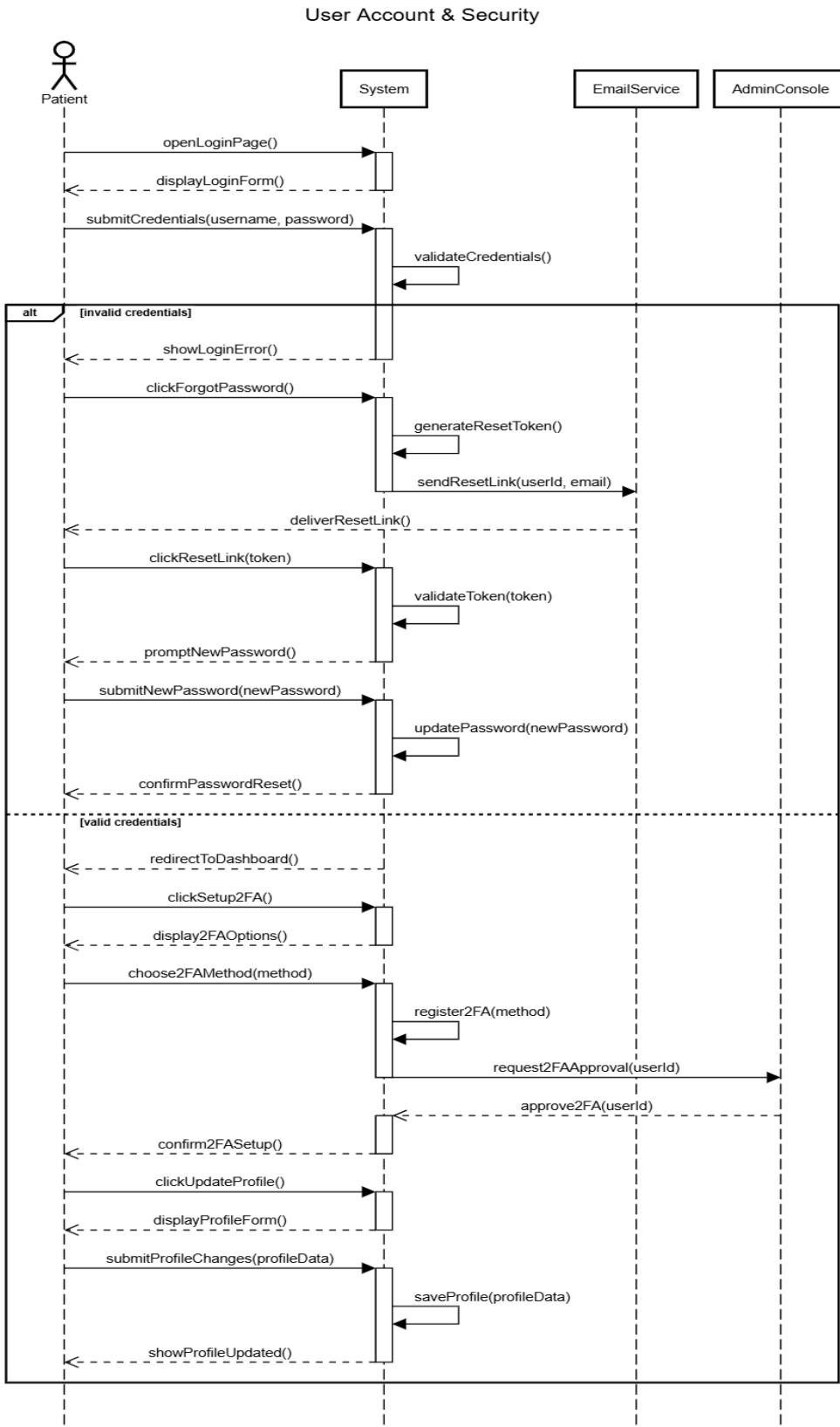
Sequence Diagram (UC4)

E-Prescription & Pharmacy Integration



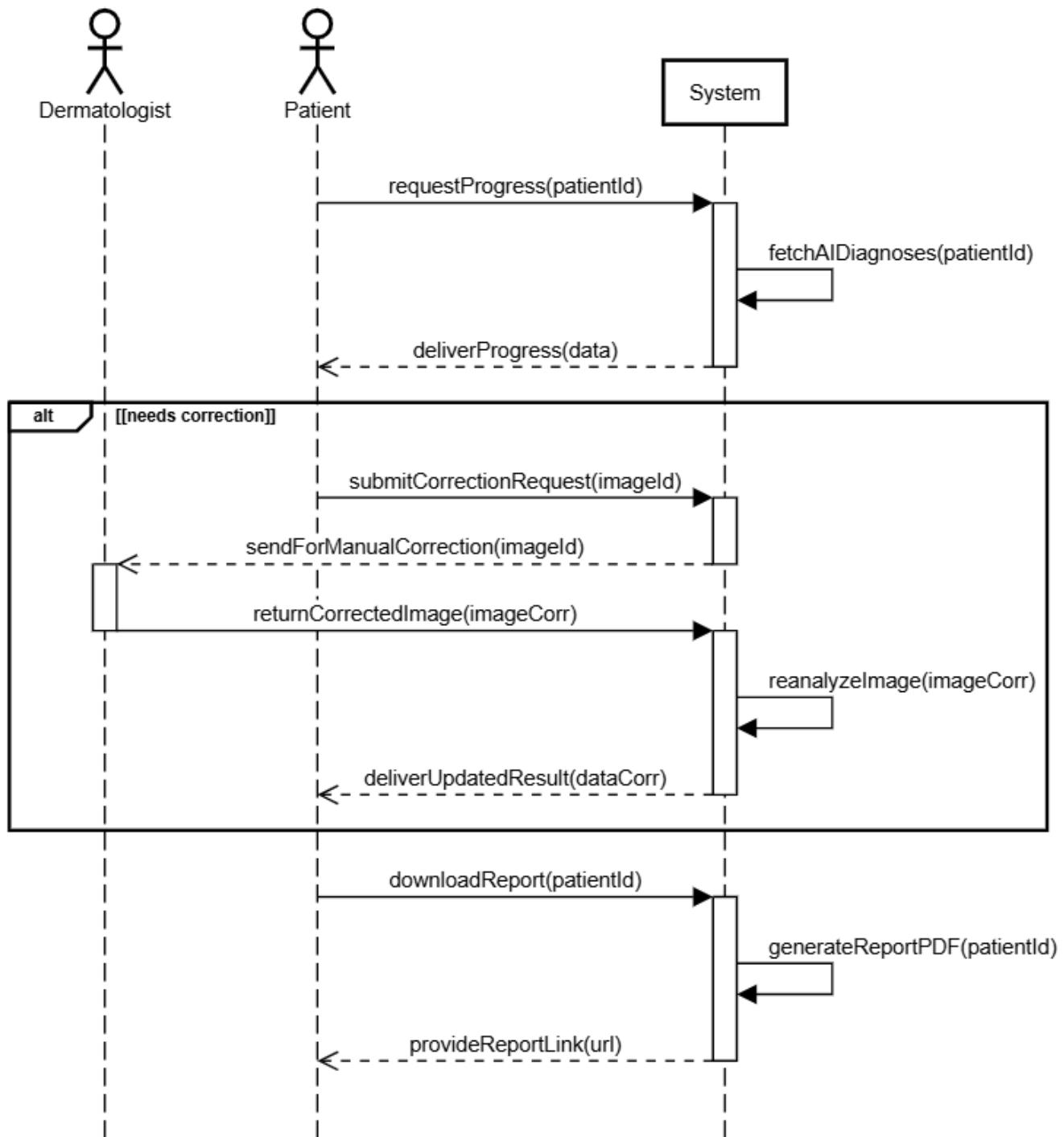
Sequence Diagram (UC5)

*Sequence Diagram (UC6)*



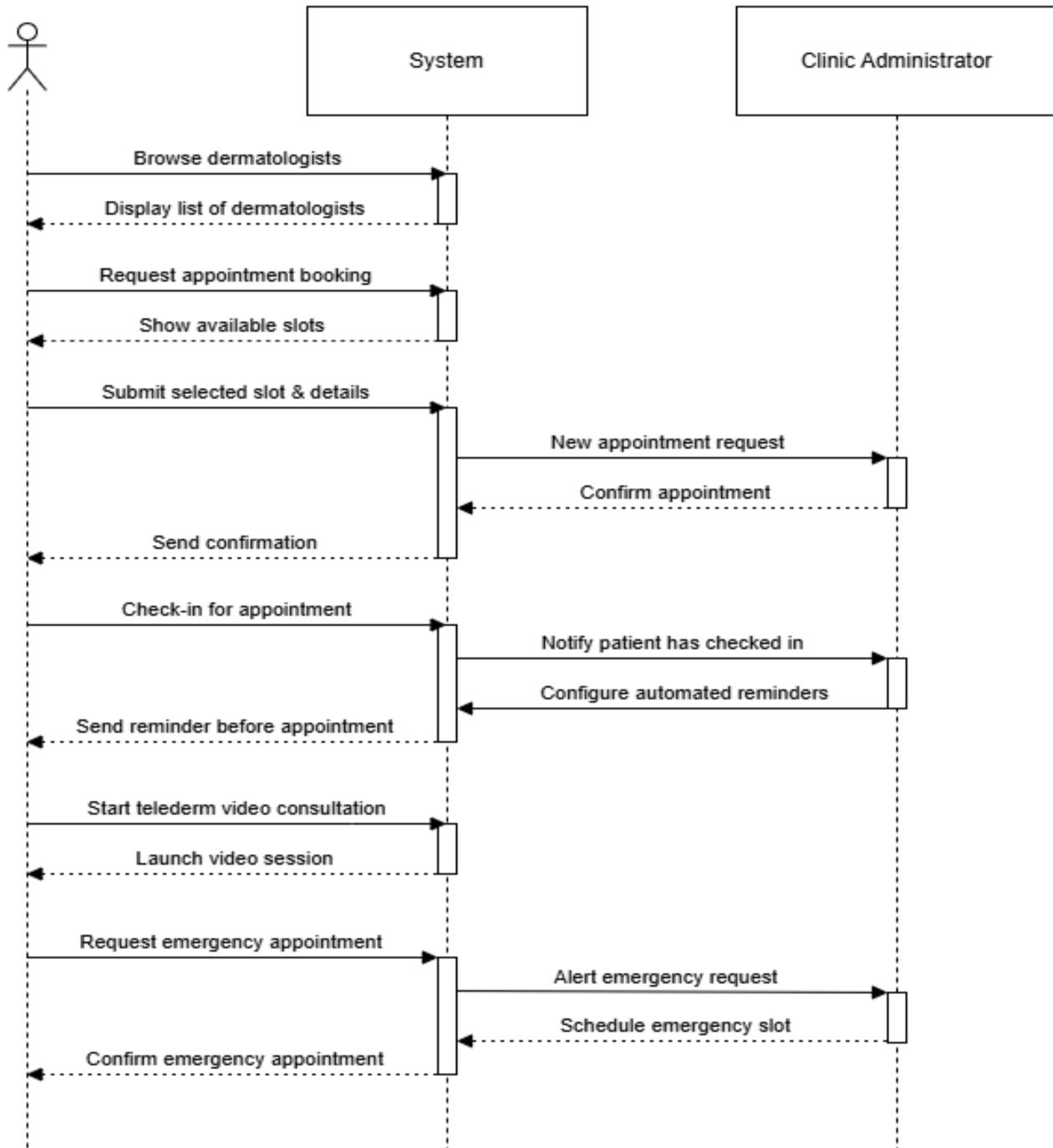
Sequence Diagram (UC7 - UC9)

AI Analysis & Reporting

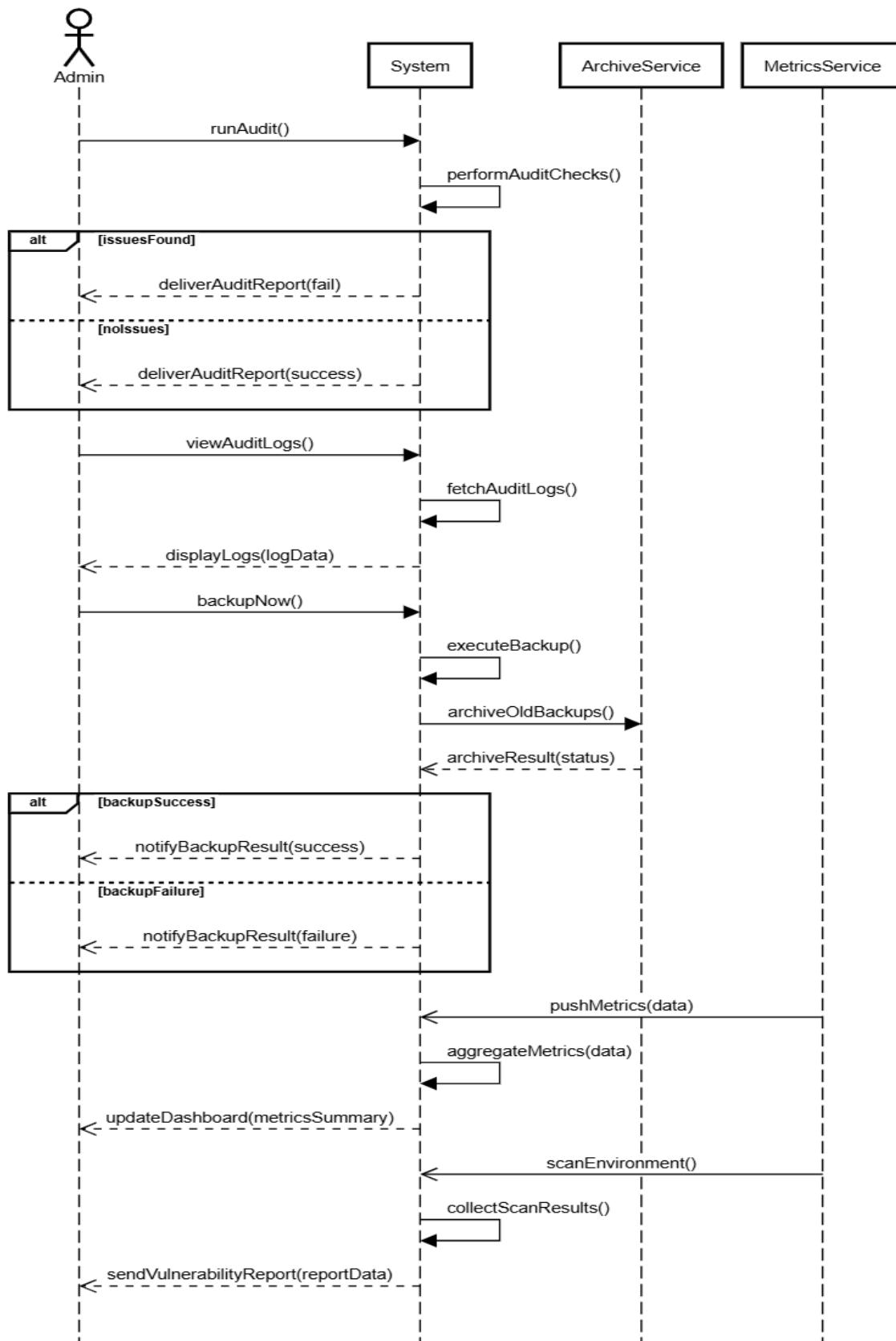


Sequence Diagram (UC10 - UC12)

