

Requirement & Design Specification HIV Clinic Appointment Booking System

Version: 2.0

January 2025

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1 Introduction

1.1 Purpose

This Requirements Design Specification (RDS) document provides a comprehensive specification for the HIV Clinic Management System. This system is designed to streamline appointment booking, patient management, and HIV treatment monitoring processes for both healthcare providers and patients.

1.2 Scope

The HIV Clinic Management System encompasses:

- User authentication and role-based access control
- Patient and doctor management
- Appointment booking and scheduling
- Medical record management with HIV-specific features
- ARV (Antiretroviral) treatment tracking and monitoring
- Notification and reminder systems
- Administrative dashboards and reporting

1.3 Document Structure

This document follows the template structure and contains:

- Requirements Specifications with use case mappings
- Comprehensive Use Case Specifications for all 27 use cases
- Detailed Design Specifications for all system components
- Technical appendices and supporting documentation

1.4 Stakeholders

- **Patients:** Individuals seeking HIV care and treatment
- **Doctors:** Healthcare providers treating HIV patients
- **Administrators:** System administrators managing clinic operations
- **Managers:** Clinic managers overseeing operations and analytics
- **IT Staff:** Technical personnel maintaining the system

2 Requirements Specifications

2.1 Functional Requirements Overview

The system implements 27 distinct use cases organized by functional areas:

#	Feature	Screen	Description
1	Public Access	Home Page	Browse public HIV information and educational content
2	Authentication	Register Page	User registration for patients and doctors
3	Authentication	Login Page	Secure user authentication with role-based routing
4	Dashboard	Patient Dashboard	Personalized patient interface
5	Profile	Profile Management	Update personal profile information
6	Security	Password Management	Change user passwords securely
7	Dashboard	Dashboard View	Role-based dashboard access
8	Appointments	Appointment Management	Book, view, and cancel appointments
9	Medical Records	Personal Records	Manage personal medical records
10	Notifications	Notification Center	View system notifications
11	Authentication	Logout	Secure session termination
12	Dashboard	Doctor Dashboard	Professional doctor interface
13	Appointments	Doctor Appointments	Manage doctor-side appointments
14	Scheduling	Availability Slots	Manage doctor availability
15	Medical Records	Patient Records Access	Access patient medical records
16	Treatment	ARV Management	Manage HIV antiretroviral treatments
17	Communications	Patient Notifications	Send notifications to patients
18	Dashboard	Admin Dashboard	Administrative system overview
19	User Management	User Administration	Manage system users
20	Monitoring	Appointment Oversight	View all system appointments
21	Content Management	Blog Management	Manage educational blog content
22	Dashboard	Manager Dashboard	Operational management interface
23	Administration	Patient Records Admin	Administrative patient record management
24	Administration	Doctor Records Admin	Administrative doctor record management
25	Analytics	System Analytics	Comprehensive system analytics
26	Reporting	Data Export	Export system data for analysis
27	Analytics	Clinic Statistics	View clinic operational statistics

2.2 Use Case Diagram

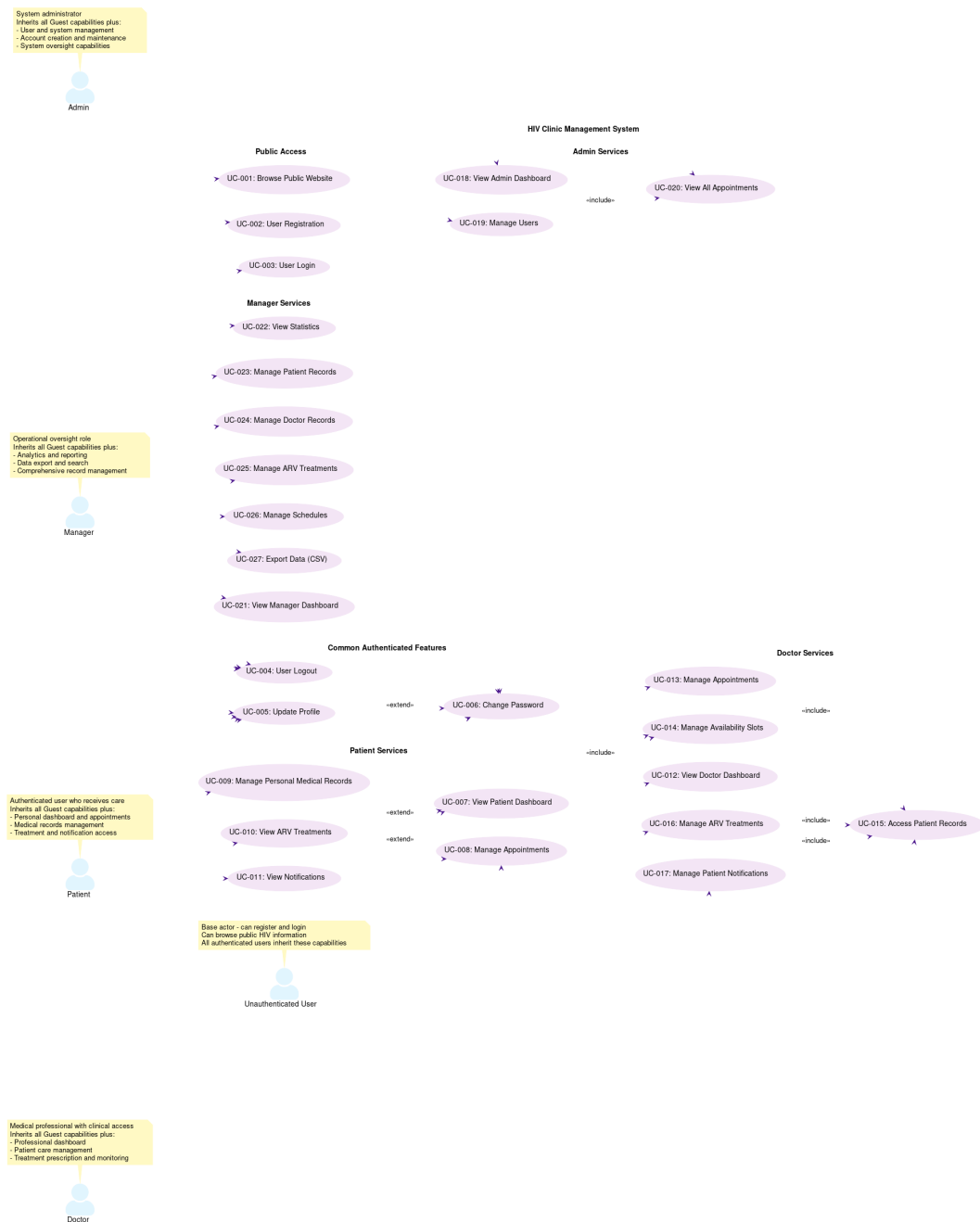


Figure 1: HIV Clinic Management System Use Case Diagram

The use case diagram shows the complete system with 27 use cases, two primary actors (Unauthenticated User and Authenticated User), and proper UML relationships including associations, generalizations, includes, and extends.

2.3 User Interface Flow

Figure 2: Overall Screen Flow

The interface flow demonstrates role-based navigation from public access through authentication to specialized dashboards for different user types.

3 Use Case Specifications

3.1 UC-001 – Browse Public Website

UC ID and Name:	UC-001 – Browse Public Website
Created By:	System Analyst
Date Created:	January 2025
Primary Actor:	Unauthenticated User
Secondary Actors:	None
Description:	Users can view HIV information, educational content, and blog posts without requiring authentication
Trigger:	User accesses the website homepage or navigation menu
Preconditions:	<ul style="list-style-type: none">• The system is online and accessible• Public content is available in the system
Postconditions:	<ul style="list-style-type: none">• Public HIV information and content is displayed• User can navigate through available public pages
Normal Flow:	<ol style="list-style-type: none">1. User opens the website2. System displays homepage with HIV clinic information3. User navigates through public content sections4. User can read educational content and blog posts
Alternative Flows:	AF-1: User accesses specific public pages directly via URL
Exceptions:	<ul style="list-style-type: none">• EX-1: If public content is unavailable, system displays maintenance message
Business Rules:	<ul style="list-style-type: none">• BR-001: Public content must be accessible without authentication• BR-002: HIV educational content must be medically accurate
Priority:	High

Frequency of Use:	High
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3.2 UC-002 – User Registration

