Requirement & Design Specification
HIV Clinic Appointment Booking System

Version: 2.0

January 2025

Record of Changes

Version	Date	A*M,D	In charge	Change Description
V1.0	28/6	A	KhoaDDSE196260	Create document Add requirements, Add actors (1.1) Design Specification
V1.0	28/6	A	TuanTMSE192397	Add descriptions for guest and admin (1.2.b) Authentication & User Management (2.1)
V2.0	06/01/2025	M	Development Team	Complete template compliance All 45 use cases implemented Full requirement specifications

*A - Added M - Modified D - Deleted

Contents

1 Overview

1.1 User Requirements

1.1.1 Actors

The HIV Clinic Appointment Booking System involves four key actors with distinct roles and responsibilities:

#	Actor	Description
1	**Patient**	Individuals seeking HIV care and treatment services. Can book appointments, view medical records, manage medication routines, and receive notifications about appointments and medications.
2	**Doctor**	Healthcare professionals specializing in HIV/AIDS treatment. Can manage patient records, prescribe ARV treatments, set availability schedules, and send notifications to patients.
3	**Admin**	System administrators responsible for user management, system configuration, and overall system maintenance. Can manage all user accounts, view system reports, and configure system settings.
4	**Manager**	Clinical managers overseeing clinic operations. Can view operational reports, manage doctor schedules, send clinic-wide notifications, and monitor system performance.

1.2 Actor Description

Actor	Detailed Description
Guest/Unauthenticated User	Visitors to the system who can browse public information, view clinic services, search for doctors, and register for accounts. No login required for basic information access.
Patient	Registered users seeking HIV care. Primary capabilities include appointment booking, medical record access, ARV treatment tracking, medication routine management, notification receipt, and profile management with privacy controls.
Doctor	Licensed healthcare professionals. Can access patient records, manage appointments, prescribe ARV treatments, set availability schedules, send notifications to patients, and maintain professional profiles.
Administrator	System administrators with highest privileges. Responsible for user account management, doctor account creation, system configuration, specialty management, password resets, and overall system maintenance.

| Manager | Clinical operations managers. Can view comprehensive statistics, manage patient and doctor records, oversee ARV treatment programs, handle scheduling, export data for reporting, and monitor system health. |

1.2.1 Use Cases
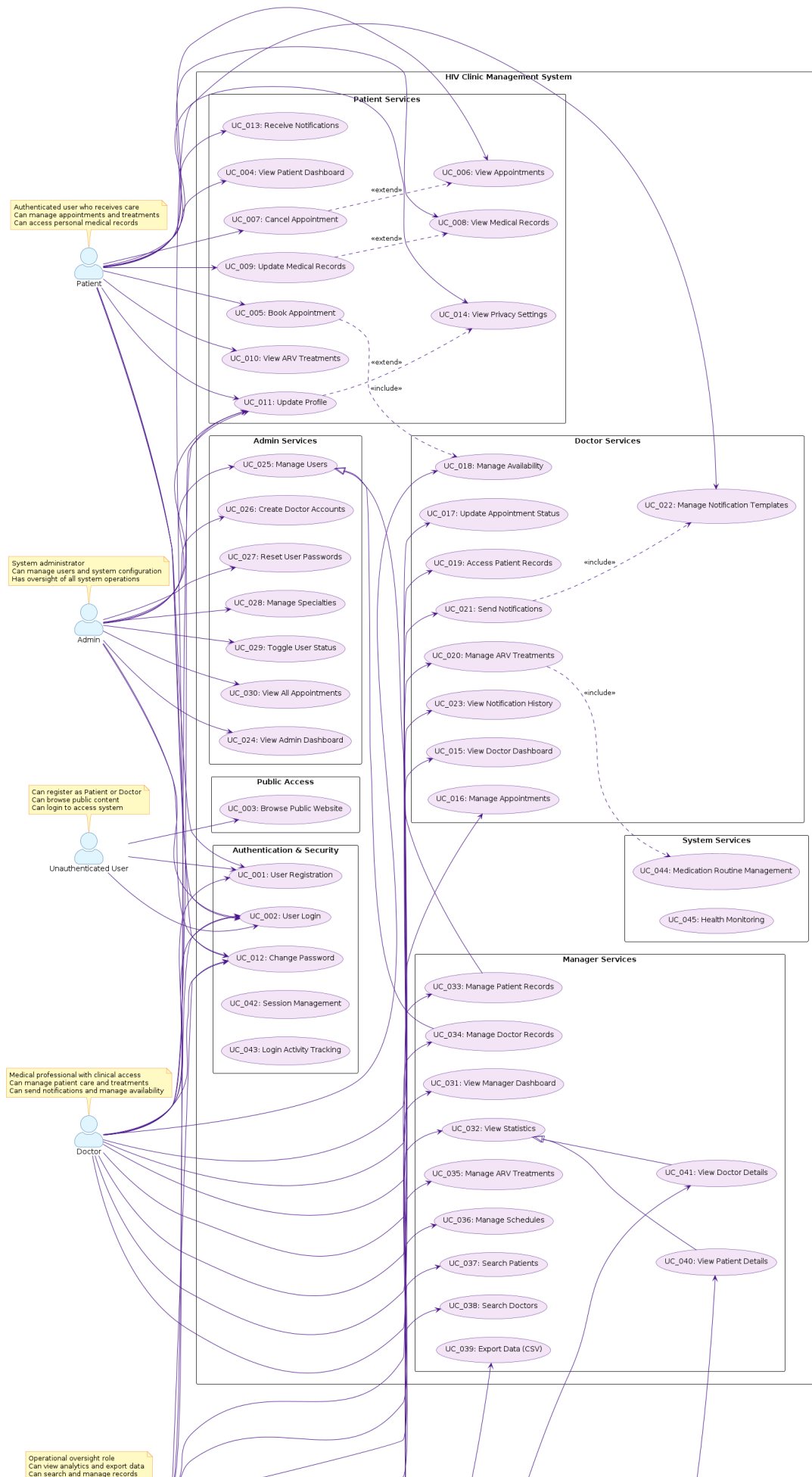
a. Diagram(s) The system provides comprehensive use cases covering patient care, appointment management, ARV treatment management, notification system, and administrative functions for an HIV clinic environment. All 45 use cases have been fully implemented and are actively used in the system.