UC13-UC18: Appointment Booking & Management

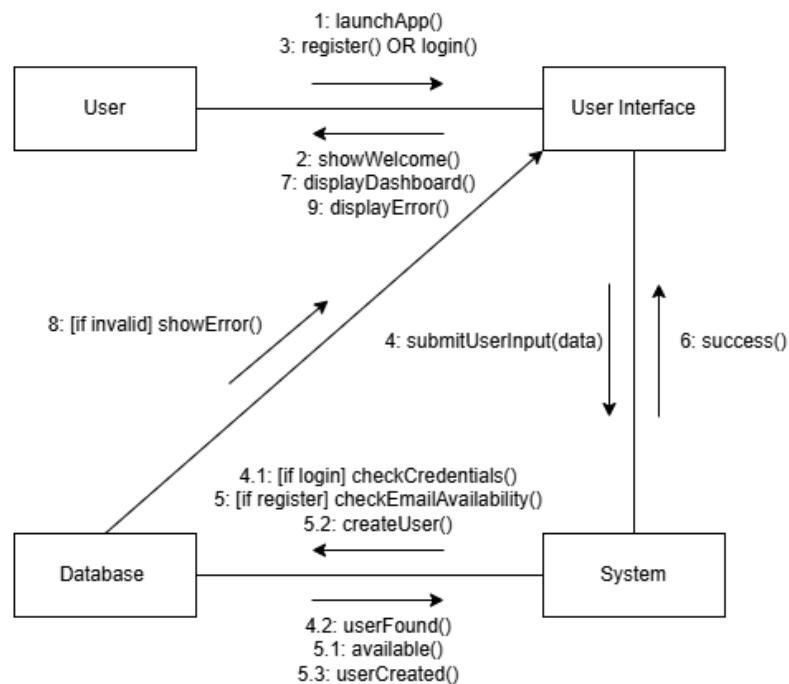


Sequence Diagram (UC13 - UC18)

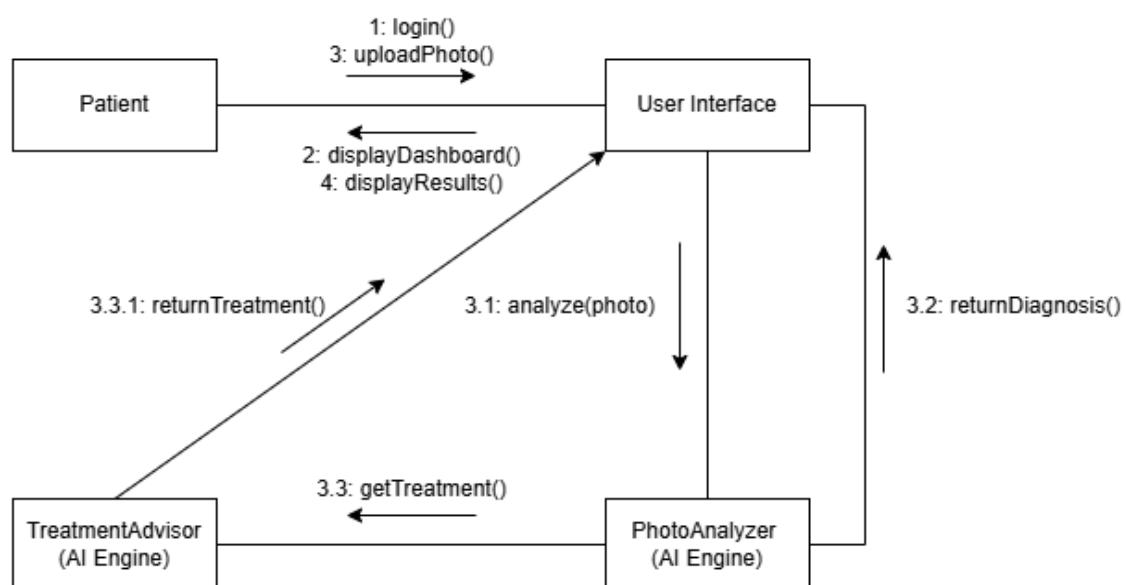
*Sequence Diagram (UC36 - UC40)*

Collaboration Diagrams

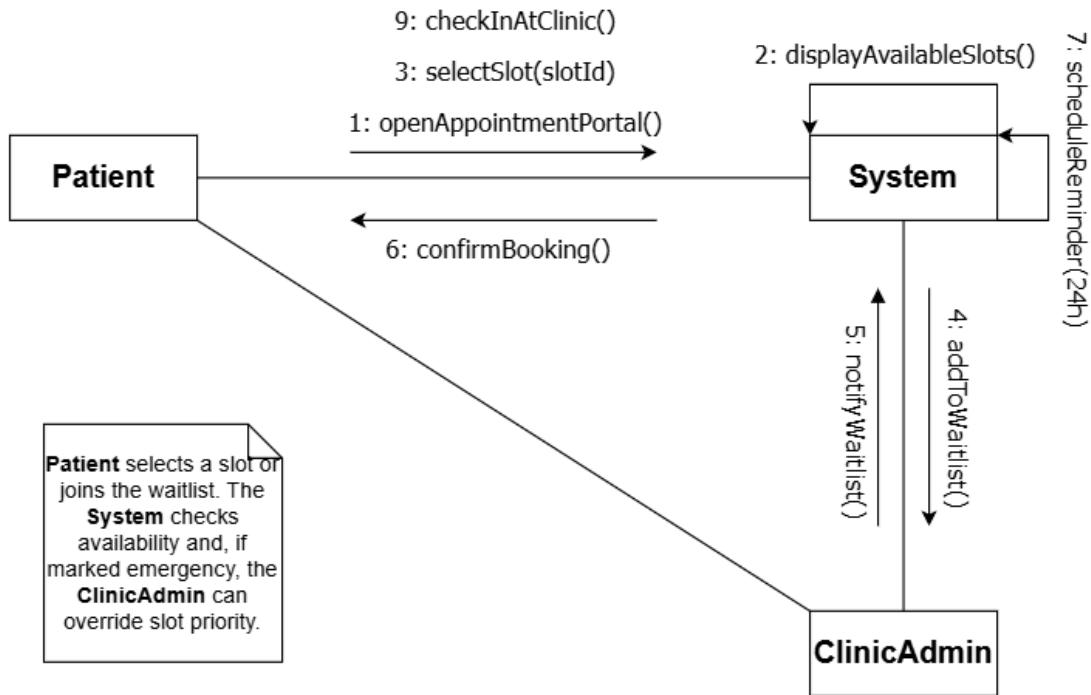
Collaboration Diagram (UC1)



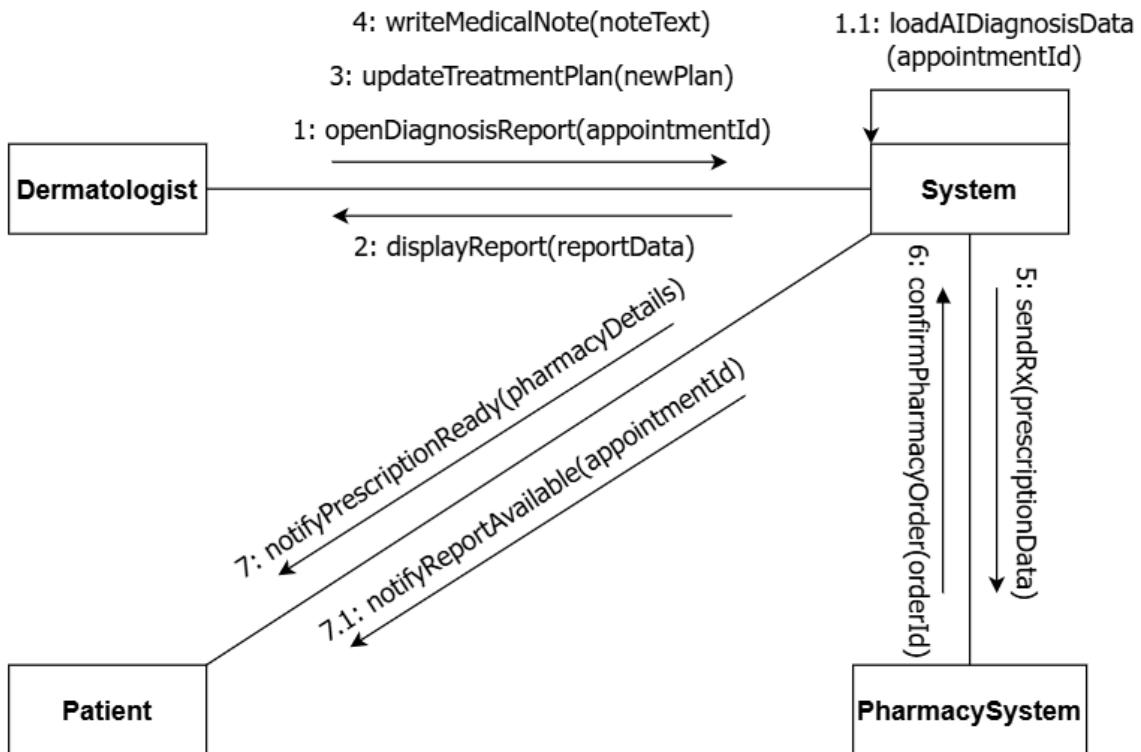
Collaboration Diagram (UC2)



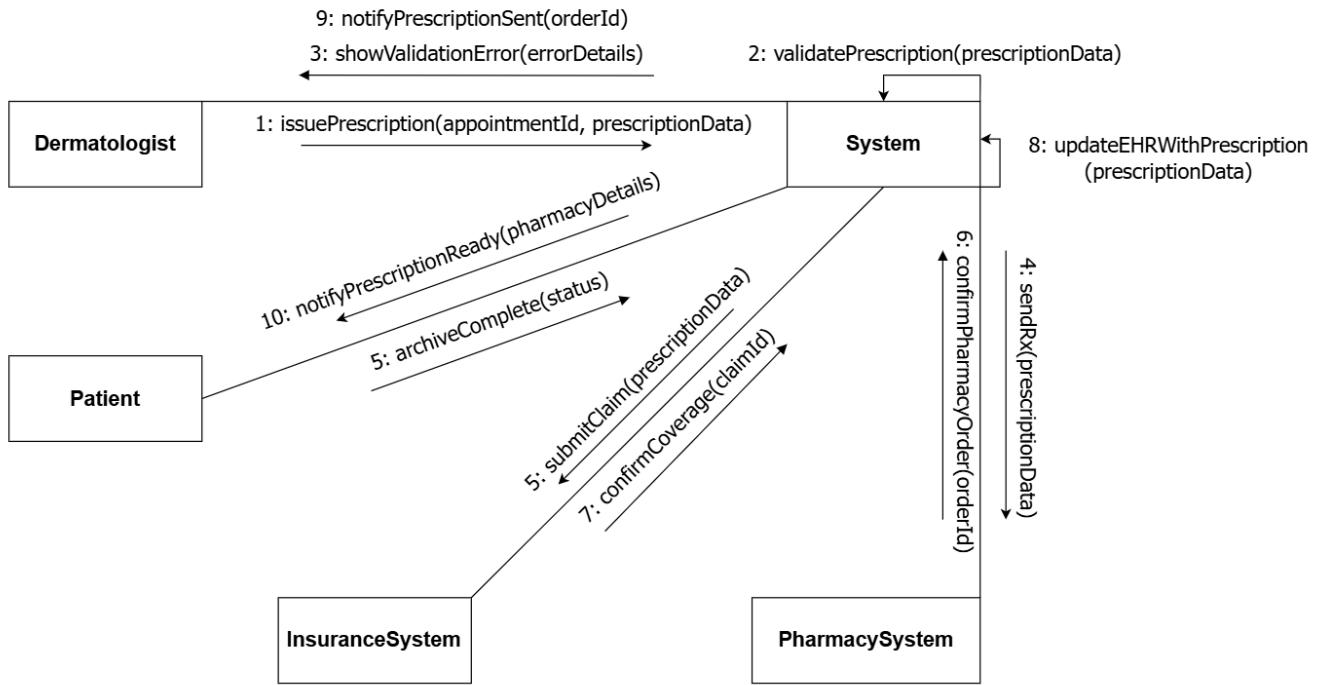
Collaboration Diagram (UC3)



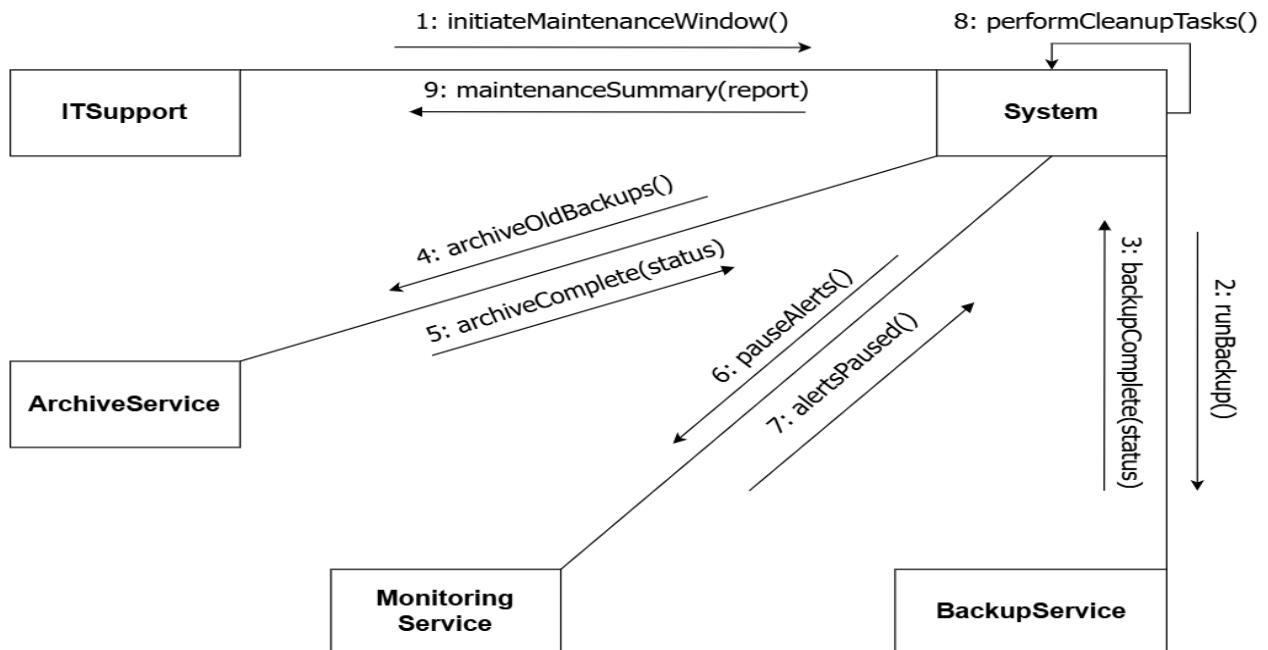
Collaboration Diagram (UC4)