UC ID and Name:	UC-002 – User Registration
Created By:	System Analyst
Date Created:	January 2025
Primary Actor:	Unauthenticated User
Secondary Actors:	System
Description:	New users (patients and doctors) can create accounts with role-based access to the HIV clinic system
Trigger:	User clicks "Register" from homepage or login page
Preconditions:	<ul style="list-style-type: none">• User is not currently logged in• Registration system is operational
Postconditions:	<ul style="list-style-type: none">• New user account is created in the system• User receives confirmation notification• User can login with new credentials
Normal Flow:	<ol style="list-style-type: none">1. User accesses registration form2. User provides required information (name, email, phone, role)3. User creates username and password4. System validates input data5. System creates new user account6. System sends confirmation notification
Alternative Flows:	AF-1: Email already exists → System shows error and suggests login AF-2: Invalid data format → System highlights errors for correction

Exceptions:	<ul style="list-style-type: none">• EX-1: System error during registration → Show error message and retry option
Business Rules:	<ul style="list-style-type: none">• BR-003: Email addresses must be unique in the system• BR-004: Passwords must meet security requirements• BR-005: Doctor registrations require additional verification
Priority:	High
Frequency of Use:	Medium

3.3 UC-003 – User Login

UC ID and Name:	UC-003 – User Login
Created By:	System Analyst
Date Created:	January 2025
Primary Actor:	Unauthenticated User
Secondary Actors:	System
Description:	Existing users authenticate using username/password with JWT token-based security
Trigger:	User accesses login page and submits credentials
Preconditions:	<ul style="list-style-type: none">• A registered account exists• The user is not currently logged in• Authentication system is operational
Postconditions:	<ul style="list-style-type: none">• The user is authenticated• The user is redirected to their personal dashboard• Login activity is logged for security

Normal Flow:	<ol style="list-style-type: none"> 1. User enters username/email and password 2. The system validates the credentials 3. System generates JWT token 4. User is redirected to appropriate dashboard based on role 5. System logs successful login
Alternative Flows: AF-2: Account disabled → System shows account status message	AF-1: Invalid credentials → System shows error message
Exceptions:	<ul style="list-style-type: none"> • EX-1: Multiple failed attempts → Account temporarily locked • EX-2: System authentication error → Show retry option
Business Rules:	<ul style="list-style-type: none"> • BR-006: Maximum 3 failed login attempts before temporary account lockout • BR-007: Session timeout after 2 hours of inactivity • BR-008: All login attempts must be logged for security audit
Priority:	High
Frequency of Use:	High

3.4 UC-004 – View Patient Dashboard

UC ID and Name:	UC-004 – View Patient Dashboard
Created By:	System Analyst
Date Created:	January 2025
Primary Actor:	Authenticated User (Patient)
Secondary Actors:	System

Description:	Patients access their personalized dashboard showing appointments, medical records, notifications, and treatment information
Trigger:	Patient successfully logs in or navigates to dashboard
Preconditions:	<ul style="list-style-type: none"> • Patient is authenticated and logged in • Patient has appropriate access permissions
Postconditions:	<ul style="list-style-type: none"> • Dashboard displays current patient information • Quick access to key patient functions is available • Recent activity and notifications are shown
Normal Flow:	<ol style="list-style-type: none"> 1. System verifies patient authentication 2. System retrieves patient-specific data 3. Dashboard displays upcoming appointments 4. Dashboard shows recent medical activity 5. Patient can access primary functions (appointments, records, notifications)
Alternative Flows: AF-2: No recent activity → Dashboard shows guidance for getting started	AF-1: First-time login → System shows welcome tour
Exceptions:	<ul style="list-style-type: none"> • EX-1: Data loading error → Show error message with refresh option • EX-2: Session expired → Redirect to login page
Business Rules:	<ul style="list-style-type: none"> • BR-009: Patients can only view their own information • BR-010: Recent activity is limited to last 30 days
Priority:	High
Frequency of Use:	High

3.5 UC-005 – Update Profile

UC ID and Name:	UC-005 – Update Profile
Created By:	System Analyst
Date Created:	January 2025
Primary Actor:	Authenticated User
Secondary Actors:	System
Description:	Users can update their personal profile information including contact details and preferences
Trigger:	User navigates to profile settings and initiates update
Preconditions:	<ul style="list-style-type: none">• User is authenticated and logged in• Profile data exists in the system
Postconditions:	<ul style="list-style-type: none">• Profile information is updated in the system• User receives confirmation of successful update• Updated information is reflected across the system
Normal Flow:	<ol style="list-style-type: none">1. User accesses profile settings2. System displays current profile information3. User modifies editable fields4. User submits updated information5. System validates and saves changes6. System confirms successful update
Alternative Flows: AF-2: No changes made → System displays "no changes detected" message	AF-1: Invalid data → System highlights errors for correction

Exceptions:	<ul style="list-style-type: none">• EX-1: Email already in use → Show error and suggest alternatives• EX-2: Database error → Show error message and retry option
Business Rules:	<ul style="list-style-type: none">• BR-011: Email addresses must remain unique• BR-012: Certain fields (role, user ID) cannot be modified by users• BR-013: Phone numbers must follow valid format
Priority:	Medium
Frequency of Use:	Low

3.6 UC-006 – Change Password

UC ID and Name:	UC-006 – Change Password
Created By:	System Analyst
Date Created:	January 2025
Primary Actor:	Authenticated User
Secondary Actors:	System
Description:	Users can change their account password for security purposes
Trigger:	User accesses password change functionality
Preconditions:	<ul style="list-style-type: none">• User is authenticated and logged in• User knows current password
Postconditions:	<ul style="list-style-type: none">• Password is updated in the system• User receives confirmation of password change• Password change is logged for security audit

Normal Flow:	<ol style="list-style-type: none"> 1. User accesses password change form 2. User enters current password 3. User enters new password twice for confirmation 4. System validates current password 5. System validates new password meets requirements 6. System updates password and logs activity
Alternative Flows: AF-2: New passwords don't match → Highlight mismatch error	AF-1: Current password incorrect → Show error message
Exceptions:	<ul style="list-style-type: none"> • EX-1: New password doesn't meet requirements → Show specific requirements • EX-2: System error → Show error message and retry option
Business Rules:	<ul style="list-style-type: none"> • BR-014: New password must meet security requirements • BR-015: Cannot reuse last 3 passwords • BR-016: Password changes must be logged for security
Priority:	High
Frequency of Use:	Low

3.7 UC-007 – View Dashboard

UC ID and Name:	UC-007 – View Dashboard
Created By:	System Analyst
Date Created:	January 2025
Primary Actor:	Authenticated User
Secondary Actors:	System

Description:	Users access role-appropriate dashboards with personalized information and quick access to key functions
Trigger:	User navigates to dashboard after login or from navigation menu
Preconditions:	<ul style="list-style-type: none"> • User is authenticated and logged in • User has appropriate role permissions
Postconditions:	<ul style="list-style-type: none"> • Role-appropriate dashboard is displayed • User can access relevant system functions • Recent activity and notifications are shown
Normal Flow:	<ol style="list-style-type: none"> 1. System determines user role 2. System loads role-specific dashboard layout 3. Dashboard displays relevant widgets and information 4. User can interact with dashboard elements 5. User can navigate to detailed functions
Alternative Flows: AF-2: Dashboard customization → User can modify widget preferences	AF-1: Multiple roles → System shows role selector
Exceptions:	<ul style="list-style-type: none"> • EX-1: Data loading error → Show error message with refresh option • EX-2: Permission denied → Redirect to appropriate page
Business Rules:	<ul style="list-style-type: none"> • BR-017: Dashboard content must match user role permissions • BR-018: Sensitive information requires additional verification
Priority:	High

Frequency of Use:	High
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3.8 UC-008 – Manage Appointments

UC ID and Name:	UC-008 – Manage Appointments
Created By:	System Analyst
Date Created:	January 2025
Primary Actor:	Patient
Secondary Actors:	System, Doctor
Description:	Patients can book, view, and cancel appointments with available doctors
Trigger:	Patient accesses appointment management section
Preconditions:	<ul style="list-style-type: none">• Patient is logged in to the system• At least one doctor has available appointment slots
Postconditions:	<ul style="list-style-type: none">• Appointment is successfully booked, viewed, or cancelled• Doctor and patient receive appropriate notifications• Appointment status is updated in the system