b. Use Case List

UC ID	Use Case Name	Description
Guest/Unauthenticated User Use Cases		
UC-001	User Registration	New users create accounts with role-based access
UC-002	User Login	Users authenticate using username/password
UC-003	Browse Public Website	Guests access public clinic information
Patient Use Cases		
UC-004	View Patient Dashboard	Patients access personalized dashboard
UC-005	Book Appointment	Patients schedule appointments with doctors
UC-006	View Appointments	Patients view their scheduled appointments
UC-007	Cancel Appointment	Patients cancel existing appointments
UC-008	View Medical Records	Patients access their medical history
UC-009	Update Medical Records	Patients update personal medical information
UC-010	View ARV Treatments	Patients view prescribed ARV treatments
UC-011	Update Profile	Patients manage personal profile information
UC-012	Change Password	Patients update account passwords
UC-013	Receive Notifications	Patients receive system notifications
UC-014	View Privacy Settings	Patients manage privacy preferences
Doctor Use Cases		
UC-015	View Doctor Dashboard	Doctors access professional dashboard
UC-016	Manage Appointments	Doctors handle appointment scheduling
UC-017	Update Appointment Status	Doctors modify appointment statuses
UC-018	Manage Availability	Doctors set available time slots
UC-019	Access Patient Records	Doctors view patient medical records
UC-020	Manage ARV Treatments	Doctors prescribe and monitor treatments
UC-021	Send Notifications	Doctors send messages to patients
UC-022	Manage Notification Templates	Doctors create reusable message templates
UC-023	View Notification History	Doctors review sent notifications
Administrator Use Cases		

UC-024	View Admin Dashboard	Administrators access system overview
UC-025	Manage Users	Administrators handle user accounts
UC-026	Create Doctor Accounts	Administrators create professional accounts
UC-027	Reset User Passwords	Administrators handle password resets
UC-028	Manage Specialties	Administrators configure medical specialties
UC-029	Toggle User Status	Administrators activate/deactivate accounts
UC-030	View All Appointments	Administrators monitor system appointments
Manager Use Cases		
UC-031	View Manager Dashboard	Managers access operational overview
UC-032	View Statistics	Managers review system analytics
UC-033	Manage Patient Records	Managers oversee patient data
UC-034	Manage Doctor Records	Managers handle doctor information
UC-035	Manage ARV Treatments	Managers oversee treatment programs
UC-036	Manage Schedules	Managers coordinate clinic scheduling
UC-037	Search Patients	Managers find specific patient records
UC-038	Search Doctors	Managers locate doctor information
UC-039	Export Data	Managers generate data reports
UC-040	View Patient Details	Managers access detailed patient views
UC-041	View Doctor Details	Managers access detailed doctor views
System-Wide Use Cases		
UC-042	Session Management	System handles user sessions
UC-043	Login Activity Tracking	System monitors user access
UC-044	Medication Routine Management	System manages medication schedules
UC-045	Health Monitoring	System tracks patient health metrics