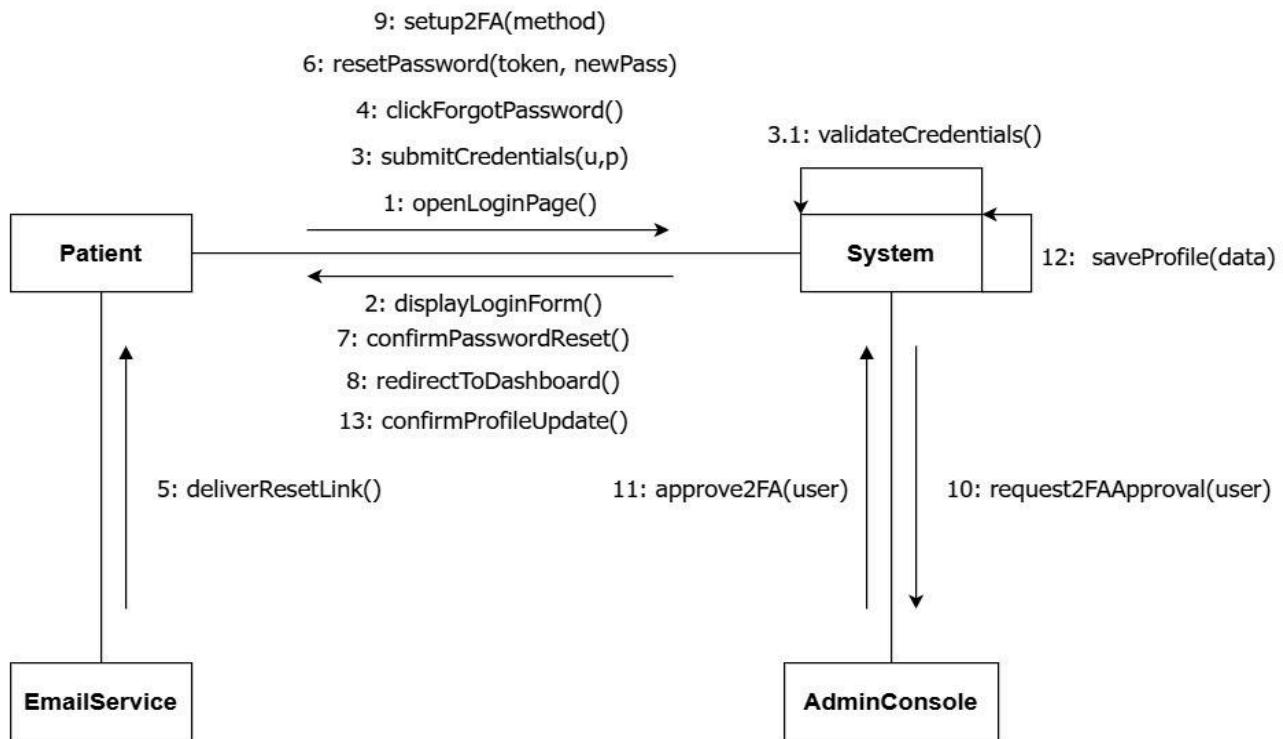
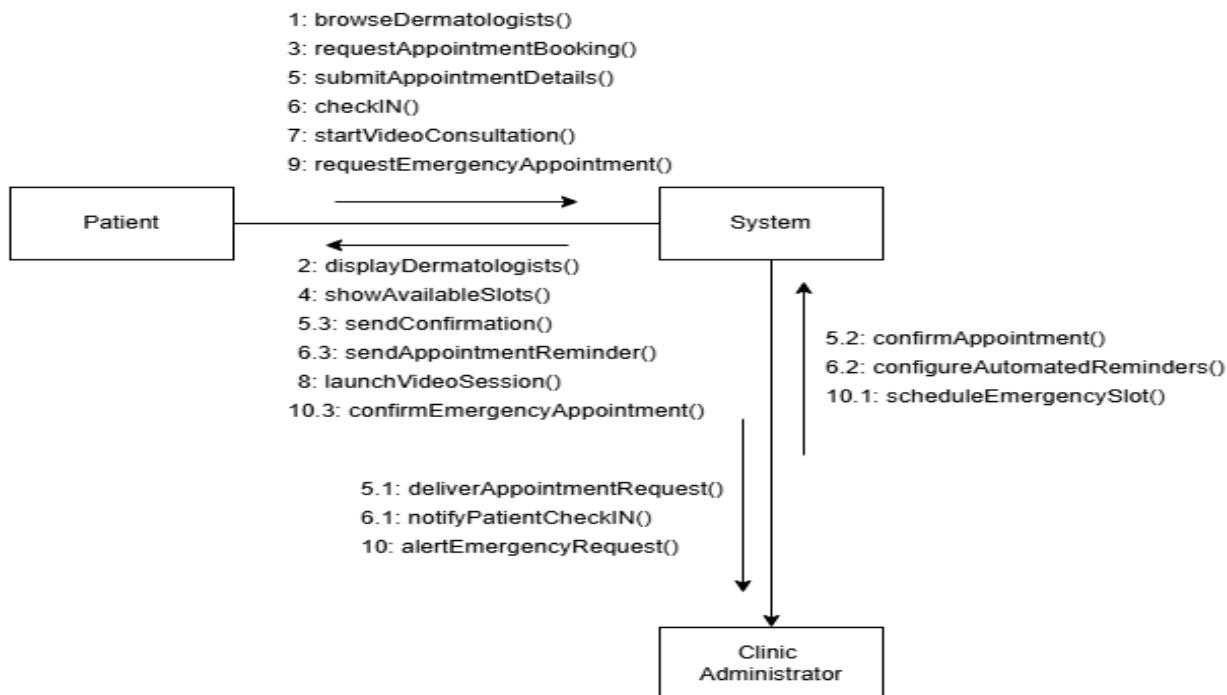


Collaboration Diagram (UC5)

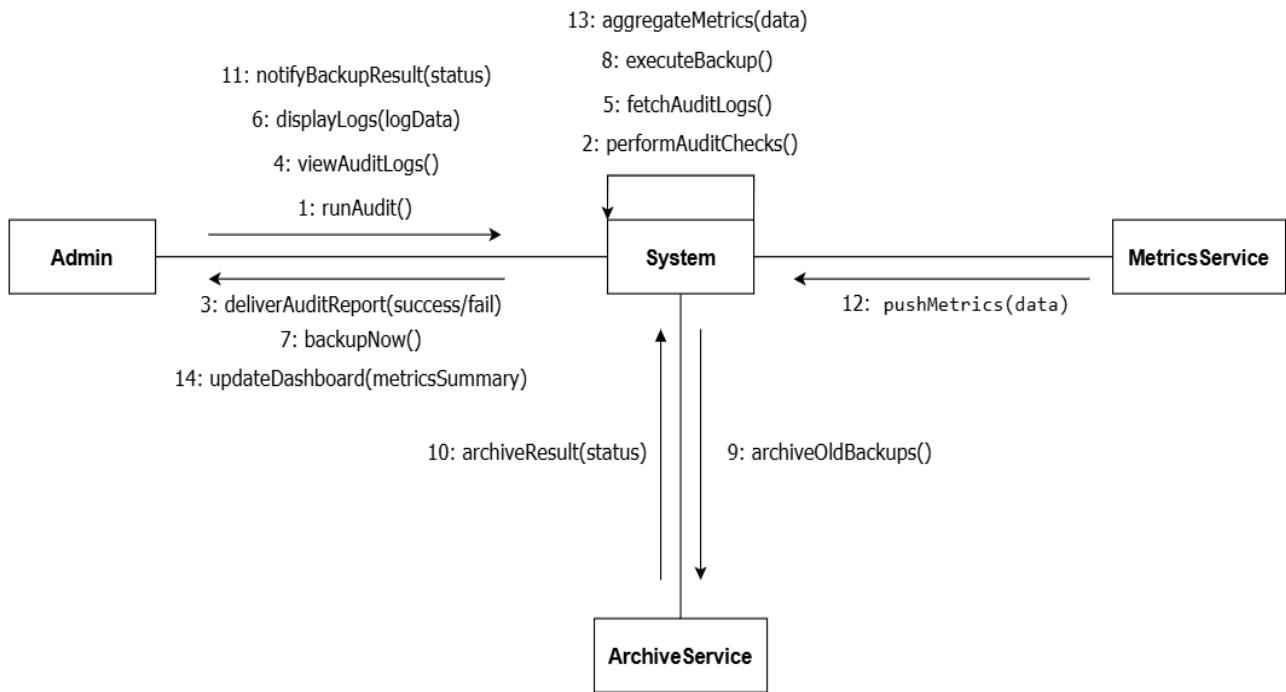


Collaboration Diagram (UC6)



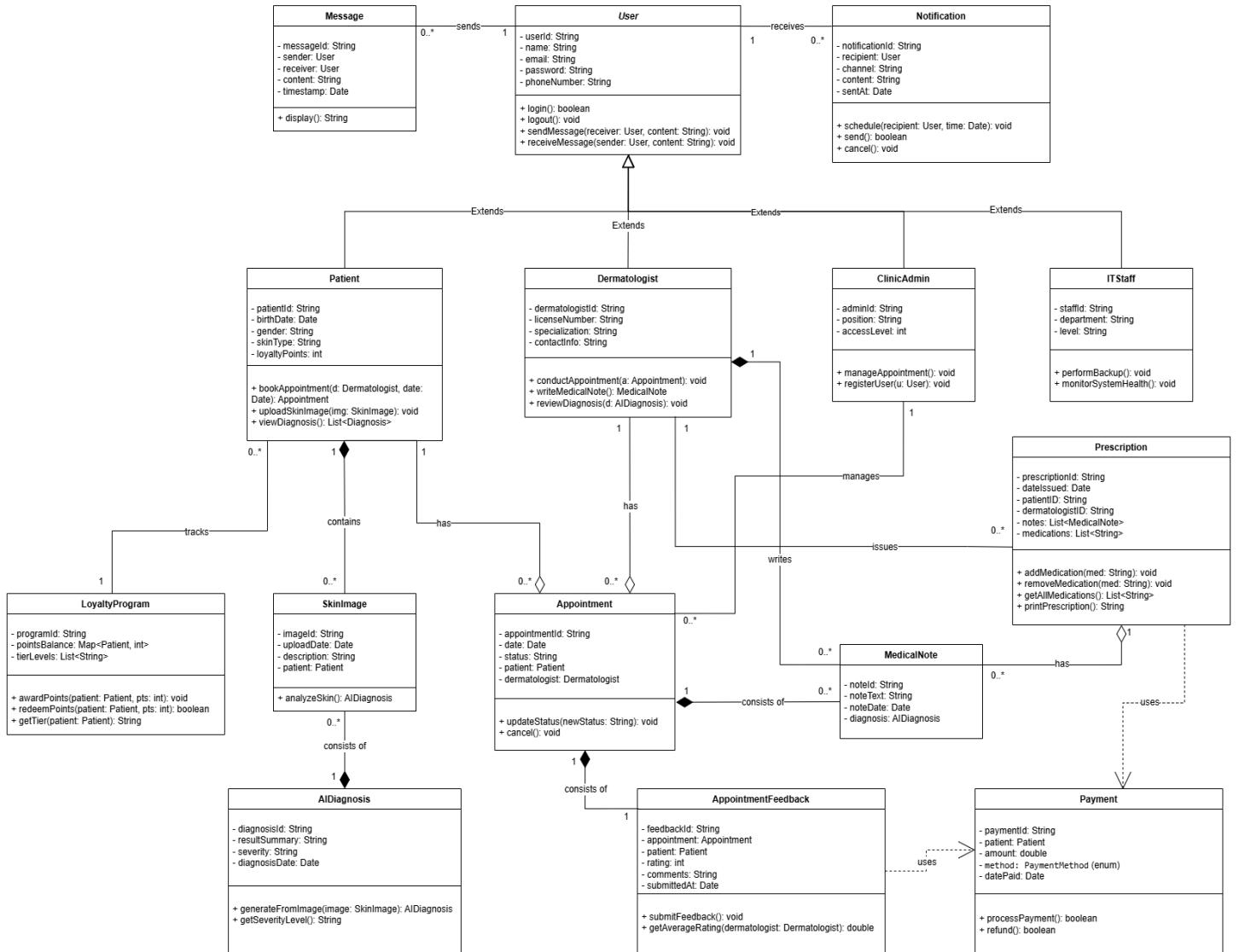
Collaboration Diagram (UC7 - UC12)***Collaboration Diagram (UC13 - UC18)***

Collaboration Diagram (UC36 - UC40)