Normal Flow:	Booking: <ol style="list-style-type: none">1. Patient selects doctor from available list2. Patient chooses available date and time slot3. Patient provides appointment notes (optional)4. System creates appointment and updates availability5. System sends confirmation to patient and doctor Viewing: <ol style="list-style-type: none">1. Patient accesses appointment list2. System displays past, current, and future appointments3. Patient can view appointment details Cancelling: <ol style="list-style-type: none">1. Patient selects appointment to cancel2. Patient provides cancellation reason3. System cancels appointment and frees time slot4. System notifies doctor of cancellation
Alternative Flows: AF-2: Appointment within 24 hours → Requires confirmation	AF-1: No available slots → System suggests alternative dates
Exceptions:	<ul style="list-style-type: none">• EX-1: Slot becomes unavailable during booking → Show updated availability• EX-2: System error during booking → Rollback changes and show error

Business Rules:	<ul style="list-style-type: none">• BR-019: Patients cannot book overlapping appointments• BR-020: Cancellations within 24 hours may incur penalties• BR-021: Maximum 3 future appointments per patient
Priority:	Critical
Frequency of Use:	High

3.9 UC-009 – Manage Personal Medical Records

UC ID and Name:	UC-009 – Manage Personal Medical Records
Created By:	System Analyst
Date Created:	January 2025
Primary Actor:	Patient
Secondary Actors:	System
Description:	Patients can view and update their personal medical records, including HIV treatment history and current medications
Trigger:	Patient accesses medical records section from dashboard
Preconditions:	<ul style="list-style-type: none">• Patient is authenticated and logged in• Patient medical record exists in the system
Postconditions:	<ul style="list-style-type: none">• Medical record information is displayed to patient• Access is logged for audit purposes• Patient can proceed with treatment planning

Normal Flow:	<ol style="list-style-type: none"> 1. Patient accesses medical records 2. System displays current medical information 3. Patient can view treatment history and current medications 4. Patient can update emergency contact information 5. Patient can add notes about symptoms or concerns 6. System saves any updates made by patient
Alternative Flows: AF-2: Read-only view → Patient can only view, not edit certain fields	AF-1: No medical record exists → System guides patient to create basic record
Exceptions:	<ul style="list-style-type: none"> • EX-1: Permission denied → Show message about restricted access • EX-2: Data integrity error → Prevent save and show error message
Business Rules:	<ul style="list-style-type: none"> • BR-022: Patients can only view their own medical records • BR-023: Medical diagnoses can only be updated by doctors • BR-024: Emergency contact information can be updated by patients
Priority:	High
Frequency of Use:	Medium

3.10 UC-010 – View Notifications

UC ID and Name:	UC-010 – View Notifications
Created By:	System Analyst
Date Created:	January 2025
Primary Actor:	Authenticated User

Secondary Actors:	System
Description:	Users can view system notifications including appointment reminders, treatment alerts, and system messages
Trigger:	User accesses notification center or receives notification alert
Preconditions:	<ul style="list-style-type: none">• User is authenticated and logged in• Notification system is operational
Postconditions:	<ul style="list-style-type: none">• Notifications are displayed to user• Read status is updated for viewed notifications• User can take action on actionable notifications
Normal Flow:	<ol style="list-style-type: none">1. User accesses notification center2. System retrieves user-specific notifications3. Notifications are displayed in chronological order4. User can read notification details5. User can mark notifications as read/unread6. User can delete or archive old notifications
Alternative Flows: AF-2: Priority notifications → Highlighted with urgent styling	AF-1: No notifications → Display "no new notifications" message
Exceptions:	<ul style="list-style-type: none">• EX-1: Notification loading error → Show error message and retry option• EX-2: Notification action failed → Show specific error message

Business Rules:	<ul style="list-style-type: none">• BR-025: Users can only view their own notifications• BR-026: Critical notifications cannot be deleted• BR-027: Notifications are retained for 90 days
Priority:	Medium
Frequency of Use:	High

3.11 UC-011 – Logout

UC ID and Name:	UC-011 – Logout
Created By:	System Analyst
Date Created:	January 2025
Primary Actor:	Authenticated User
Secondary Actors:	System
Description:	Users can securely terminate their session and log out of the system
Trigger:	User clicks logout button or session timeout occurs
Preconditions:	<ul style="list-style-type: none">• User is currently logged in• User session is active
Postconditions:	<ul style="list-style-type: none">• User session is terminated• User is redirected to public homepage• Logout activity is logged for security

Normal Flow:	<ol style="list-style-type: none"> 1. User initiates logout action 2. System invalidates user session token 3. System clears any cached user data 4. System logs logout activity 5. User is redirected to homepage 6. System displays logout confirmation
Alternative Flows: AF-2: Logout from multiple tabs → Logout applies to all sessions	AF-1: Auto-logout due to inactivity → Show timeout message
Exceptions:	<ul style="list-style-type: none"> • EX-1: Logout error → Force session termination and redirect • EX-2: Concurrent sessions → End all user sessions safely
Business Rules:	<ul style="list-style-type: none"> • BR-028: All logout events must be logged for security audit • BR-029: Session tokens must be invalidated on logout • BR-030: Auto-logout occurs after 2 hours of inactivity
Priority:	High
Frequency of Use:	High

3.12 UC-012 – View Doctor Dashboard

UC ID and Name:	UC-012 – View Doctor Dashboard
Created By:	System Analyst
Date Created:	January 2025
Primary Actor:	Authenticated User (Doctor)
Secondary Actors:	System

Description:	Doctors access their professional dashboard showing patient appointments, medical records, and treatment management tools
Trigger:	Doctor successfully logs in or navigates to dashboard
Preconditions:	<ul style="list-style-type: none"> • Doctor is authenticated and logged in • Doctor has appropriate medical permissions
Postconditions:	<ul style="list-style-type: none"> • Doctor dashboard displays professional tools and information • Quick access to patient management functions is available • Appointment schedule and notifications are shown
Normal Flow:	<ol style="list-style-type: none"> 1. System verifies doctor authentication and permissions 2. System retrieves doctor-specific data and schedule 3. Dashboard displays today's appointments and patient notifications 4. Dashboard shows pending treatment reviews and ARV monitoring 5. Doctor can access patient records and treatment management tools
Alternative Flows: AF-2: Urgent patient alerts → Priority notifications highlighted	AF-1: No appointments today → Dashboard shows availability management
Exceptions:	<ul style="list-style-type: none"> • EX-1: Medical data loading error → Show error with refresh option • EX-2: Permission validation failed → Redirect to access request

Business Rules:	<ul style="list-style-type: none">• BR-031: Doctors can only access assigned patient information• BR-032: Medical license validation required for treatment access
Priority:	High
Frequency of Use:	High

3.13 UC-013 – Manage Doctor Appointments

UC ID and Name:	UC-013 – Manage Doctor Appointments
Created By:	System Analyst
Date Created:	January 2025
Primary Actor:	Doctor
Secondary Actors:	System, Patient
Description:	Doctors can view, confirm, reschedule, and manage their appointments with patients
Trigger:	Doctor accesses appointment management section
Preconditions:	<ul style="list-style-type: none">• Doctor is authenticated and logged in• Doctor has scheduled appointments in the system
Postconditions:	<ul style="list-style-type: none">• Appointment status is updated based on doctor action• Patients receive notifications of any changes• Appointment records are maintained for medical documentation

Normal Flow:	<ol style="list-style-type: none"> 1. Doctor accesses appointment schedule 2. System displays appointments organized by date and time 3. Doctor can view patient details for each appointment 4. Doctor can confirm, reschedule, or cancel appointments 5. Doctor can add pre-appointment notes 6. System notifies patients of any changes
Alternative Flows: AF-2: Appointment rescheduling → System finds alternative time slots	AF-1: Emergency cancellation → System sends urgent notifications
Exceptions:	<ul style="list-style-type: none"> • EX-1: Patient cannot be reached → Log unsuccessful contact attempt • EX-2: Schedule conflict → Highlight conflicts for resolution
Business Rules:	<ul style="list-style-type: none"> • BR-033: Doctors can only manage their own appointments • BR-034: Appointment changes require patient notification • BR-035: Emergency cancellations have priority notification
Priority:	High
Frequency of Use:	High