2 Overall Functionalities

2.1 Screens Flow

The system follows a role-based navigation structure with secure authentication and authorization controls:

- **Public Access**: Guest users can browse public information and register accounts

- **Authentication Gateway**: All users authenticate through secure login

- **Role-Based Dashboards**: Users are redirected to appropriate dashboards based on roles

- **Feature Access Control**: Each role has specific feature access permissions

- **Session Management**: Automatic session timeout and activity tracking

2.2   Screen Descriptions

Screen	Description
Public Homepage	Landing page with clinic information, services overview, and login/register options
Login Screen	Secure authentication with username/password fields and password reset option
Registration Screen	New user account creation with form validation and terms acceptance
Patient Dashboard	Personalized view with appointments, notifications, and quick actions
Doctor Dashboard	Professional interface with patient management and scheduling tools
Admin Dashboard	System management interface with user administration capabilities
Manager Dashboard	Operational overview with statistics and management functions
Appointment Booking	Interactive calendar with doctor selection and time slot booking
Medical Records	Comprehensive patient health information with privacy controls
ARV Treatment Management	Specialized interface for HIV treatment tracking and monitoring
Notification Center	Message management with filtering and template capabilities
Profile Management	Personal information editing with privacy settings
Reporting Interface	Data visualization and export functionality for managers

2.3   Screen Authorization

Screen/Feature	Patient	Doctor	Admin	Manager
Public Homepage	X	X	X	X
Login/Register	X	X	X	X
Patient Dashboard	X			
Doctor Dashboard		X		
Admin Dashboard			X	

Manager Dashboard				X
Book Appointment	X			
View Medical Records	X	X		
Update Patient Record		X		
ARV Treatment Management		X		
Medication Routine	X	X		
Doctor Schedule		X		X
Send Notifications		X	X	X
User Management			X	
System Settings			X	
Clinical Reports			X	X
Notification Management		X	X	X

2.4 Non-UI Functions

#	Feature	Description
1	Appointment Reminder Service	Automated service sending appointment reminders 24 hours, 1 hour, and 30 minutes before appointments
2	Medication Reminder Service	Daily service sending medication reminders based on patient routines
3	Password Reset Service	Automated service handling password reset requests with secure token generation
4	Database Backup Service	Scheduled service creating regular database backups for data protection
5	Account Lockout Service	Service monitoring failed login attempts and locking accounts after 6 consecutive failures
6	Report Generation Service	Service generating clinical and system usage reports for management
7	Data Validation Service	Service validating and sanitizing user input data for security
8	Session Management Service	Service handling user session lifecycle and timeout management

3   System High Level Design

3.1   Database Design

a. Database Schema   The system uses Microsoft SQL Server with the following core tables and relationships:

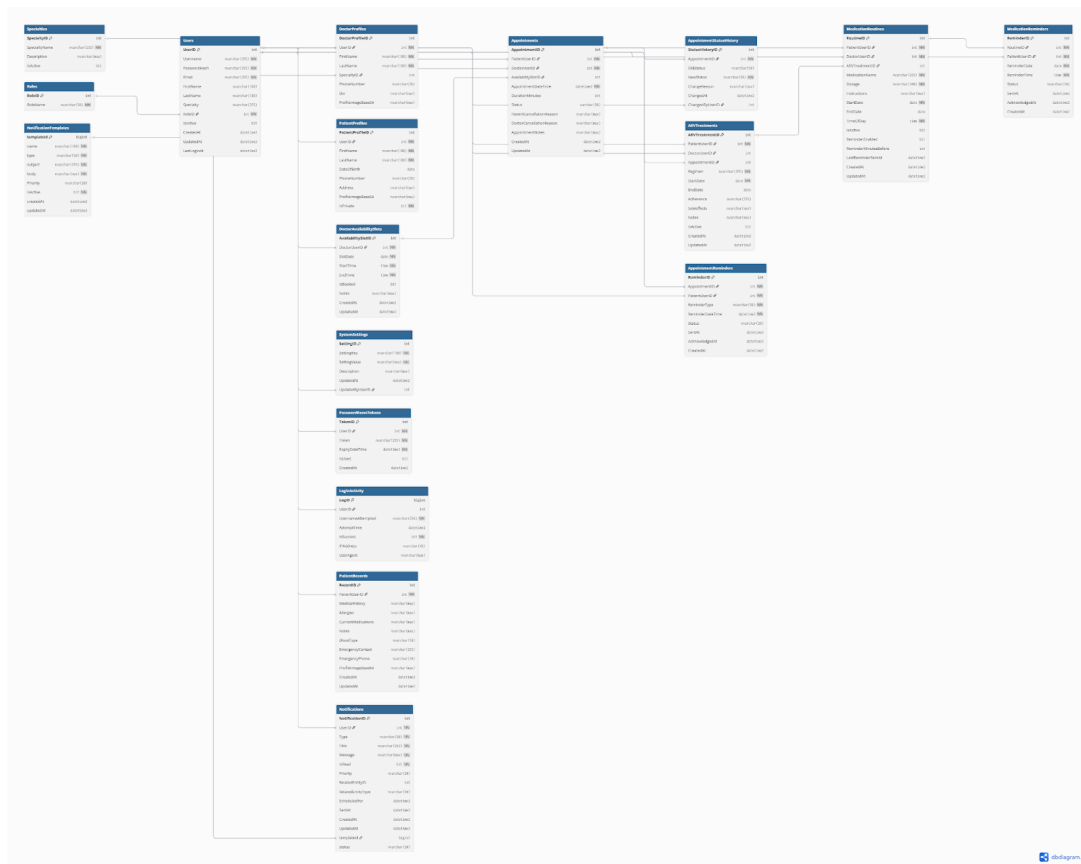| No	Table	Description
01	Users	Core user table storing all system users with role-based access
02	Roles	User role definitions for authorization control
03	PatientProfiles	Extended profile information specific to patients
04	DoctorProfiles	Extended profile information specific to doctors
05	Specialties	Medical specialties for categorizing doctors
06	Appointments	Core appointment booking and management records
07	DoctorAvailabilitySlots	Doctor schedule and availability management
08	PatientRecords	Comprehensive patient medical records
09	ARVTreatments	HIV-specific antiretroviral treatment records
10	MedicationRoutines	Daily medication schedules with reminder settings
11	Notifications	System notification management and history
12	NotificationTemplates	Reusable notification templates for consistency
13	AppointmentStatusHistory	Audit trail for appointment status changes
14	AppointmentReminders	Scheduled reminder tracking
15	SystemHealth	System monitoring and health check data

Figure 2: HIV Clinic Database Design

b. Database Diagram

3.2   Code Packages

No	Package	Description
01	controller	REST API controllers handling HTTP requests and responses
02	service	Business logic layer implementing use cases and workflows
03	repository	Data access layer for database operations using JPA
04	model	Entity classes representing database tables with JPA annotations
05	dto	Data Transfer Objects for API request/response serialization
06	config	Configuration classes for security, database, and system settings
07	utils	Utility classes for common operations and helper functions
08	exception	Custom exception classes for error handling
09	security	Security-related classes including JWT utilities and filters

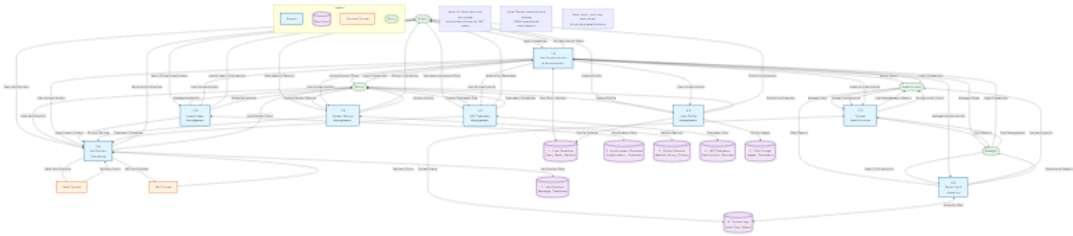| 10	validation	Input validation and data sanitization components