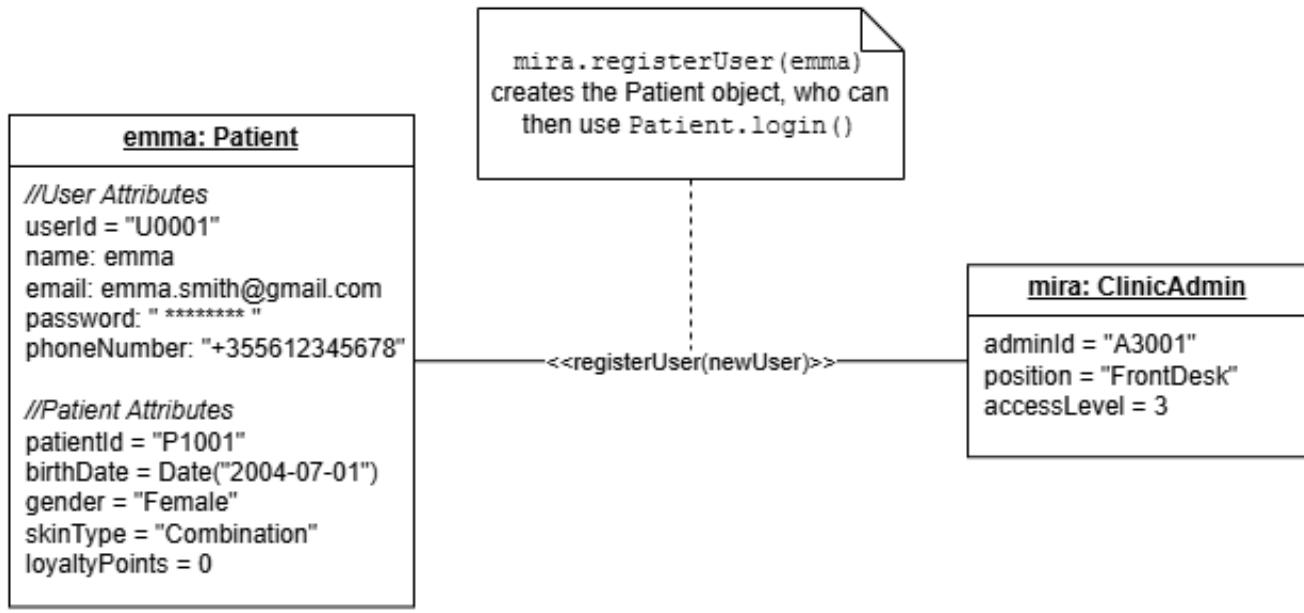
Structural Diagrams

Class Diagram

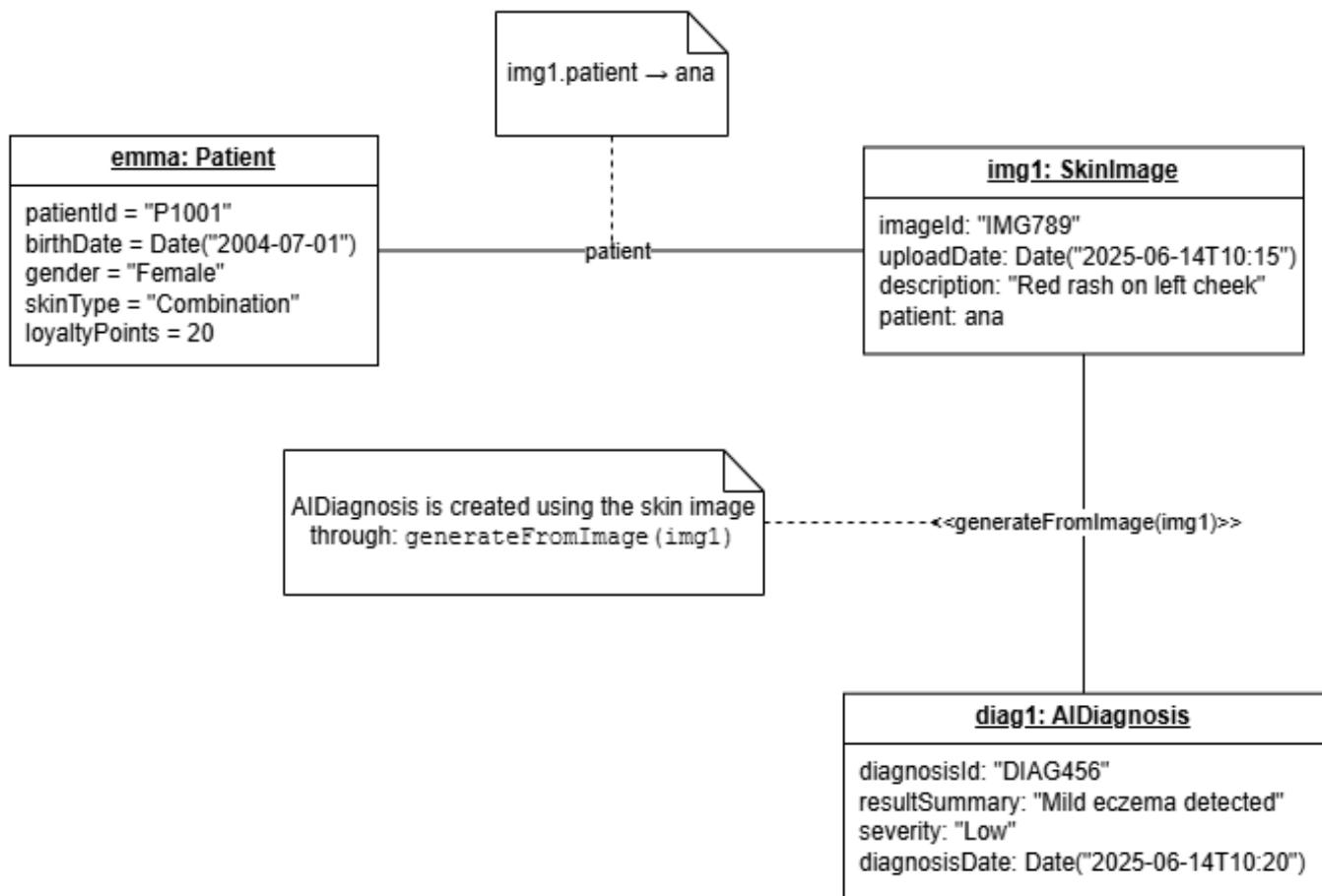


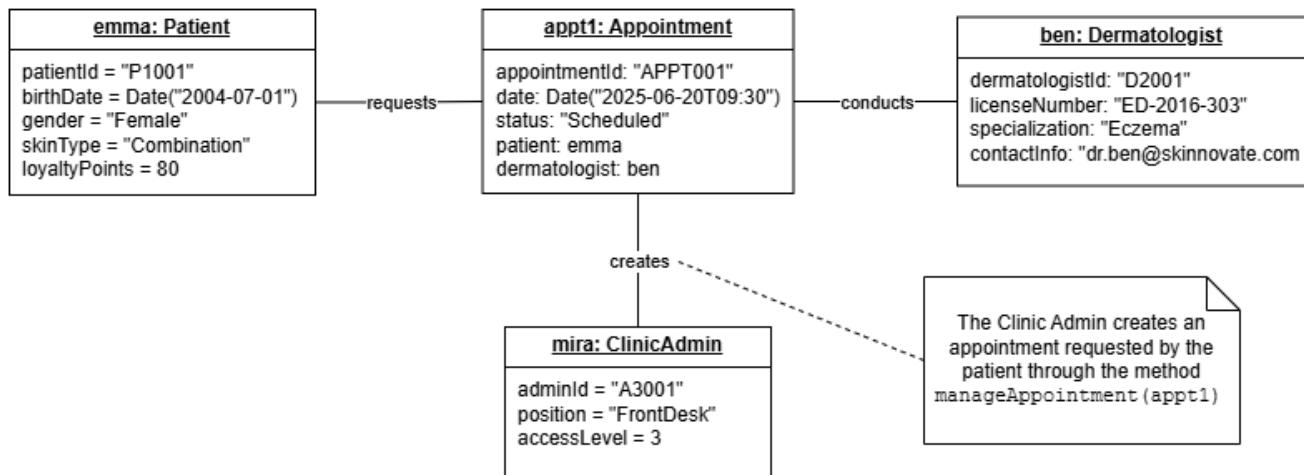
Object Diagrams

ObjectDiagramUC1

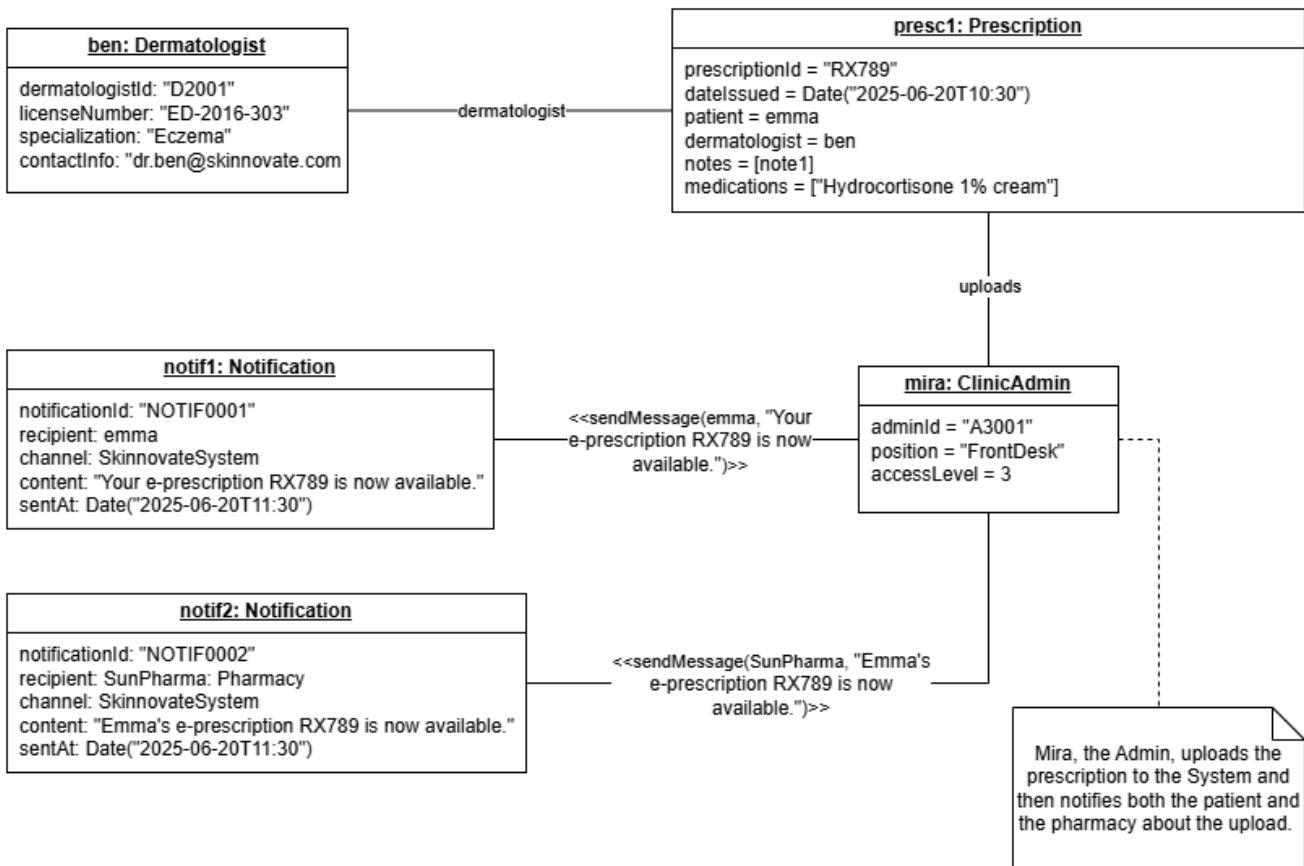


The same logic follows for all other users that register:
Dermatologist, ClinicAdmin.