3.14 UC-014 – Manage Availability Slots

UC ID and Name:	UC-014 – Manage Availability Slots
Created By:	System Analyst

Date Created:	January 2025
Primary Actor:	Doctor
Secondary Actors:	System
Description:	Doctors can create, modify, and manage their availability slots for patient appointments
Trigger:	Doctor accesses availability management from their dashboard
Preconditions:	<ul style="list-style-type: none"> • Doctor is authenticated and logged in • Doctor has appropriate scheduling permissions
Postconditions:	<ul style="list-style-type: none"> • Doctor availability is updated in the system • New slots become available for patient booking • Existing appointments are preserved during changes
Normal Flow:	<ol style="list-style-type: none"> 1. Doctor accesses availability management interface 2. System displays current availability schedule 3. Doctor can add new time slots with date and time 4. Doctor can modify existing unbooked slots 5. Doctor can block unavailable times 6. System updates availability for patient booking
Alternative Flows: AF-2: Emergency blocking → Doctor immediately blocks slots for urgent matters	AF-1: Bulk availability update → Doctor sets recurring weekly schedule
Exceptions:	<ul style="list-style-type: none"> • EX-1: Slot already booked → Prevent modification and show warning • EX-2: Schedule conflict → Highlight conflicts for resolution

Business Rules:	<ul style="list-style-type: none">• BR-036: Cannot modify slots that are already booked• BR-037: Availability must be set at least 24 hours in advance• BR-038: Minimum slot duration is 30 minutes
Priority:	High
Frequency of Use:	Medium

3.15 UC-015 – Access Patient Records

UC ID and Name:	UC-015 – Access Patient Records
Created By:	System Analyst
Date Created:	January 2025
Primary Actor:	Doctor
Secondary Actors:	System
Description:	Doctors can access comprehensive patient medical records for treatment planning and monitoring
Trigger:	Doctor selects patient from appointment list or searches for patient
Preconditions:	<ul style="list-style-type: none">• Doctor is authenticated and logged in• Patient record exists in the system• Doctor has permission to access the specific patient's records
Postconditions:	<ul style="list-style-type: none">• Patient medical information is displayed to doctor• Access is logged for audit purposes• Doctor can proceed with treatment planning

Normal Flow:	<ol style="list-style-type: none"> 1. Doctor searches for or selects patient 2. System verifies doctor's access permissions 3. System displays comprehensive patient medical record 4. Doctor can view medical history, current medications, and test results 5. Doctor can access HIV treatment history and ARV regimens 6. Doctor can view appointment history and treatment notes
Alternative Flows: AF-2: Emergency access → Override normal permissions with justification	AF-1: Multiple patients with same name → System shows disambiguation list
Exceptions:	<ul style="list-style-type: none"> • EX-1: Access denied → Show permission error and contact information • EX-2: Patient record not found → Show search suggestions
Business Rules:	<ul style="list-style-type: none"> • BR-039: All patient record access must be logged • BR-040: Doctors can only access records of their assigned patients • BR-041: Emergency access requires additional documentation
Priority:	Critical
Frequency of Use:	High

3.16 UC-016 – Manage ARV Treatments

UC ID and Name:	UC-016 – Manage ARV Treatments
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Created By:	System Analyst
Date Created:	January 2025
Primary Actor:	Doctor
Secondary Actors:	Patient, System
Description:	Doctors can prescribe and monitor HIV antiretroviral treatments including regimen management and adherence tracking
Trigger:	Doctor accesses ARV treatment management during patient consultation
Preconditions:	<ul style="list-style-type: none">• Doctor is authenticated and has patient access permissions• Patient has an active medical record• Doctor is authorized to prescribe ARV treatments
Postconditions:	<ul style="list-style-type: none">• ARV treatment regimen is prescribed or updated• Patient receives treatment schedule and instructions• Treatment adherence monitoring is activated• Medical record is updated with treatment information
Normal Flow:	<ol style="list-style-type: none">1. Doctor reviews patient's medical history and current condition2. Doctor selects appropriate ARV regimen from available options3. Doctor specifies dosage, frequency, and treatment duration4. Doctor enters treatment goals and monitoring parameters5. System creates treatment plan and schedules reminders6. Doctor provides patient education about the treatment

Alternative Flows: AF-2: Treatment modification needed → Doctor updates existing regimen AF-3: Poor adherence detected → Doctor schedules counseling session	AF-1: Patient has drug allergies → System alerts and suggests alternatives
Exceptions:	<ul style="list-style-type: none"> • EX-1: Drug interaction detected → System blocks prescription and suggests alternatives • EX-2: Patient medical record incomplete → Request additional information
Business Rules:	<ul style="list-style-type: none"> • BR-042: Only licensed doctors can prescribe ARV treatments • BR-043: All ARV prescriptions must be documented and logged • BR-044: Patient consent required for treatment changes • BR-045: Regular adherence monitoring is mandatory
Priority:	Critical
Frequency of Use:	High

3.17 UC-017 – Send Patient Notifications

UC ID and Name:	UC-017 – Send Patient Notifications
Created By:	System Analyst
Date Created:	January 2025
Primary Actor:	Doctor
Secondary Actors:	System, Patient
Description:	Doctors can send notifications to patients regarding appointments, treatment updates, and medical reminders

Trigger:	Doctor initiates notification sending from patient management interface
Preconditions:	<ul style="list-style-type: none"> • Doctor is authenticated and logged in • Patient exists in the system with valid contact information • Doctor has permission to communicate with the patient
Postconditions:	<ul style="list-style-type: none"> • Notification is sent to patient via selected channels • Communication is logged in patient record • Delivery status is tracked by the system
Normal Flow:	<ol style="list-style-type: none"> 1. Doctor selects patient for notification 2. Doctor chooses notification type (appointment, treatment, reminder) 3. Doctor composes message content 4. Doctor selects delivery method (email, SMS, in-app) 5. System validates message and sends notification 6. System logs communication in patient record
Alternative Flows: AF-2: Scheduled notification → Doctor sets future delivery time AF-3: Bulk notifications → Doctor sends to multiple patients	AF-1: Urgent notification → System prioritizes delivery and sends immediately
Exceptions:	<ul style="list-style-type: none"> • EX-1: Delivery failure → System retries and logs failure reason • EX-2: Invalid contact information → Alert doctor to update patient record

Business Rules:	<ul style="list-style-type: none">• BR-046: All patient communications must be logged• BR-047: Urgent medical notifications have delivery priority• BR-048: Patients can opt out of non-critical notifications
Priority:	High
Frequency of Use:	High

3.18 UC-018 – View Admin Dashboard

UC ID and Name:	UC-018 – View Admin Dashboard
Created By:	System Analyst
Date Created:	January 2025
Primary Actor:	Authenticated User (Administrator)
Secondary Actors:	System
Description:	Administrators access comprehensive dashboard for system oversight, user management, and operational monitoring
Trigger:	Administrator successfully logs in or navigates to admin dashboard
Preconditions:	<ul style="list-style-type: none">• Administrator is authenticated and logged in• Administrator has appropriate administrative permissions
Postconditions:	<ul style="list-style-type: none">• Administrative dashboard displays system overview and management tools• Quick access to user management and system monitoring is available• System alerts and notifications are prominently displayed

Normal Flow:	<ol style="list-style-type: none"> 1. System verifies administrator authentication and permissions 2. System retrieves system-wide data and statistics 3. Dashboard displays user activity, appointment metrics, and system health 4. Dashboard shows pending administrative tasks and alerts 5. Administrator can access user management and system configuration tools
Alternative Flows: AF-2: First-time admin login → System shows administrative setup wizard	AF-1: System alerts present → Priority alerts highlighted at top of dashboard
Exceptions:	<ul style="list-style-type: none"> • EX-1: System data loading error → Show error with system status information • EX-2: Permission validation failed → Redirect to access request page
Business Rules:	<ul style="list-style-type: none"> • BR-049: Administrative actions must be logged for audit • BR-050: System alerts require administrator acknowledgment
Priority:	High
Frequency of Use:	Medium

3.19 UC-019 – Manage Users

UC ID and Name:	UC-019 – Manage Users
Created By:	System Analyst
Date Created:	January 2025
Primary Actor:	Administrator

Secondary Actors:	System
Description:	Administrators can create, modify, activate, deactivate, and delete user accounts across all system roles
Trigger:	Administrator accesses user management section
Preconditions:	<ul style="list-style-type: none"> • Administrator is authenticated and logged in • Administrator has user management permissions
Postconditions:	<ul style="list-style-type: none"> • User account is created, modified, or status changed as requested • All user management actions are logged for audit • Affected users receive appropriate notifications
Normal Flow:	<ol style="list-style-type: none"> 1. Administrator accesses user management interface 2. System displays list of all users with filtering options 3. Administrator can search, sort, and filter users 4. Administrator can create new users or modify existing ones 5. Administrator can activate, deactivate, or delete accounts 6. System logs all changes and sends notifications to affected users
Alternative Flows: AF-2: User role change → System validates new role permissions	AF-1: Bulk user operations → Administrator can select multiple users for batch actions
Exceptions:	<ul style="list-style-type: none"> • EX-1: Cannot delete user with active appointments → Show warning and options • EX-2: Email already exists → Prevent duplicate and suggest alternatives