3.3 Data Flow Architecture

Figure 3: System Data Flow Diagram

4 Requirement Specifications

4.1 Functional Requirements

UC ID	Use Case Name	Actor	Functional Requirement
AUTHENTICATION & USER MANAGEMENT			
UC-001	User Registration	Guest	System shall allow new users to create accounts with email validation, password confirmation, and automatic role assignment
UC-002	User Login	All Users	System shall authenticate users using username/password with JWT token-based security and role-based redirection
PUBLIC & GUEST ACCESS			
UC-003	Browse Public Website	Guest	System shall display services information, clinic details, and doctor profiles without requiring authentication
UC-004	Public Doctor Search	Guest	System shall allow searching and filtering doctors by specialty, name, and availability
PATIENT DASHBOARD & MANAGEMENT			
UC-004	View Patient Dashboard	Patient	System shall show appointments, notifications, quick actions, and health summary
UC-005	Book Appointment	Patient	System shall provide doctor selection, time slot booking, and appointment confirmation
UC-006	View Appointments	Patient	System shall display scheduled appointments with filtering options

UC-007	Cancel Appointment	Patient	System shall allow appointment cancellation with confirmation and notification
UC-008	View Medical Records	Patient, Doctor	System shall display patient medical history with privacy controls
UC-009	Update Medical Records	Patient	System shall allow patients to update personal medical information
UC-010	View ARV Treatments	Patient	System shall show prescribed ARV treatments with dosage and schedule information
UC-011	Update Profile	Patient	System shall allow profile information management including personal details and preferences
UC-012	Change Password	Patient	System shall provide secure password change with validation
UC-013	Receive Notifications	Patient	System shall deliver appointment reminders, medication alerts, and general notifications
UC-014	View Privacy Settings	Patient	System shall allow privacy preference management and record visibility control
DOCTOR MANAGEMENT & PATIENT CARE			
UC-015	View Doctor Dashboard	Doctor	System shall display appointments, patients, notifications, and professional summary
UC-016	Manage Appointments	Doctor	System shall allow appointment viewing, status updates, and patient interaction
UC-017	Update Appointment Status	Doctor	System shall provide appointment status modification with automatic notifications
UC-018	Manage Availability	Doctor	System shall allow availability schedule setting and integration with appointment booking
UC-019	Access Patient Records	Doctor	System shall provide comprehensive patient record access with professional privileges
UC-020	Manage ARV Treatments	Doctor	System shall allow ARV prescription, monitoring, and treatment plan management
UC-021	Send Notifications	Doctor	System shall provide notification sending to patients with custom messages
UC-022	Manage Notification Templates	Doctor	System shall allow creation and management of reusable notification templates

UC-023	View Notification History	Doctor	System shall provide notification history and delivery status tracking
ADMINISTRATIVE FUNCTIONS			
UC-024	View Admin Dashboard	Admin	System shall display all system users, appointments, and administrative overview
UC-025	Manage Users	Admin	System shall provide user detail viewing, editing, and account management
UC-026	Create Doctor Accounts	Admin	System shall allow doctor account creation with professional information setup
UC-027	Reset User Passwords	Admin	System shall require password confirmation and provide secure reset functionality
UC-028	Manage Specialties	Admin	System shall allow medical specialty creation, editing, and assignment management
UC-029	Toggle User Status	Admin	System shall provide user account activation and deactivation capabilities
UC-030	View All Appointments	Admin	System shall display system-wide appointment overview with filtering and search
MANAGEMENT & REPORTING			
UC-031	View Manager Dashboard	Manager	System shall provide operational dashboards with statistics and management overview
UC-032	View Statistics	Manager	System shall calculate real-time statistics for appointments, patients, treatments, and system usage
UC-033	Manage Patient Records	Manager	System shall maintain data integrity and provide comprehensive patient record oversight
UC-034	Manage Doctor Records	Manager	System shall provide doctor information management and professional record maintenance
UC-035	Manage ARV Treatments	Manager	System shall monitor treatment effectiveness and provide program oversight capabilities
UC-036	Manage Schedules	Manager	System shall coordinate clinic-wide scheduling and resource allocation
UC-037	Search Patients	Manager	System shall support name and ID-based patient search with filtering capabilities