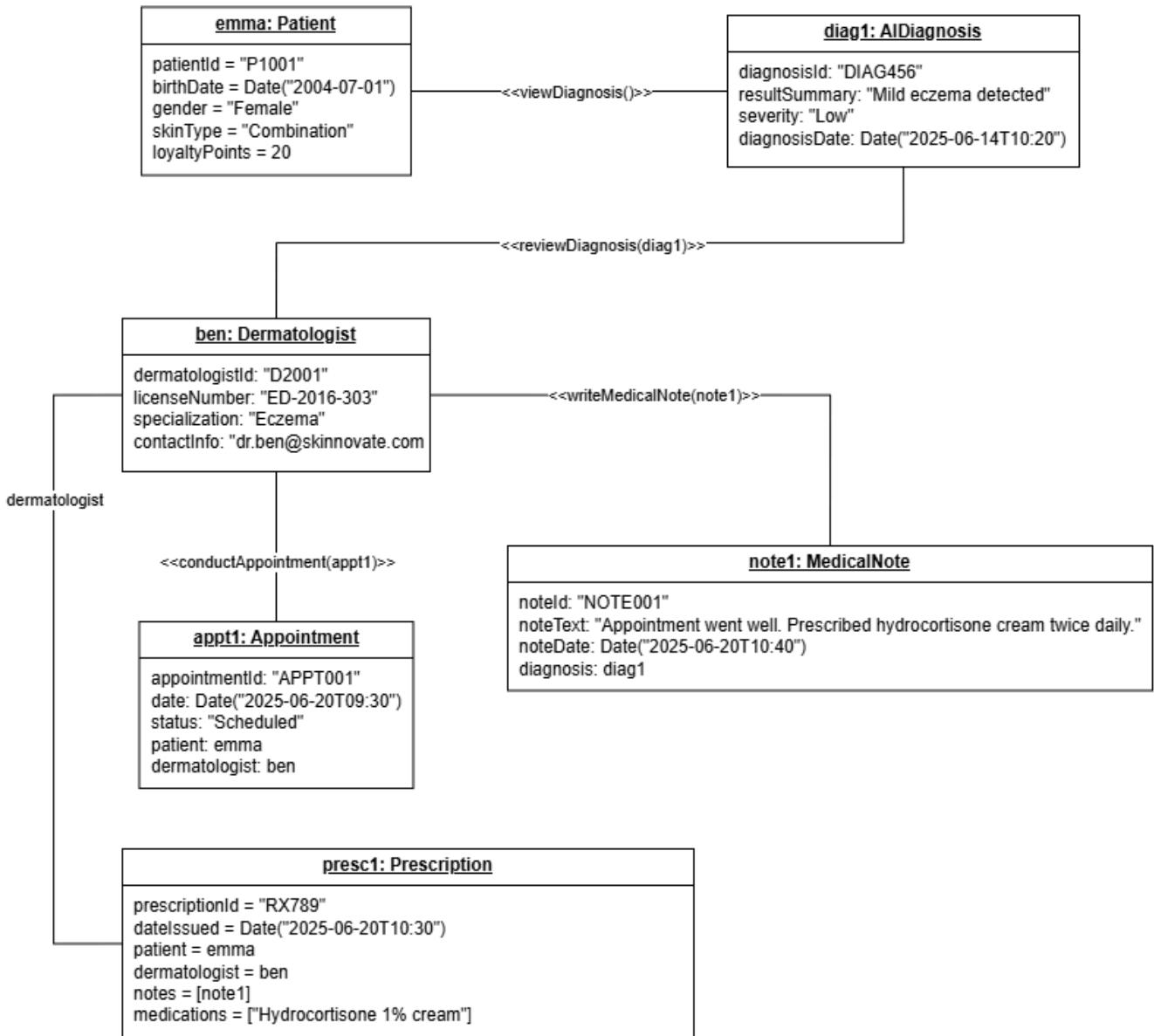
ObjectDiagramUC2

ObjectDiagramUC3

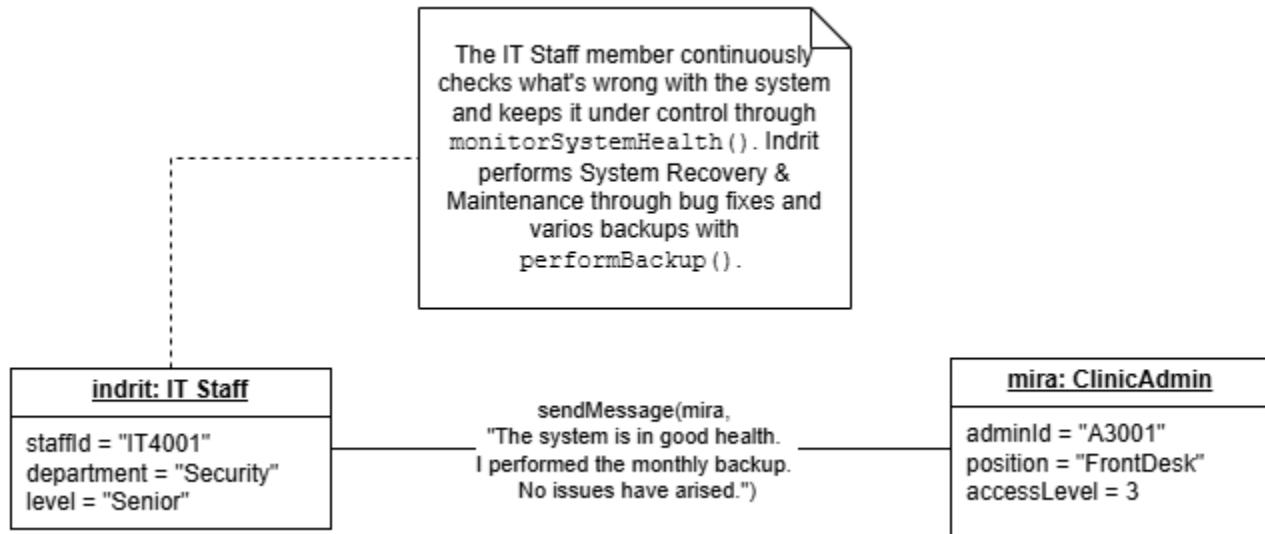
ObjectDiagramUC4



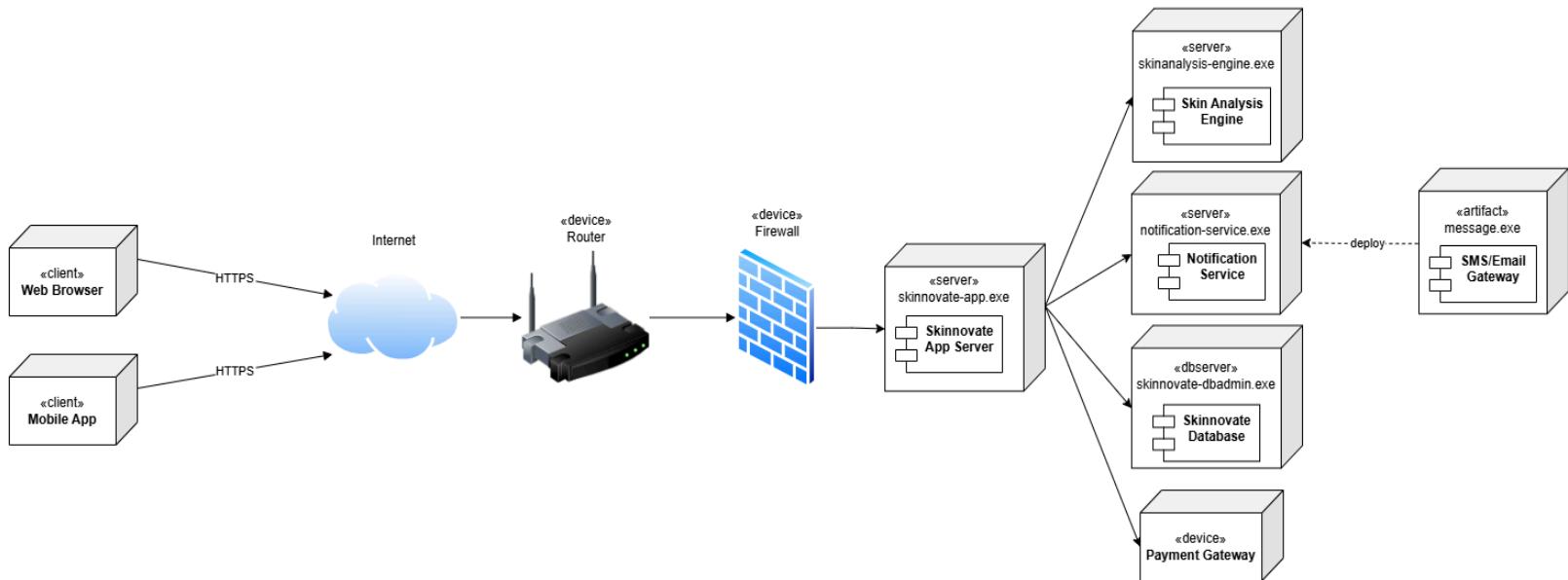
ObjectDiagramUC5



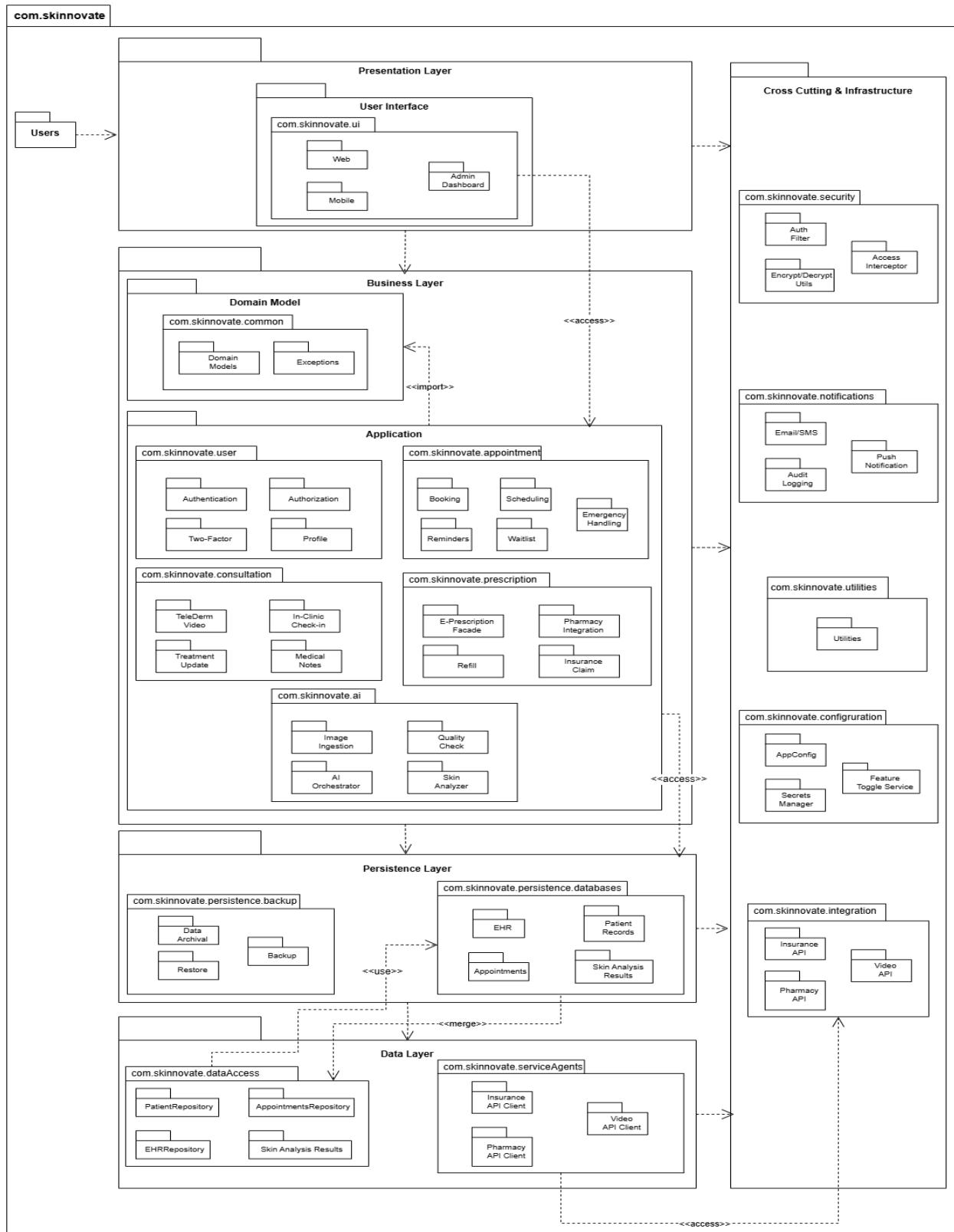
ObjectDiagramUC6



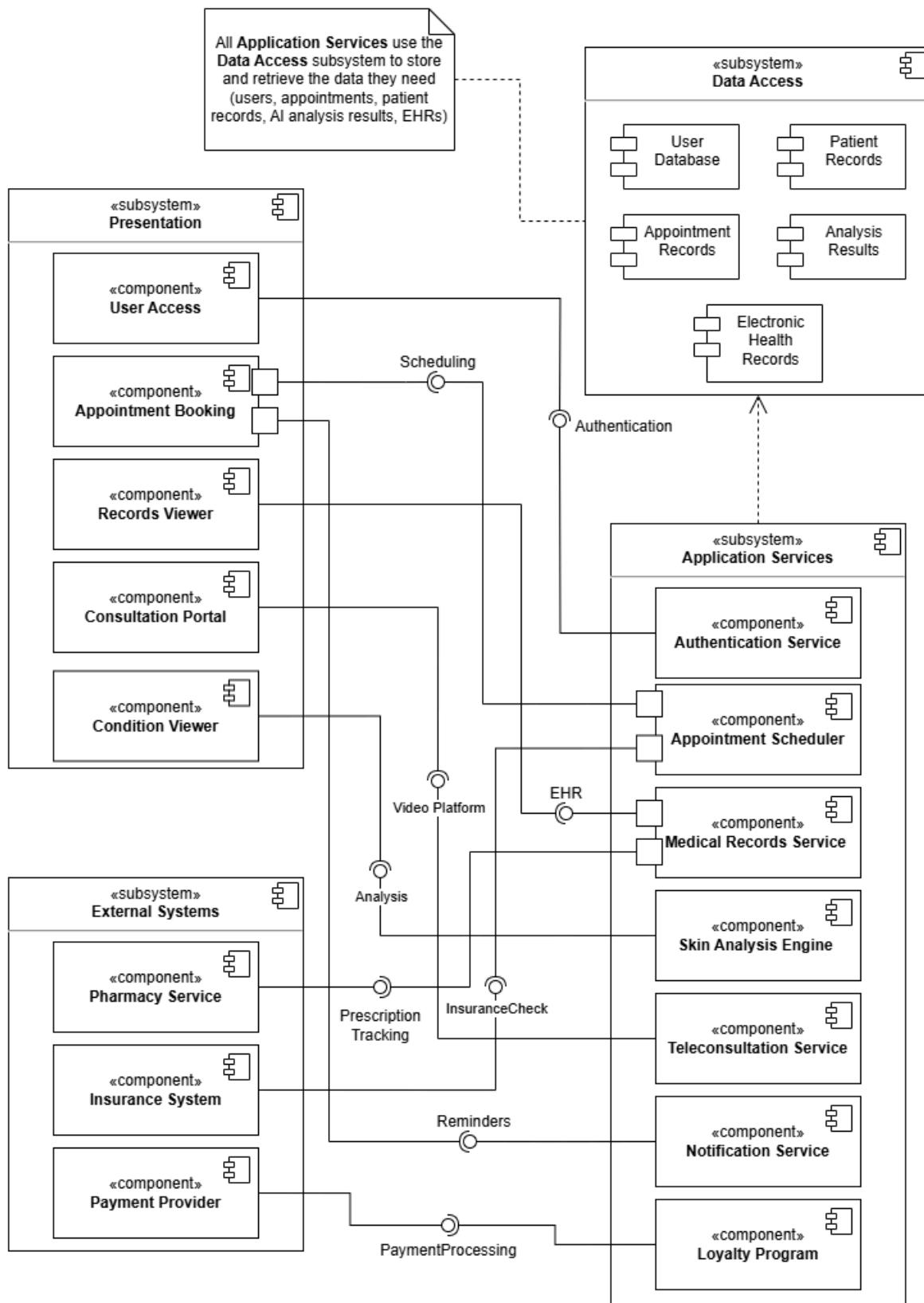
Deployment Diagram



Package Diagram