Business Rules:	<ul style="list-style-type: none">• BR-051: All user management actions must be logged• BR-052: Cannot delete users with active medical records• BR-053: Doctor deactivation requires medical hand-over process
Priority:	High
Frequency of Use:	Medium

3.20 UC-020 – View All Appointments

UC ID and Name:	UC-020 – View All Appointments
Created By:	System Analyst
Date Created:	January 2025
Primary Actor:	Administrator
Secondary Actors:	System
Description:	Administrators can view and monitor all appointments across the system for oversight and management
Trigger:	Administrator accesses appointment oversight section
Preconditions:	<ul style="list-style-type: none">• Administrator is authenticated and logged in• Administrator has appointment monitoring permissions
Postconditions:	<ul style="list-style-type: none">• System-wide appointment data is displayed• Administrator can identify patterns and issues• Reports can be generated for management purposes

Normal Flow:	<ol style="list-style-type: none"> 1. Administrator accesses appointment monitoring dashboard 2. System displays all appointments with filtering and sorting options 3. Administrator can filter by date, doctor, patient, or status 4. Administrator can view appointment details and history 5. Administrator can generate reports on appointment metrics 6. Administrator can identify scheduling conflicts or issues
Alternative Flows: AF-2: Export functionality → Administrator can export appointment data	AF-1: Real-time monitoring → Dashboard updates automatically with new appointments
Exceptions:	<ul style="list-style-type: none"> • EX-1: Large dataset loading → Show progress indicator and pagination • EX-2: Data access error → Show error message with refresh option
Business Rules:	<ul style="list-style-type: none"> • BR-054: Appointment viewing access must be logged • BR-055: Patient privacy must be maintained in reports • BR-056: Administrative access includes all appointment data
Priority:	Medium
Frequency of Use:	Medium

3.21 UC-021 – Manage Blog Content

UC ID and Name:	UC-021 – Manage Blog Content
Created By:	System Analyst
Date Created:	January 2025
Primary Actor:	Administrator
Secondary Actors:	System
Description:	Administrators can create, edit, publish, and manage HIV educational blog content for public viewing
Trigger:	Administrator accesses content management section
Preconditions:	<ul style="list-style-type: none"> • Administrator is authenticated and logged in • Administrator has content management permissions
Postconditions:	<ul style="list-style-type: none"> • Blog content is created, updated, or published as requested • Content changes are reflected on public website • Content management actions are logged
Normal Flow:	<ol style="list-style-type: none"> 1. Administrator accesses blog content management interface 2. System displays existing blog posts with status indicators 3. Administrator can create new blog posts with rich text editor 4. Administrator can edit existing posts and update content 5. Administrator can publish, unpublish, or schedule posts 6. System updates public blog section with changes
Alternative Flows:	<p>AF-1: Content scheduling → Administrator sets future publication date</p> <p>AF-2: Content review → Administrator can save drafts for later review</p>

Exceptions:	<ul style="list-style-type: none">• EX-1: Content saving error → Show error and auto-save recent changes• EX-2: Invalid content format → Highlight formatting issues
Business Rules:	<ul style="list-style-type: none">• BR-057: All blog content must be medically accurate• BR-058: Content changes must be logged with timestamp• BR-059: Published content must be approved by authorized personnel
Priority:	Medium
Frequency of Use:	Low

3.22 UC-022 – View Manager Dashboard

UC ID and Name:	UC-022 – View Manager Dashboard
Created By:	System Analyst
Date Created:	January 2025
Primary Actor:	Authenticated User (Manager)
Secondary Actors:	System
Description:	Managers access comprehensive operational dashboard with analytics, reporting, and clinic performance metrics
Trigger:	Manager successfully logs in or navigates to management dashboard
Preconditions:	<ul style="list-style-type: none">• Manager is authenticated and logged in• Manager has appropriate management-level permissions

Postconditions:	<ul style="list-style-type: none"> • Management dashboard displays operational metrics and analytics • Quick access to reporting and data analysis tools is available • Performance indicators and trends are prominently displayed
Normal Flow:	<ol style="list-style-type: none"> 1. System verifies manager authentication and permissions 2. System retrieves clinic-wide operational data and analytics 3. Dashboard displays appointment metrics, patient statistics, and performance indicators 4. Dashboard shows financial summaries and operational efficiency metrics 5. Manager can access detailed reports and data export functions
Alternative Flows: AF-2: Real-time updates → Dashboard refreshes automatically with latest data	AF-1: Custom dashboard → Manager can customize widget layout and metrics
Exceptions:	<ul style="list-style-type: none"> • EX-1: Analytics data loading error → Show error with data source status • EX-2: Report generation failure → Show error and suggest alternative timeframe
Business Rules:	<ul style="list-style-type: none"> • BR-060: Management data access must be logged • BR-061: Patient data in reports must be anonymized • BR-062: Financial data requires additional security verification
Priority:	High

Frequency of Use:	Medium
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3.23 UC-023 – Manage Patient Records (Admin)

UC ID and Name:	UC-023 – Manage Patient Records (Admin)
Created By:	System Analyst
Date Created:	January 2025
Primary Actor:	Administrator
Secondary Actors:	System
Description:	Administrators can perform comprehensive patient record management including creation, modification, archival, and data integrity operations
Trigger:	Administrator accesses patient record management section
Preconditions:	<ul style="list-style-type: none">• Administrator is authenticated and logged in• Administrator has patient record management permissions
Postconditions:	<ul style="list-style-type: none">• Patient records are created, modified, or archived as requested• All administrative actions on records are logged• Data integrity and consistency are maintained

Normal Flow:	<ol style="list-style-type: none"> 1. Administrator accesses patient record management interface 2. System displays patient list with search and filter capabilities 3. Administrator can create new patient records or modify existing ones 4. Administrator can manage record permissions and access levels 5. Administrator can archive inactive records or merge duplicate entries 6. System validates changes and maintains audit trail
Alternative Flows: AF-2: Record restoration → Administrator can restore archived records	AF-1: Bulk record operations → Administrator can perform batch updates
Exceptions:	<ul style="list-style-type: none"> • EX-1: Data integrity violation → Prevent action and show specific error • EX-2: Record in use by active appointment → Warn and require confirmation
Business Rules:	<ul style="list-style-type: none"> • BR-063: All patient record changes must be logged with administrator ID • BR-064: Archived records must be retained for minimum 7 years • BR-065: Record merging requires approval workflow
Priority:	High
Frequency of Use:	Low

3.24 UC-024 – Manage Doctor Records (Admin)

UC ID and Name:	UC-024 – Manage Doctor Records (Admin)
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Created By:	System Analyst
Date Created:	January 2025
Primary Actor:	Administrator
Secondary Actors:	System
Description:	Administrators can manage doctor profiles, credentials, specializations, and professional information
Trigger:	Administrator accesses doctor management section
Preconditions:	<ul style="list-style-type: none"> • Administrator is authenticated and logged in • Administrator has doctor management permissions
Postconditions:	<ul style="list-style-type: none"> • Doctor records are created, updated, or modified as requested • Professional credentials and certifications are validated • Doctor availability and scheduling permissions are updated
Normal Flow:	<ol style="list-style-type: none"> 1. Administrator accesses doctor management interface 2. System displays doctor list with professional details 3. Administrator can create new doctor profiles or update existing ones 4. Administrator can manage specializations, credentials, and certifications 5. Administrator can set scheduling permissions and availability defaults 6. System validates professional credentials and updates doctor status
Alternative Flows: AF-2: Doctor onboarding → Administrator guides new doctor through setup process	AF-1: Credential verification → System validates license numbers with external databases

Exceptions:	<ul style="list-style-type: none"> • EX-1: Invalid credentials → Prevent activation and require valid documentation • EX-2: Doctor has active patients → Require patient transfer before deactivation
Business Rules:	<ul style="list-style-type: none"> • BR-066: Doctor credentials must be verified before activation • BR-067: Deactivated doctors require patient hand-over process • BR-068: Professional license expiration triggers alerts
Priority:	High
Frequency of Use:	Low

3.25 UC-025 – View System Analytics

UC ID and Name:	UC-025 – View System Analytics
Created By:	System Analyst
Date Created:	January 2025
Primary Actor:	Manager
Secondary Actors:	System
Description:	Managers can access comprehensive system analytics including usage patterns, performance metrics, and operational insights
Trigger:	Manager accesses analytics section from management dashboard
Preconditions:	<ul style="list-style-type: none"> • Manager is authenticated and logged in • Manager has analytics access permissions • Sufficient historical data exists for meaningful analysis