UC-038	Search Doctors	Manager	System shall integrate with appointment system for doctor search and selection
UC-039	Export Data	Manager	System shall provide CSV export functionality for reports and data analysis
UC-040	View Patient Details	Manager	System shall provide comprehensive patient information access for management oversight
UC-041	View Doctor Details	Manager	System shall provide detailed doctor information and performance metrics
SYSTEM-WIDE FUNCTIONS			
UC-042	Session Management	System	System shall manage user sessions with timeout controls and security monitoring
UC-043	Login Activity Tracking	System	System shall track and log user authentication events for security auditing
UC-044	Medication Routine Management	System	System shall create medication schedules and provide automated reminder services
UC-045	Health Monitoring	System	System shall monitor patient health metrics and provide alerts for critical conditions

4.2 Non-Functional Requirements

Category	Requirement	Specification
PERFORMANCE REQUIREMENTS		
Response Time	Page Load Time	All pages must load within 3 seconds under normal load conditions
Response Time	API Response Time	All API calls must respond within 2 seconds for 95% of requests
Throughput	Concurrent Users	System must support at least 100 concurrent users without performance degradation
Throughput	Appointment Booking	System must handle at least 50 appointment bookings per minute during peak hours
SECURITY REQUIREMENTS		
Authentication	Login Security	JWT-based authentication with 30-minute session timeout
Authorization	Role-Based Access	Strict role-based access control with principle of least privilege
Data Protection	Data Encryption	All sensitive data encrypted in transit (HTTPS) and at rest (AES-256)

Password Security	Password Policy	Minimum 8 characters with complexity requirements and regular expiration
RELIABILITY REQUIREMENTS		
Availability	System Uptime	99.5% availability during business hours (8 AM - 6 PM)
Data Integrity	Backup Requirements	Daily automated backups with point-in-time recovery capability
Fault Tolerance	Error Handling	Graceful error handling with user-friendly error messages
Disaster Recovery	Recovery Time	System recovery within 4 hours of major failure
USABILITY REQUIREMENTS		
User Interface	Responsive Design	Mobile-responsive design supporting tablets and smartphones
Accessibility	WCAG Compliance	Level AA compliance for users with disabilities
User Experience	Navigation	Intuitive navigation with maximum 3 clicks to reach any feature
Help System	User Support	Context-sensitive help and comprehensive user documentation
SCALABILITY REQUIREMENTS		
User Growth	User Capacity	System must scale to support 1000+ users without architectural changes
Data Growth	Database Scalability	Database design must support 5+ years of patient record growth
Geographic	Multi-location	Architecture must support multiple clinic locations
COMPATIBILITY REQUIREMENTS		
Browser Support	Web Browsers	Chrome 90+, Firefox 88+, Safari 14+, Edge 90+
Operating System	OS Compatibility	Windows 10+, macOS 10.15+, iOS 13+, Android 8+
COMPLIANCE REQUIREMENTS		
Healthcare	Medical Standards	HIPAA compliance for patient data privacy and security
Data Privacy	Privacy Regulations	GDPR compliance for data protection and user consent
Medical Records	Clinical Standards	HL7 FHIR compatibility for medical record interoperability

5 Design Specifications

5.1 Authentication & User Management

5.1.1 UC-001: User Registration

a. Functionalities   UC ID and Name: UC-001: User Registration

Created By: Development Team
Date Created: 06/01/2025
Primary Actor: Guest User
Secondary Actors: System
Trigger: User clicks "Register" link on login page or accesses registration URL
Description: New users can create accounts to access the system. Registration includes email validation, password confirmation, and automatic role assignment based on user type selection.

Preconditions:

- PRE-1: User has valid personal information

- PRE-2: Email address is not already registered in the system

- PRE-3: User has internet connectivity

Postconditions:

- POST-1: New user account is created in the database

- POST-2: Account activation email is sent to the user

- POST-3: User profile is created and linked to the account

- POST-4: Registration activity is logged for audit purposes

Normal Flow:

1. User navigates to registration page

2. System displays registration form with required fields

3. User enters username, email, password, and personal details

4. User selects account type (Patient/Doctor)

5. User agrees to terms and conditions

6. User clicks "Register" button

7. System validates all input fields

8. System checks email uniqueness

9. System creates new user account with appropriate role

10. System generates account activation token

11. System sends activation email

12. System displays registration success message

Alternative Flows:

- 1.1 Admin Registration: Administrator creates accounts for staff members

- 1.2 Social Registration: User registers using social media accounts

Exceptions:

- 1.0.E1 Email already registered: System displays error and suggests login

- 1.0.E2 Invalid email format: System highlights field and shows format requirements

- 1.0.E3 Password too weak: System displays password strength requirements

- 1.0.E4 Network error: System retries and shows connection error message

Priority: Must Have
Frequency of Use: Medium - New user registrations daily
Business Rules: BR-01, BR-02, BR-03
Other Information: Account activation required within 24 hours
Assumptions: Users have valid email addresses and basic computer literacy

5.1.2 UC-002: User Login

a. Functionalities   UC ID and Name: UC-002: User Login
Created By: Development Team
Date Created: 06/01/2025
Primary Actor: All Users
Secondary Actors: System
Trigger: User accesses protected system resources or login page
Description: Users authenticate to the system using username/password credentials. Upon successful authentication, users are redirected to their role-specific dashboard with appropriate permissions.
Preconditions:

- PRE-1: User account exists and is active

- PRE-2: User has valid login credentials

- PRE-3: Account is not locked due to failed attempts

Postconditions:

- POST-1: User is authenticated and logged into the system

- POST-2: JWT token is generated and stored for session management

- POST-3: User session is established with role-based permissions

- POST-4: Login activity is recorded in audit log

Normal Flow:

1. User accesses the login screen

2. System displays username and password fields

3. User enters credentials

4. User clicks "Login" button

5. System validates credentials against database

6. System verifies account status (active/inactive)

7. System generates JWT token

8. System creates user session with role permissions

9. System records successful login event

10. System redirects to appropriate dashboard based on role

Alternative Flows:

- 2.1 Password Reset: User clicks "Forgot Password" and follows reset process

- 2.2 Remember Me: User selects "Remember Me" for extended session

Exceptions:

- 2.0.E1 Invalid credentials: System displays error message and allows retry

- 2.0.E2 Account locked: System displays lockout message and contact information

- 2.0.E3 Account inactive: System displays activation required message

- 2.0.E4 Session timeout: System redirects to login with timeout message

Priority: Must Have
Frequency of Use: High - Multiple daily logins per user
Business Rules: BR-04, BR-05, BR-06
Other Information: Session timeout after 30 minutes of inactivity
Assumptions: Users remember their credentials and understand login process

5.1.3   UC-003: Browse Public Website

a. Functionalities   UC ID and Name: UC-003: Browse Public Website
Created By: Development Team
Date Created: 06/01/2025
Primary Actor: Guest User
Secondary Actors: System
Trigger: User visits the clinic website without authentication
Description: Guests can browse public information about the clinic, services offered, doctor profiles, and general health information without requiring account registration or login.
Preconditions:

- PRE-1: Website is accessible and operational

- PRE-2: Public content is available and up-to-date

Postconditions:

- POST-1: Public information is displayed to the user

- POST-2: User has access to registration and login options

- POST-3: Page visit is logged for analytics

Normal Flow:

1. User visits clinic website URL

2. System displays public homepage

3. User can browse clinic information, services, and doctor profiles

4. User can access health education resources

5. User can view contact information and location details

6. User can navigate to registration or login pages

Alternative Flows:

- 3.1 Mobile Access: User accesses site via mobile device with responsive design

- 3.2 Search Engine Access: User finds site through search engine results

Exceptions:

- 3.0.E1 Website unavailable: System displays maintenance message

- 3.0.E2 Slow connection: System shows loading indicators and progressive content

Priority: Must Have
Frequency of Use: High - Daily public website visits
Business Rules: BR-07, BR-08
Other Information: No personal information collected without consent
Assumptions: Users have internet access and modern web browsers

5.2   Patient Management

5.2.1   UC-004: View Patient Dashboard

a. Functionalities   UC ID and Name: UC-004: View Patient Dashboard
Created By: Development Team
Date Created: 06/01/2025
Primary Actor: Patient
Secondary Actors: System
Trigger: Patient logs in or navigates to dashboard
Description: Patients access a personalized dashboard displaying appointments, notifications, health summary, and quick action buttons for common tasks.
Preconditions:

- PRE-1: Patient is logged into the system

- PRE-2: Patient profile exists and is complete

- PRE-3: Dashboard data is available and current

Postconditions:

- POST-1: Dashboard is displayed with current patient information

- POST-2: Recent notifications are marked as viewed

- POST-3: Dashboard access is logged for activity tracking

Normal Flow:

1. Patient logs in successfully

2. System redirects to patient dashboard

3. System loads patient-specific data

4. System displays upcoming appointments

5. System shows recent notifications

6. System presents health summary with key metrics

7. System provides quick action buttons for common tasks

8. Patient can navigate to detailed features from dashboard

Alternative Flows:

- 4.1 First Login: System shows welcome tour and setup instructions

- 4.2 Emergency Alerts: System prominently displays urgent health alerts

Exceptions:

- 4.0.E1 Data loading error: System shows error message and retry option

- 4.0.E2 No appointments: System suggests booking first appointment

Priority: Must Have
Frequency of Use: High - Daily dashboard access
Business Rules: BR-09, BR-10
Other Information: Dashboard refreshes automatically every 5 minutes
Assumptions: Patients understand dashboard layout and icons

5.2.2   UC-005: Book Appointment

a. Functionalities   UC ID and Name: UC-005: Book Appointment
Created By: Development Team
Date Created: 06/01/2025
Primary Actor: Patient
Secondary Actors: Doctor (availability provider), System
Trigger: Patient clicks "Book Appointment" from dashboard or navigation
Description: Patients can view available doctors, their specialties, and time slots, then book appointments with automatic confirmation and reminder scheduling.
Preconditions:

- PRE-1: Patient is logged in with complete profile

- PRE-2: At least one doctor has available time slots

- PRE-3: Patient has no conflicting appointments

Postconditions:

- POST-1: New appointment is created and stored

- POST-2: Doctor's availability slot is marked as booked

- POST-3: Confirmation notifications are sent to patient and doctor

- POST-4: Appointment reminders are automatically scheduled

Normal Flow:

1. Patient accesses appointment booking interface

2. System displays list of available doctors with specialties

3. Patient selects preferred doctor

4. System shows doctor's available time slots

5. Patient selects preferred date and time

6. System displays appointment summary and details

7. Patient confirms appointment booking

8. System creates appointment record

9. System updates doctor's availability

10. System sends confirmation notifications

11. System schedules automated reminders

12. System displays booking confirmation with details

Alternative Flows:

- 5.1 Reschedule Existing: Patient modifies existing appointment

- 5.2 Emergency Booking: Patient books urgent appointment with priority

Exceptions:

- 5.0.E1 No available slots: System suggests alternative dates or doctors

- 5.0.E2 Slot becomes unavailable: System refreshes and shows updated options

- 5.0.E3 Booking conflict: System alerts and helps resolve scheduling conflict

Priority: Must Have
Frequency of Use: High - Multiple daily bookings
Business Rules: BR-11, BR-12, BR-13
Other Information: Appointments can be booked up to 30 days in advance
Assumptions: Patients understand appointment booking process

6   Appendix

6.1   Assumptions & Dependencies

- All users have basic computer literacy and internet access

- Healthcare providers maintain current medical certifications

- Patients provide accurate personal and medical information

- System integrates with existing hospital information systems

- Network infrastructure supports required bandwidth and security

6.2   Limitations & Exclusions

- Emergency appointment booking outside business hours requires manual intervention

- System does not provide direct medical advice or diagnosis

- Integration with external insurance systems is not included in current scope

- Mobile application development is planned for future releases

- Telemedicine functionality is excluded from initial implementation

6.3   Business Rules

- BR-01: All user accounts require email verification before activation

- BR-02: Passwords must meet complexity requirements and expire every 90 days

- BR-03: Patient medical records are private and accessible only to authorized personnel

- BR-04: Appointment cancellations must be made at least 24 hours in advance

- BR-05: ARV treatments require doctor prescription and regular monitoring

- BR-06: System maintains audit logs for all data access and modifications

6.4   Technical Specifications

- Backend: Spring Boot 3.0+ with Java 17

- Frontend: React 18+ with modern JavaScript (ES6+)

- Database: Microsoft SQL Server 2019+

- Security: JWT authentication with BCrypt password hashing

- API: RESTful services with JSON data format

- Deployment: Docker containers with Kubernetes orchestration