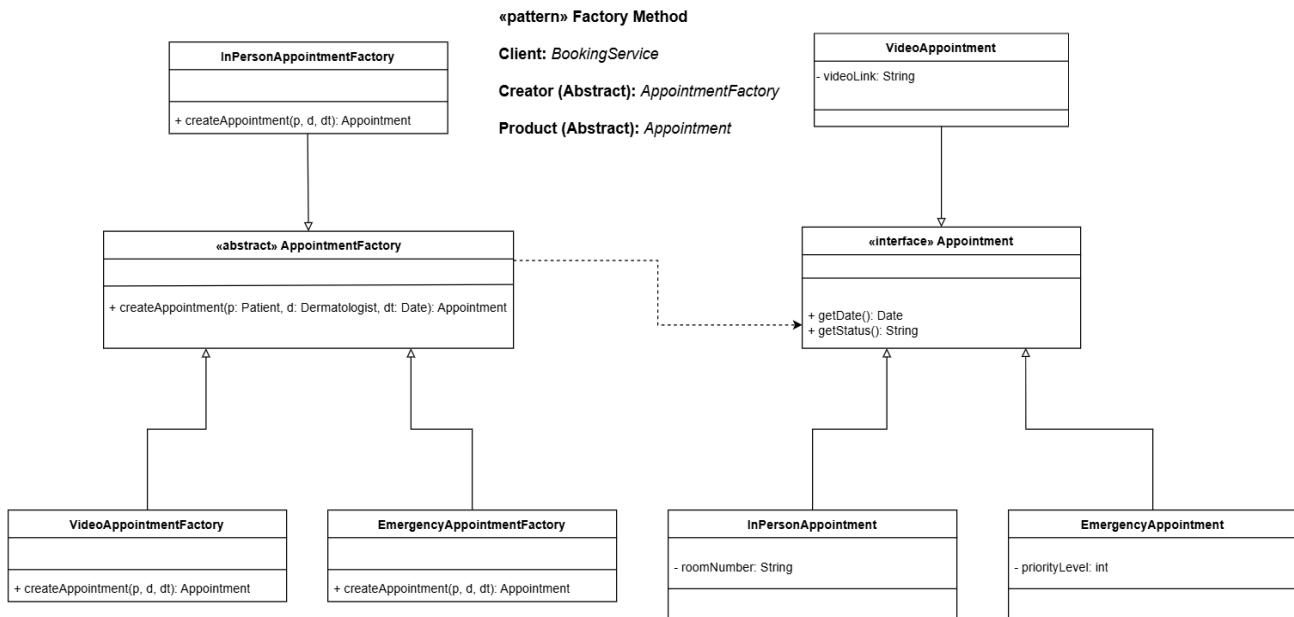
Component Diagram



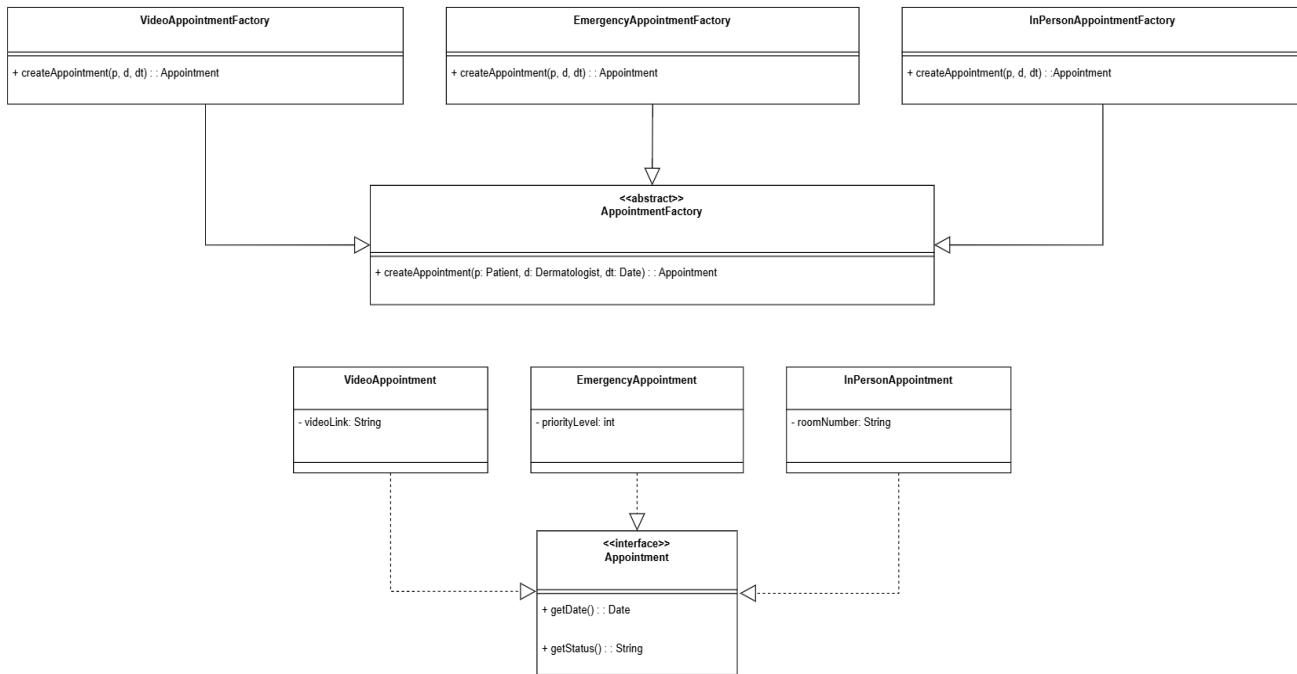
DESIGN PATTERNS

Creational Design Patterns

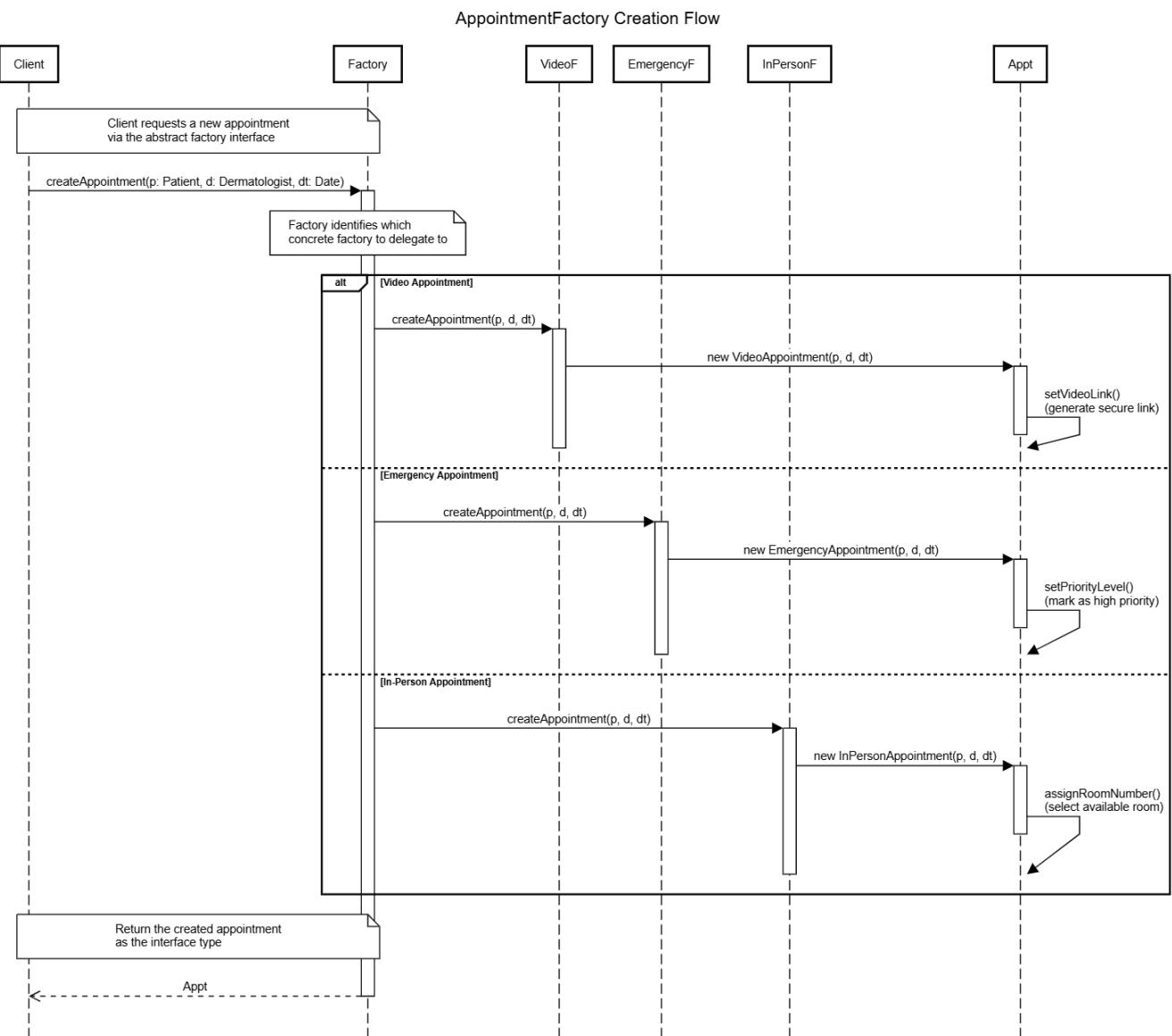
Factory Method - Design Pattern



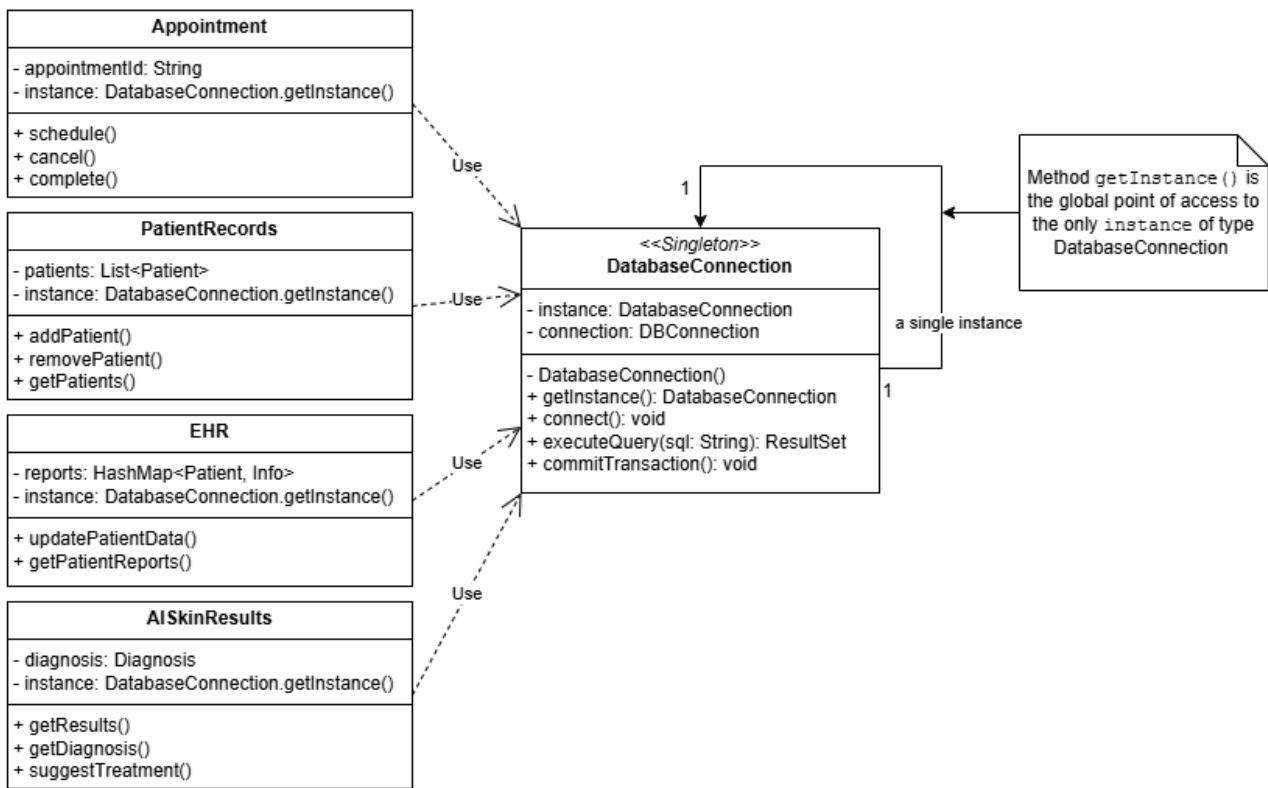
Factory Method - Class Diagram



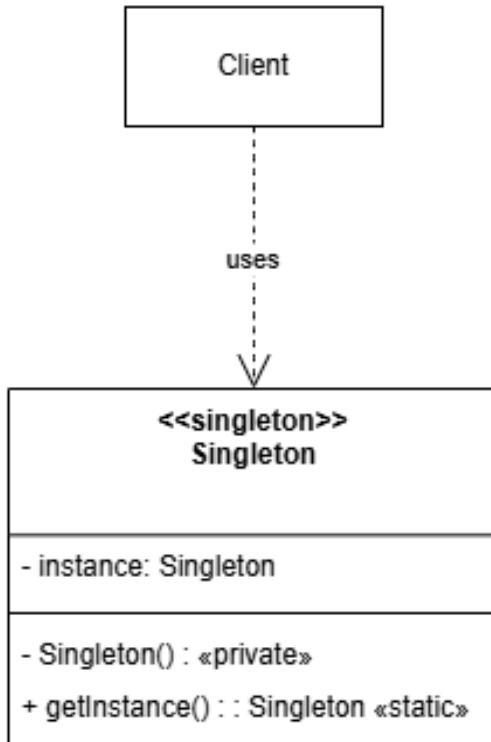