Postconditions:	<ul style="list-style-type: none"> • Comprehensive analytics reports are displayed • Insights and trends are highlighted for decision making • Data can be exported for further analysis
Normal Flow:	<ol style="list-style-type: none"> 1. Manager accesses system analytics interface 2. System generates comprehensive analytics dashboard 3. Manager can select different timeframes and metrics 4. Analytics display user activity, appointment trends, and system performance 5. Manager can drill down into specific metrics for detailed analysis 6. Manager can export reports and data for offline analysis
Alternative Flows: AF-2: Scheduled reporting → Manager can set up automated report generation	AF-1: Custom analytics → Manager can create custom reports with specific parameters
Exceptions:	<ul style="list-style-type: none"> • EX-1: Insufficient data for analysis → Show message and suggest longer timeframe • EX-2: Analytics processing error → Show error and suggest retry or alternative metrics
Business Rules:	<ul style="list-style-type: none"> • BR-069: Analytics data must be anonymized to protect patient privacy • BR-070: Analytics access must be logged for audit purposes • BR-071: Financial analytics require additional security verification
Priority:	Medium

Frequency of Use:	Medium
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3.26 UC-026 – Export Data

UC ID and Name:	UC-026 – Export Data
Created By:	System Analyst
Date Created:	January 2025
Primary Actor:	Manager
Secondary Actors:	System
Description:	Managers can export system data in various formats for reporting, analysis, and compliance purposes
Trigger:	Manager initiates data export from analytics or reporting section
Preconditions:	<ul style="list-style-type: none">• Manager is authenticated and logged in• Manager has data export permissions• System data is available for export
Postconditions:	<ul style="list-style-type: none">• Data is exported in requested format• Export activity is logged for audit purposes• Manager receives download link or file
Normal Flow:	<ol style="list-style-type: none">1. Manager accesses data export functionality2. Manager selects data type and date range for export3. Manager chooses export format (CSV, Excel, PDF, JSON)4. Manager specifies data filtering and privacy options5. System processes export request and generates file6. System provides download link or sends file to manager
Alternative Flows:	AF-1: Large dataset → System processes export in background and notifies when complete

AF-2: Scheduled exports → Manager can set up recurring data exports	
Exceptions:	<ul style="list-style-type: none"> • EX-1: Export processing error → Show error message and suggest retry or smaller dataset • EX-2: File size too large → Offer to split export into multiple files
Business Rules:	<ul style="list-style-type: none"> • BR-072: All data exports must be logged with user ID and timestamp • BR-073: Patient data exports must be anonymized unless specifically authorized • BR-074: Export files must be encrypted for sensitive data
Priority:	Medium
Frequency of Use:	Low

3.27 UC-027 – View Clinic Statistics

UC ID and Name:	UC-027 – View Clinic Statistics
Created By:	System Analyst
Date Created:	January 2025
Primary Actor:	Manager
Secondary Actors:	System
Description:	Managers can view comprehensive clinic operational statistics including patient demographics, appointment metrics, and treatment outcomes
Trigger:	Manager accesses clinic statistics from management dashboard
Preconditions:	<ul style="list-style-type: none"> • Manager is authenticated and logged in • Manager has statistics viewing permissions • Clinic operational data is available

Postconditions:	<ul style="list-style-type: none"> • Clinic statistics are displayed with visualizations • Key performance indicators are highlighted • Statistical reports can be generated for management review
Normal Flow:	<ol style="list-style-type: none"> 1. Manager accesses clinic statistics interface 2. System displays overview of clinic operations and key metrics 3. Manager can view patient demographics and appointment statistics 4. Manager can analyze treatment outcomes and success rates 5. Manager can compare current performance with historical data 6. Manager can generate detailed statistical reports
Alternative Flows: AF-2: Trend analysis → Manager can view long-term trends and patterns	AF-1: Comparative analysis → Manager can compare statistics across different time periods
Exceptions:	<ul style="list-style-type: none"> • EX-1: Insufficient data for statistics → Show message and suggest data collection improvement • EX-2: Statistical calculation error → Show error and suggest refresh or alternative metrics
Business Rules:	<ul style="list-style-type: none"> • BR-075: All statistical data must maintain patient anonymity • BR-076: Statistics viewing must be logged for audit purposes • BR-077: Historical comparisons require minimum 3 months of data
Priority:	Medium

Frequency of Use:	Medium
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4 Design Specifications

4.1 Authentication System

4.1.1 User Login (UC-003)

This screen allows users to authenticate into the system with role-based access to appropriate functionalities.

UI Design

Field Name	Field Type	Description
Username*	Text Box	User enters registered username or email address for authentication
Password*	Password Box	User enters password (masked input for security)
Login	Button	Submits authentication request to server
Register	Hyperlink	Redirects to user registration page for new users
Forgot Password?	Hyperlink	Contact admin for password reset (no self-service)

Database Access

Table	CRUD	Description
Users	R	Verify username/email and password hash for authentication
Roles	R	Retrieve user role information for authorization
LoginActivity	C	Log login attempt for security audit

— 1. *Authenticate user credentials*

```
SELECT u.UserID, u.Username, u.Email, u.IsActive, r.RoleName
FROM Users u
INNER JOIN Roles r ON u.RoleID = r.RoleID
WHERE (u.Username = ? OR u.Email = ?) AND u.IsActive = 1
```

— 2. *Log login activity*

```
INSERT INTO LoginActivity
(UserID, UsernameAttempted, AttemptTime, IsSuccess, IPAddress, UserAgent)
VALUES (?, ?, GETDATE(), ?, ?, ?)
```

4.1.2 User Registration (UC-002)

This screen enables new users to create accounts with role-based access.

UI Design

Field Name	Field Type	Description
First Name*	Text Box	User's first name
Last Name*	Text Box	User's last name
Email*	Email Box	Valid email address for account and notifications
Phone Number*	Text Box	Contact phone number
Username*	Text Box	Unique username for login
Password*	Password Box	Secure password meeting requirements
Confirm Password*	Password Box	Password confirmation
Role*	Dropdown	Select user role (Patient, Doctor)
Register	Button	Submit registration request

Database Access

Table	CRUD	Description
Users	C,R	Create new user account and check for duplicates
Roles	R	Retrieve available roles for selection
PatientProfiles	C	Create patient profile if role is Patient
DoctorProfiles	C	Create doctor profile if role is Doctor

4.2 Appointment Management

4.2.1 Appointment Booking (UC-008)

This screen enables patients to book appointments with available doctors.

UI Design

Field Name	Field Type	Description
Doctor Selection*	Dropdown	List of available doctors with specialties

Appointment Date*	Date Picker	Calendar widget for selecting appointment date
Available Time Slots*	Radio Buttons	Dynamic list of available time slots for selected doctor/date
Appointment Notes	Text Area	Optional notes about appointment purpose or concerns
Book Appointment	Button	Submit appointment booking request
Cancel	Button	Return to previous screen without booking

Database Access

Table	CRUD	Description
Users	R	Retrieve available doctors with their specialties
DoctorAvailabilitySlots	R, U	Query available slots and mark as booked
Appointments	C	Create new appointment record
Notifications	C	Schedule appointment reminder notifications

4.2.2 Doctor Appointment Management (UC-013)

This screen allows doctors to manage their appointments.

UI Design

Field Name	Field Type	Description
Appointment List	Data Grid	List of doctor's appointments with patient information
Date Filter	Date Range	Filter appointments by date range
Status Filter	Dropdown	Filter by appointment status (Scheduled, Completed, Cancelled)
Patient Details	Info Panel	Patient information for selected appointment
Confirm	Button	Confirm appointment attendance
Reschedule	Button	Reschedule appointment to different time
Cancel	Button	Cancel appointment with reason
Add Notes	Text Area	Add pre-appointment or post-appointment notes

4.3 Medical Records Management

4.3.1 Patient Medical Records (UC-009, UC-015)

This screen provides comprehensive medical record management for HIV patients.