Factory Method - Sequence Diagram

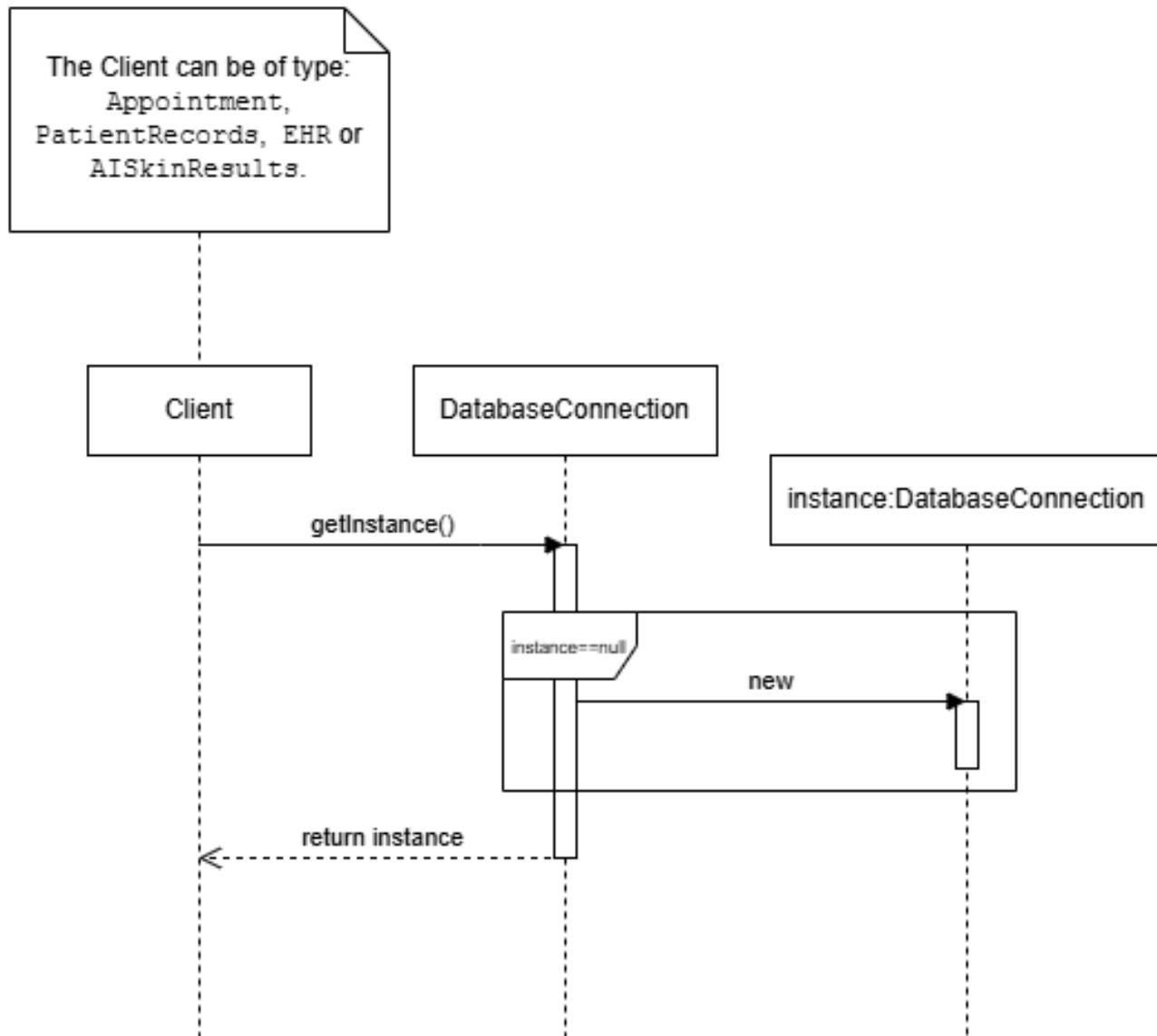


Singleton - Design Pattern



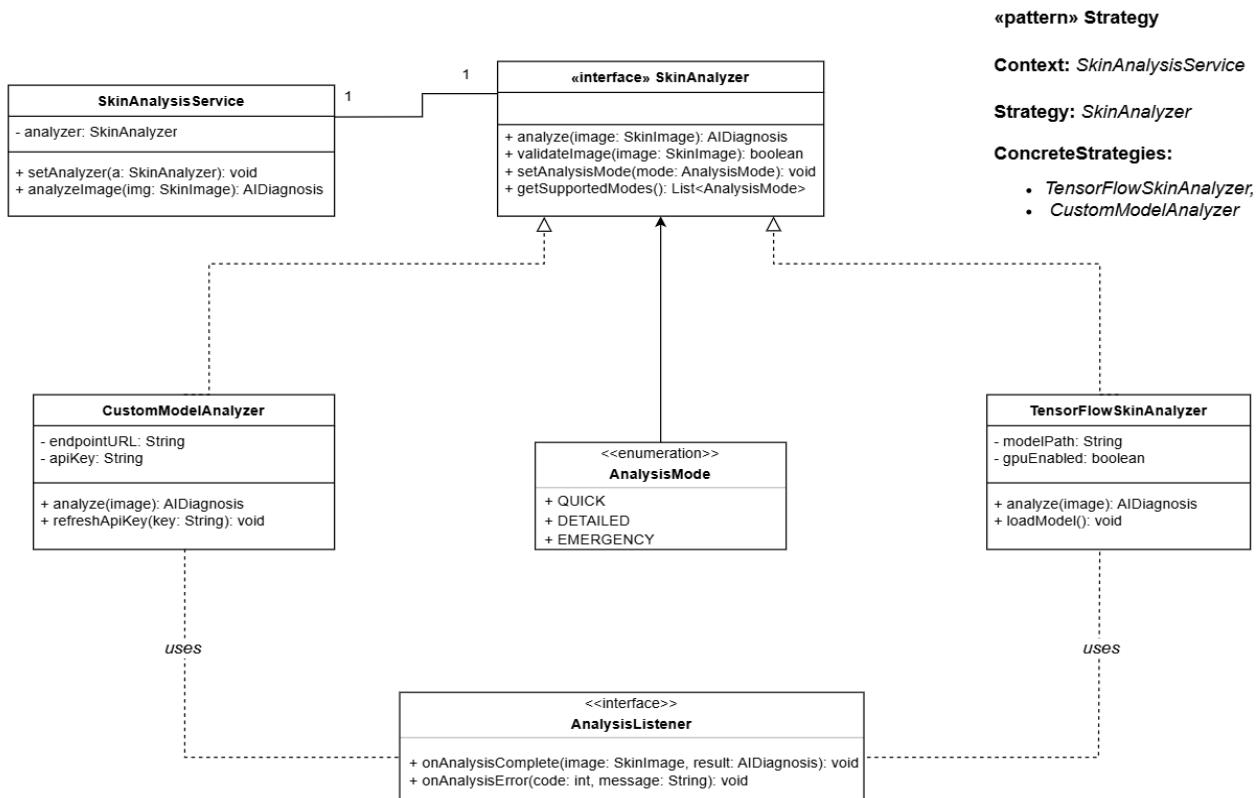
Singleton - Class Diagram



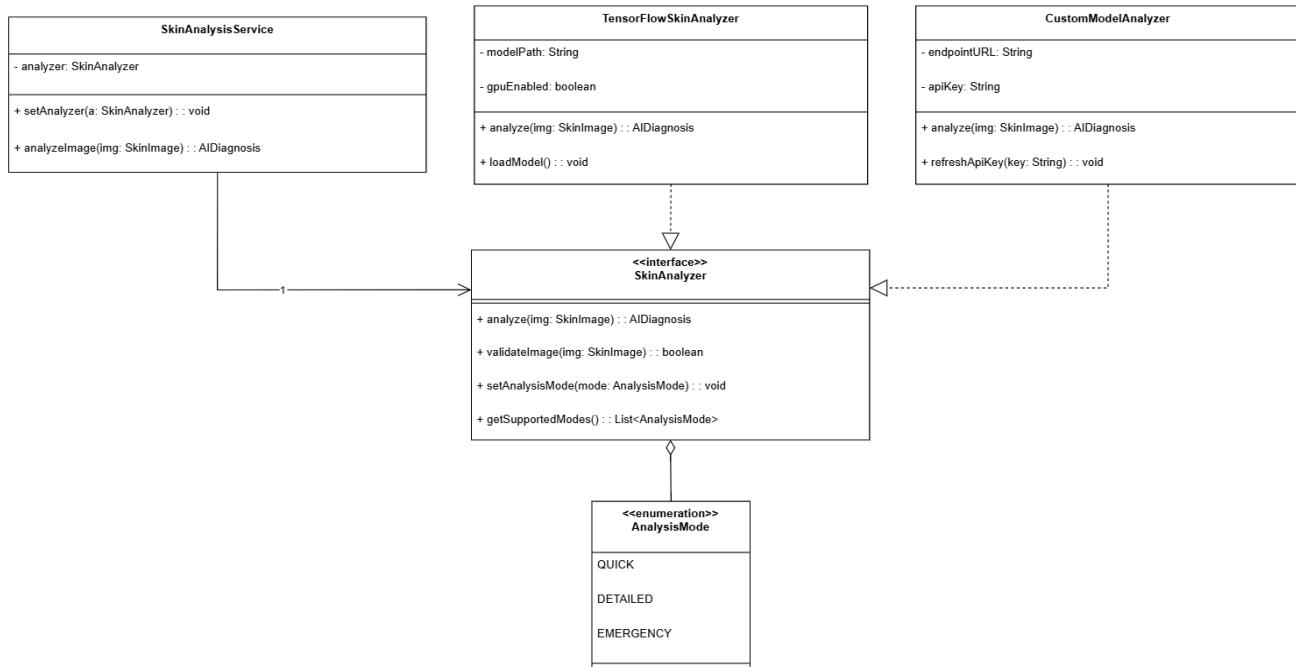
Singleton - Sequence Diagram

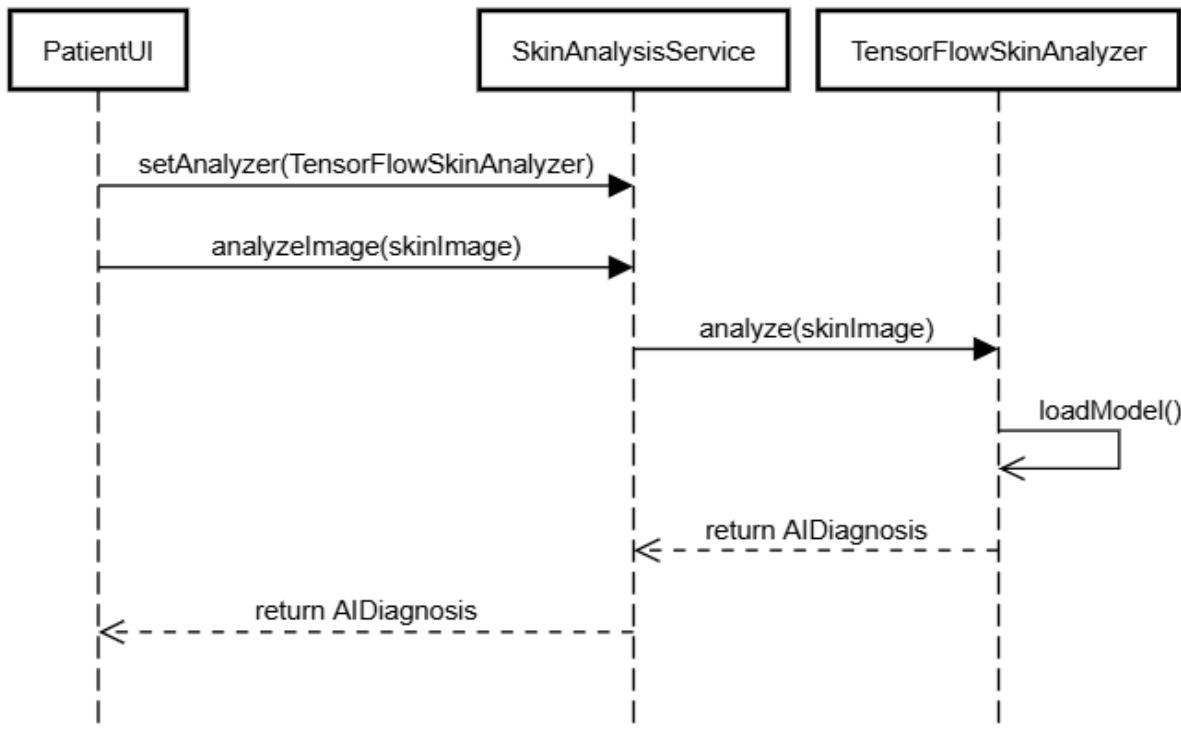
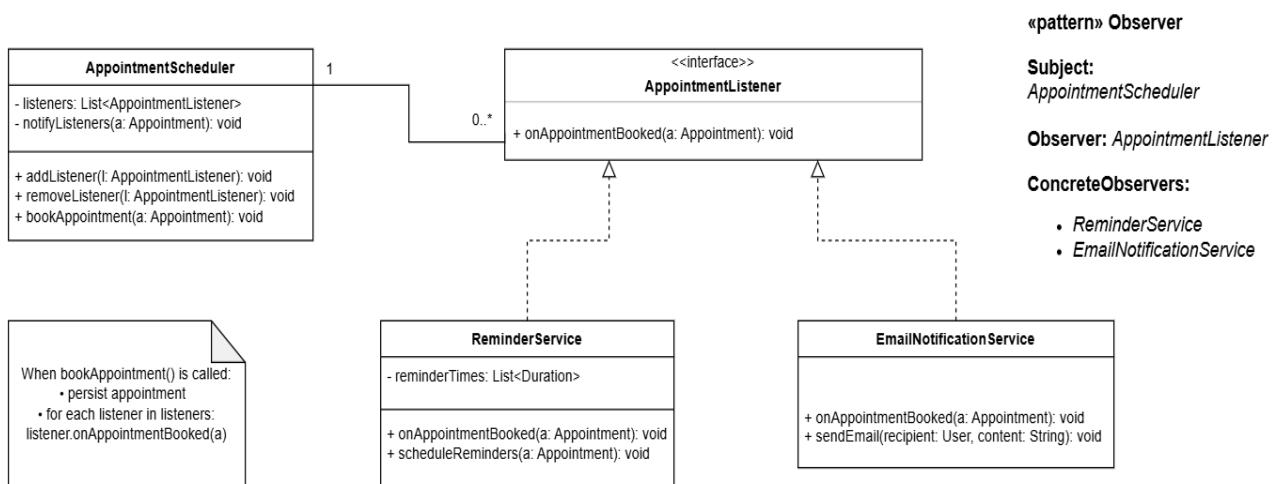
Behavioral Design Patterns

Strategy - Design Pattern

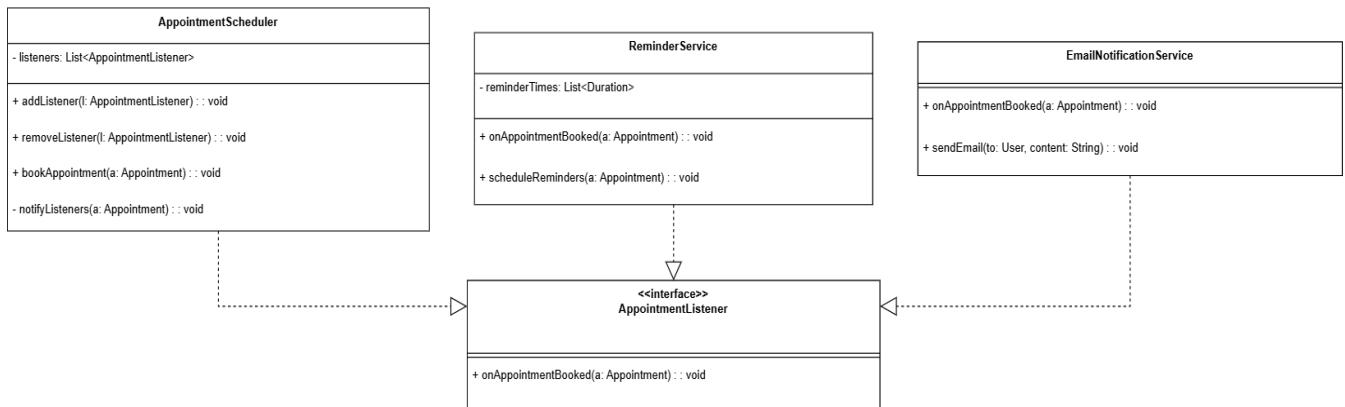


Strategy - Class Diagram

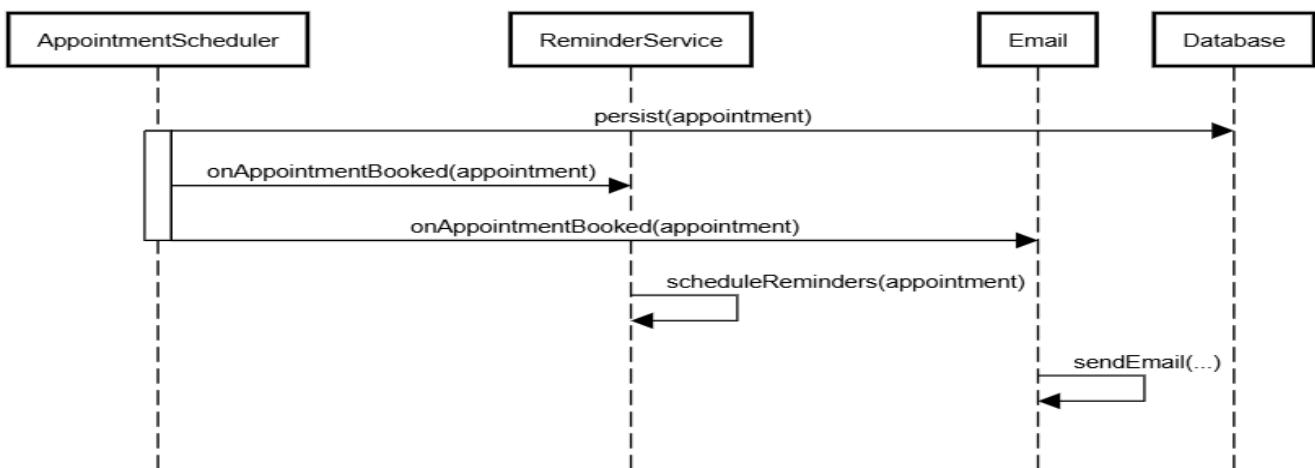


Strategy - Sequence Diagram*Observer - Design Pattern*

Observer - Class Diagram

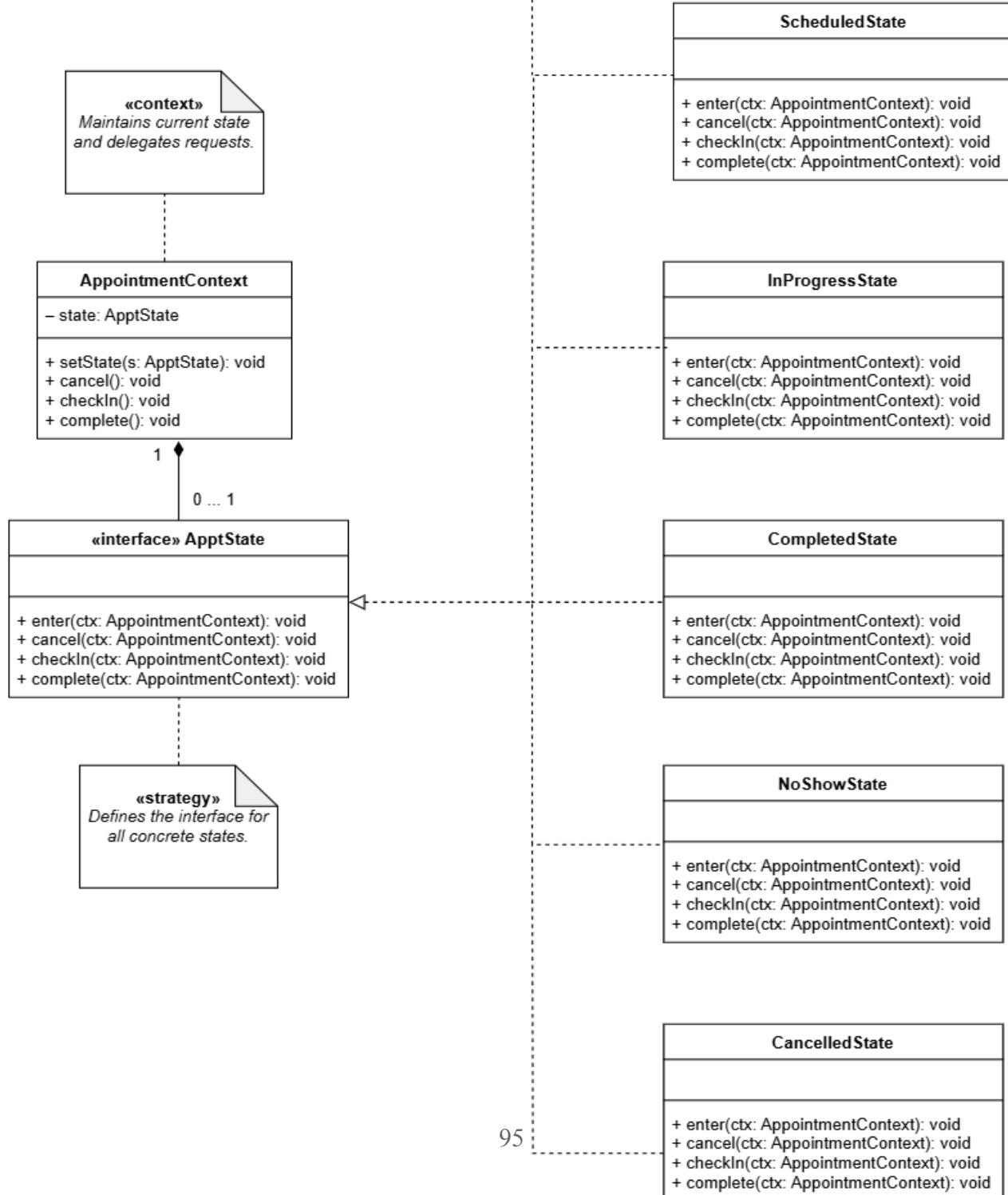


Observer - Sequence Diagram

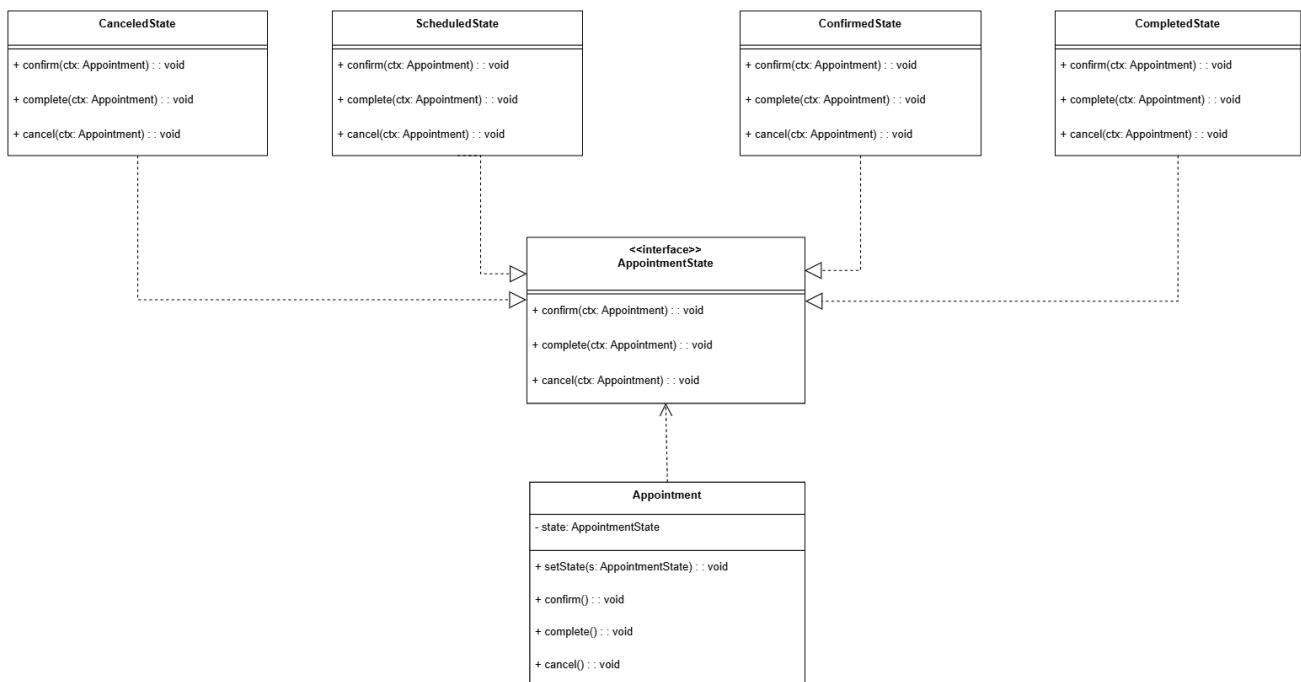


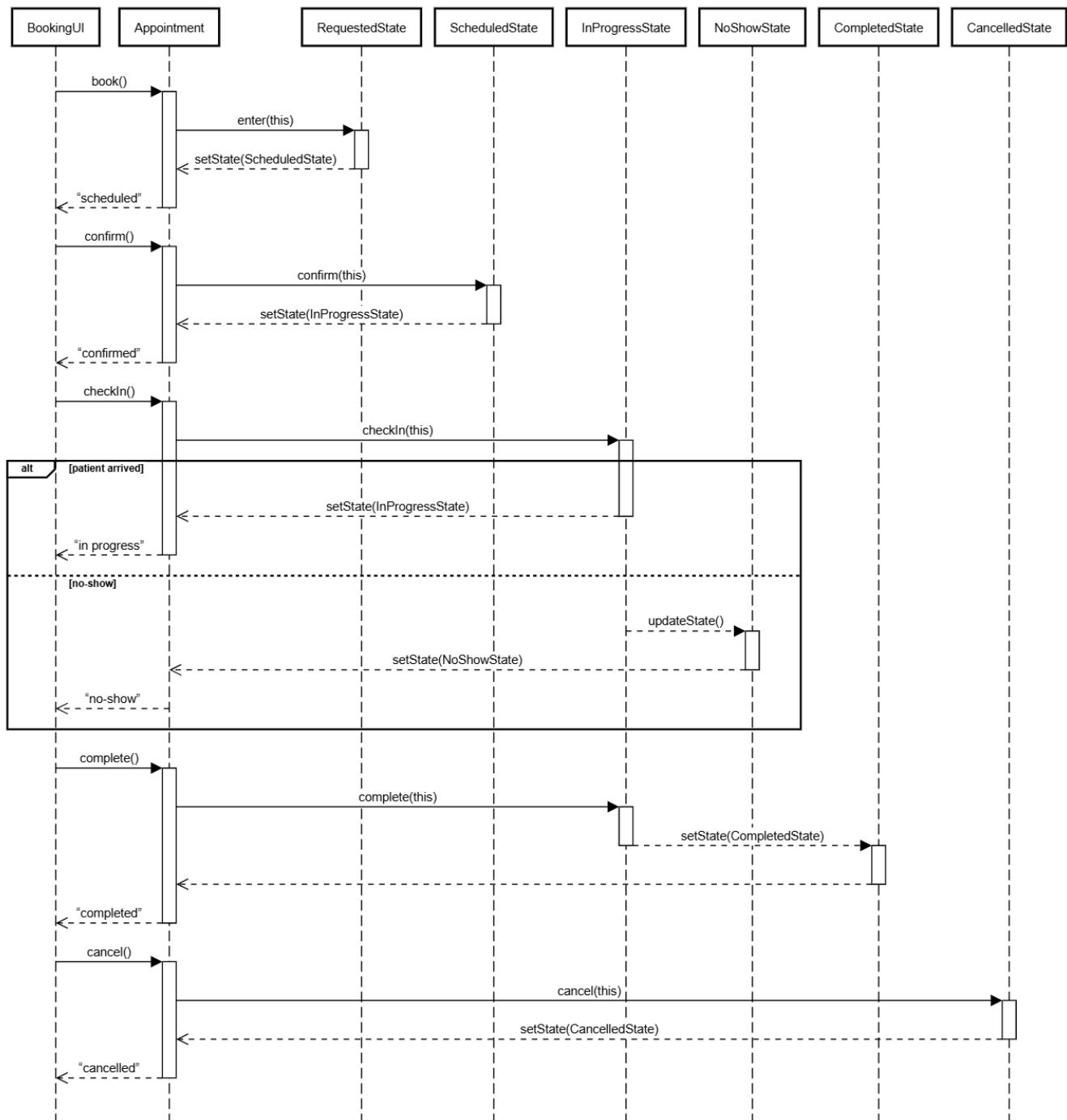
State - Design Pattern

«pattern» State
– Appointment Lifecycle (**Behavioral**)



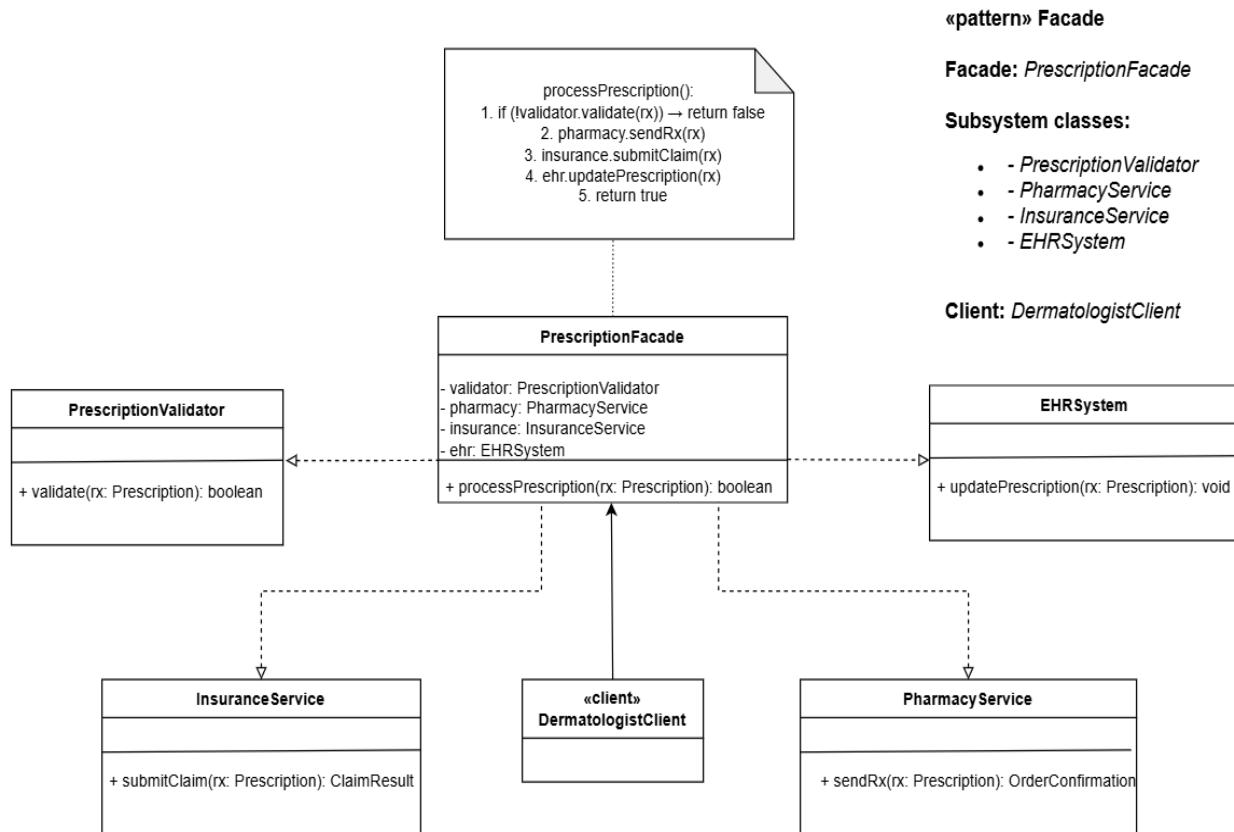
State - Class Diagram



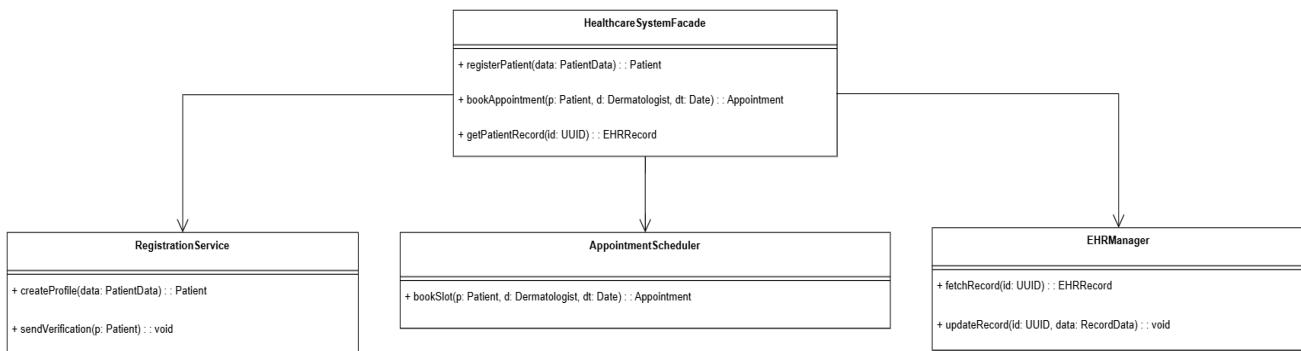
State - Sequence Diagram

Structural Design Patterns

Facade - Design Pattern



Facade - Class Diagram



Façade - Sequence Diagram