UI Design

Field Name	Field Type	Description
Medical History	Text Area	Comprehensive medical history including HIV diagnosis details
Current Allergies	Text Area	Known allergies and adverse drug reactions
Current Medications	Text Area	List of current medications including ARV regimens
Blood Type	Dropdown	ABO blood type classification
Emergency Contact	Text Box	Emergency contact person name
Emergency Phone	Text Box	Emergency contact phone number
Clinical Notes	Text Area	Doctor's clinical observations and notes
ARV Status	Display Field	Current HIV treatment status and viral load
Last CD4 Count	Text Box	Most recent CD4 cell count
Save Record	Button	Save medical record updates
View ARV History	Button	Access complete HIV treatment history
Generate Report	Button	Create medical summary report

Database Access

Table	CRUD	Description
PatientRecords	R,U	Retrieve and update patient medical records
ARVTreatments	R	Access HIV treatment history
LabResults	R,C	View and add laboratory test results
Users	R	Verify patient and doctor access permissions
MedicalHistory	C,R,U	Manage detailed medical history entries

4.4 ARV Treatment Management

4.4.1 ARV Treatment Prescription (UC-016)

This screen enables doctors to prescribe and monitor HIV antiretroviral treatments.

UI Design

Field Name	Field Type	Description
Patient Information	Display Panel	Shows patient name, ID, and current treatment status
Current Regimens	Table	Lists active ARV regimens with start dates and adherence
Available ARV Drugs	Multi-select	List of available antiretroviral medications
Dosage*	Text Box	Medication dosage specifications
Frequency*	Dropdown	Daily frequency (once, twice, three times daily)
Treatment Duration*	Date Picker	Expected treatment duration or review date
Treatment Goals	Text Area	Clinical goals and expected outcomes
Monitoring Schedule	Dropdown	Follow-up monitoring frequency
Special Instructions	Text Area	Additional patient instructions or warnings
Prescribe Treatment	Button	Submit new ARV treatment prescription
Update Existing	Button	Modify current treatment regimen
View Adherence	Button	Access patient adherence reports

Database Access

Table	CRUD	Description
ARVTreatments	C,R,U	Create, view, and update ARV treatment records
ARVDrugs	R	Retrieve available antiretroviral medications
PatientRecords	R,U	Access patient medical records and update treatment history
AdherenceTracking	C,R	Create adherence monitoring and view reports
Notifications	C	Create medication reminders for patients

4.5 Dashboard Interfaces

4.5.1 Patient Dashboard (UC-004)

Patient-focused dashboard with quick access to key functions.

UI Design

Field Name	Field Type	Description
Welcome Message	Display Panel	Personalized greeting with patient name
Upcoming Appointments	Widget	Next 3 upcoming appointments with doctor and time
Recent Notifications	Widget	Latest system notifications and reminders
Quick Actions	Button Group	Book Appointment, View Records, Update Profile
Treatment Status	Info Panel	Current ARV treatment status and adherence
Next Appointment	Highlight Panel	Next scheduled appointment with countdown
Medical Alerts	Alert Panel	Important medical alerts or reminders

4.5.2 Doctor Dashboard (UC-012)

Professional dashboard for healthcare providers.

UI Design

Field Name	Field Type	Description
Today's Schedule	Widget	List of today's appointments with patient names
Patient Alerts	Alert Panel	Urgent patient notifications and treatment alerts
Quick Actions	Button Group	Manage Appointments, View Patients, ARV Management
Treatment Reviews	Widget	Patients requiring treatment review or follow-up
Availability Status	Info Panel	Current availability status and next open slots

Recent Activity	Activity Feed	Recent patient interactions and system updates
Performance Metrics	Chart Widget	Appointment completion rates and patient satisfaction

4.6 Administrative Interfaces

4.6.1 Admin Dashboard (UC-018)

Comprehensive administrative oversight interface.

UI Design

Field Name	Field Type	Description
System Overview	Dashboard Widget	Key system metrics and health indicators
User Activity	Chart Widget	User login activity and system usage patterns
Appointment Metrics	Chart Widget	Daily appointment bookings and cancellations
System Alerts	Alert Panel	Critical system alerts requiring administrator attention
Quick Actions	Button Group	Manage Users, View Reports, System Settings
Recent Activity	Activity Feed	Recent administrative actions and system events
Performance Monitor	Status Panel	System performance metrics and resource usage

4.6.2 Manager Dashboard (UC-022)

Operational management dashboard with analytics focus.

UI Design

Field Name	Field Type	Description
Clinic Statistics	Dashboard Widget	Key operational metrics and KPIs
Financial Summary	Chart Widget	Revenue, costs, and financial performance indicators

Patient Demographics	Chart Widget	Patient population analysis and trends
Treatment Outcomes	Chart Widget	HIV treatment success rates and adherence metrics
Staff Performance	Chart Widget	Doctor and staff performance metrics
Export Functions	Button Group	Export Data, Generate Reports, Analytics
Trend Analysis	Chart Widget	Long-term operational trends and projections

4.7 Notification System

4.7.1 Notification Center (UC-010, UC-017)

Centralized notification management for all users.

UI Design

Field Name	Field Type	Description
Notification List	List View	Chronological list of notifications with read/unread status
Filter Options	Dropdown Group	Filter by type (Appointment, Treatment, System, etc.)
Priority Indicators	Visual Icons	Color-coded priority levels (Low, Medium, High, Critical)
Notification Details	Detail Panel	Full notification content and action buttons
Mark as Read	Button	Mark selected notifications as read
Delete	Button	Delete selected notifications
Settings	Button	Configure notification preferences

Database Access

Table	CRUD	Description
Notifications	R,U,D	Retrieve, update status, and delete notifications
NotificationTypes	R	Get notification categories and types
Users	R	Verify user permissions for notification access

NotificationPreferences	RU	Manage user notification preferences
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5 Database Schema

5.1 Core Tables

5.1.1 Users Table

Column	Type	Null	Description
UserID	INT	NOT NULL	Primary key, auto-increment
Username	VARCHAR(50)	NOT NULL	Unique username for login
Email	VARCHAR(100)	NOT NULL	Unique email address
PasswordHash	VARCHAR(255)	NOT NULL	Hashed password using BCrypt
FirstName	VARCHAR(50)	NOT NULL	User's first name
LastName	VARCHAR(50)	NOT NULL	User's last name
PhoneNumber	VARCHAR(20)	NULL	Contact phone number
RoleID	INT	NOT NULL	Foreign key to Roles table
IsActive	BIT	NOT NULL	Account status (1=active, 0=inactive)
CreatedAt	DATETIME	NOT NULL	Account creation timestamp
UpdatedAt	DATETIME	NOT NULL	Last update timestamp

5.1.2 Appointments Table

Column	Type	Null	Description
AppointmentID	INT	NOT NULL	Primary key, auto-increment
PatientUserID	INT	NOT NULL	Foreign key to Users table (Patient)
DoctorUserID	INT	NOT NULL	Foreign key to Users table (Doctor)

AvailabilitySlotID	INT	NOT NULL	Foreign key to DoctorAvailabilitySlots
AppointmentDate	DATETIME	NOT NULL	Scheduled appointment date and time
Status	VARCHAR(20)	NOT NULL	Appointment status (Scheduled, Completed, Cancelled)
AppointmentNotes	TEXT	NULL	Patient notes about appointment
DoctorNotes	TEXT	NULL	Doctor's notes about appointment
CreatedAt	DATETIME	NOT NULL	Appointment creation timestamp
UpdatedAt	DATETIME	NOT NULL	Last update timestamp

5.1.3 ARVTreatments Table

Column	Type	Null	Description
ARVTreatmentID	INT	NOT NULL	Primary key, auto-increment
PatientUserID	INT	NOT NULL	Foreign key to Users table (Patient)
DoctorUserID	INT	NOT NULL	Foreign key to Users table (Doctor)
Regimen	VARCHAR(200)	NOT NULL	ARV drug regimen description
Dosage	VARCHAR(100)	NOT NULL	Medication dosage instructions
Frequency	VARCHAR(50)	NOT NULL	Frequency of medication (daily, twice daily, etc.)
StartDate	DATE	NOT NULL	Treatment start date
EndDate	DATE	NULL	Treatment end date (NULL for ongoing)
TreatmentGoals	TEXT	NULL	Clinical goals for treatment
Instructions	TEXT	NULL	Special instructions for patient
Adherence	DECIMAL(5,2)	NULL	Adherence percentage (0-100)

IsActive	BIT	NOT NULL	Treatment status (1=active, 0=inactive)
CreatedAt	DATETIME	NOT NULL	Treatment creation timestamp
UpdatedAt	DATETIME	NOT NULL	Last update timestamp

6 Appendix

6.1 Use Case Relationships

6.1.1 Include Relationships

- **UC-008 (Manage Appointments)** includes **UC-014 (Manage Availability Slots)** - appointment booking requires checking doctor availability
- **UC-013 (Manage Doctor Appointments)** includes **UC-015 (Access Patient Records)** - managing appointments requires patient record access
- **UC-016 (Manage ARV Treatments)** includes **UC-015 (Access Patient Records)** - treatment management requires patient record access
- **UC-017 (Send Patient Notifications)** includes **UC-015 (Access Patient Records)** - sending notifications requires patient information
- **UC-019 (Manage Users)** includes **UC-020 (View All Appointments)** - user management includes appointment oversight

6.1.2 Extend Relationships

- **UC-009 (Manage Personal Medical Records)** extends **UC-008 (Manage Appointments)** - medical record updates may occur during appointment management
- **UC-011 (View Notifications)** extends **UC-007 (View Patient Dashboard)** - notifications are displayed as part of dashboard functionality
- **UC-005 (Update Profile)** extends **UC-006 (Change Password)** - profile updates may include password changes

6.1.3 Generalization Relationships

- **UC-023 (Manage Patient Records)** generalizes **UC-019 (Manage Users)** - patient record management is a specialized form of user management
- **UC-024 (Manage Doctor Records)** generalizes **UC-019 (Manage Users)** - doctor record management is a specialized form of user management
- **UC-008 (Manage Appointments)** generalizes **UC-013 (Manage Doctor Appointments)** - patient appointment management is a specialized form of doctor appointment management
- **UC-009 (Manage Personal Medical Records)** generalizes **UC-015 (Access Patient Records)** - personal record management is a specialized form of patient record access

6.2 Business Rules

ID	Category	Rule Definition
BR-001	Public Access	Public content must be accessible without authentication
BR-002	Content Quality	HIV educational content must be medically accurate and reviewed
BR-003	User Management	Email addresses must be unique across all user accounts
BR-004	Security	Passwords must meet minimum security requirements (8+ chars, mixed case, numbers)
BR-005	Registration	Doctor registrations require additional verification and approval
BR-006	Authentication	Maximum 3 failed login attempts before temporary account lockout
BR-007	Session Management	User sessions expire after 2 hours of inactivity
BR-008	Security Audit	All login attempts must be logged for security monitoring
BR-009	Dashboard Access	Patients can only view their own information
BR-010	Activity History	Recent activity is limited to last 30 days
BR-011	Profile Updates	Email addresses must remain unique during updates
BR-012	Field Restrictions	Certain fields (role, user ID) cannot be modified by users
BR-013	Data Validation	Phone numbers must follow valid format
BR-014	Password Security	New password must meet security requirements
BR-015	Password History	Cannot reuse last 3 passwords
BR-016	Audit Logging	Password changes must be logged for security
BR-017	Role-based Access	Dashboard content must match user role permissions
BR-018	Sensitive Data	Sensitive information requires additional verification
BR-019	Appointment Conflicts	Patients cannot book overlapping appointments

BR-020	Cancellation Policy	Appointment cancellations within 24 hours may incur penalties
BR-021	Appointment Limits	Maximum 3 future appointments allowed per patient
BR-022	Record Privacy	Patients can only view their own medical records
BR-023	Medical Authority	Medical diagnoses can only be updated by doctors
BR-024	Patient Updates	Emergency contact information can be updated by patients
BR-025	Notification Privacy	Users can only view their own notifications
BR-026	Critical Notifications	Critical notifications cannot be deleted
BR-027	Data Retention	Notifications are retained for 90 days
BR-028	Logout Logging	All logout events must be logged for security audit
BR-029	Session Security	Session tokens must be invalidated on logout
BR-030	Auto-logout	Auto-logout occurs after 2 hours of inactivity
BR-031	Doctor Access	Doctors can only access assigned patient information
BR-032	Medical Licensing	Medical license validation required for treatment access
BR-033	Appointment Ownership	Doctors can only manage their own appointments
BR-034	Change Notification	Appointment changes require patient notification
BR-035	Emergency Protocols	Emergency cancellations have priority notification
BR-036	Slot Modification	Cannot modify slots that are already booked
BR-037	Advance Scheduling	Availability must be set at least 24 hours in advance
BR-038	Minimum Duration	Minimum slot duration is 30 minutes
BR-039	Access Logging	All patient record access must be logged
BR-040	Doctor Assignments	Doctors can only access records of their assigned patients

BR-041	Emergency Access	Emergency access requires additional documentation
BR-042	ARV Authorization	Only licensed doctors can prescribe ARV treatments
BR-043	Treatment Documentation	All ARV prescriptions must be documented and logged
BR-044	Patient Consent	Patient consent required for all treatment changes
BR-045	Adherence Monitoring	Regular adherence monitoring is mandatory for ARV treatments
BR-046	Communication Logging	All patient communications must be logged
BR-047	Urgent Delivery	Urgent medical notifications have delivery priority
BR-048	Notification Preferences	Patients can opt out of non-critical notifications
BR-049	Administrative Audit	Administrative actions must be logged for audit
BR-050	Alert Acknowledgment	System alerts require administrator acknowledgment
BR-051	User Management Audit	All user management actions must be logged
BR-052	Account Deletion	Cannot delete users with active medical records
BR-053	Doctor Handover	Doctor deactivation requires medical handover process
BR-054	Appointment Monitoring	Appointment viewing access must be logged
BR-055	Privacy Protection	Patient privacy must be maintained in reports
BR-056	Administrative Scope	Administrative access includes all appointment data
BR-057	Content Accuracy	All blog content must be medically accurate
BR-058	Content Tracking	Content changes must be logged with timestamping
BR-059	Content Approval	Published content must be approved by authorized personnel

BR-060	Management Audit	Management data access must be logged
BR-061	Report Anonymization	Patient data in reports must be anonymized
BR-062	Financial Analytics	Financial analytics require additional security verification
BR-063	Record Change Audit	All patient record changes must be logged with administrator ID
BR-064	Archive Retention	Archived records must be retained for minimum 7 years
BR-065	Merge Approval	Record merging requires approval workflow
BR-066	Credential Verification	Doctor credentials must be verified before activation
BR-067	Deactivation Process	Deactivated doctors require patient handover process
BR-068	License Monitoring	Professional license expiration triggers alerts
BR-069	Analytics Privacy	Analytics data must be anonymized to protect patient privacy
BR-070	Analytics Audit	Analytics access must be logged for audit purposes
BR-071	Financial Analytics	Financial analytics require additional security verification
BR-072	Export Logging	All data exports must be logged with user ID and timestamp
BR-073	Export Anonymization	Patient data exports must be anonymized unless specifically authorized
BR-074	Export Encryption	Export files must be encrypted for sensitive data
BR-075	Statistical Anonymity	All statistical data must maintain patient anonymity
BR-076	Statistics Audit	Statistics viewing must be logged for audit purposes
BR-077	Historical Data	Historical comparisons require minimum 3 months of data

6.3 Assumptions & Dependencies

- **AS-1:** Microsoft SQL Server database is available and properly configured for healthcare data storage
- **AS-2:** SMTP email service is configured for sending appointment and medication reminders
- **AS-3:** System users have basic computer literacy and internet access
- **AS-4:** Clinic staff will receive training on HIV patient management workflows
- **AS-5:** All medical staff have proper licensing and authorization to treat HIV patients
- **DE-1:** Integration with existing hospital information systems may be required
- **DE-2:** HIPAA compliance requirements must be met for patient data protection
- **DE-3:** System depends on reliable internet connectivity for real-time operations
- **DE-4:** ARV drug database must be maintained and updated regularly

6.4 Limitations & Exclusions

- System does not include billing or insurance processing capabilities
- Laboratory result integration is limited to manual entry
- Telemedicine or video consultation features are excluded from current scope
- Mobile application development is not part of initial release
- Integration with external pharmacy systems is not included
- Advanced analytics and AI-driven treatment recommendations are excluded
- Multi-language support is not included in initial version
- Integration with external HIV registries or national health databases is excluded

6.5 Technical Specifications

- **Backend Technology:** Spring Boot 3.x with Java 17
- **Frontend Technology:** React 18 with modern JavaScript (ES6+)
- **Database:** Microsoft SQL Server with T-SQL stored procedures
- **Authentication:** JWT (JSON Web Tokens) with BCrypt password hashing
- **API Architecture:** RESTful APIs with JSON data exchange
- **Security:** HTTPS/TLS encryption, CORS configuration, input validation
- **Deployment:** Containerized deployment ready (Docker compatible)
- **Testing:** Unit testing with JUnit, Integration testing with TestContainers