IthalaMed

Unified Healthcare Ecosystem Platform

FUNCTIONAL REQUIREMENTS DOCUMENT

Version 3.0 - Final

Document Date: December 2025
Status: Ready for Development

Confidential - For Internal Use Only

Table of Contents

1. Executive Summary

1.1 Document Purpose

This Functional Requirements Document (FRD) provides comprehensive specifications for developing the IthalaMed unified healthcare platform. It defines all functional requirements, user workflows, screen specifications, data requirements, and integration points necessary for development teams to build the platform.

1.2 Platform Overview

IthalaMed is Africa's comprehensive unified healthcare platform designed to connect the entire healthcare ecosystem into one seamless digital solution. The platform bridges patients, healthcare providers, hospitals, pharmacies, laboratories, emergency services, medical aid providers, and government regulators.

1.2.1 Core Vision

Single Medical Record Across Africa

Unified patient data accessible by authorized healthcare providers for comprehensive, coordinated care delivery across all healthcare facilities regardless of location.

1.2.2 Key Value Propositions

- **Unified Medical Record:** Single patient record accessible across Africa
- **Real-time Collaboration:** Instant data exchange between all healthcare stakeholders
- **Improved Efficiency:** Automated workflows reducing administrative burden by 60%
- **Enhanced Care Quality:** 360° patient view for better clinical decisions
- **African-Focused:** Built for African healthcare infrastructure and challenges
- **Interoperability:** HL7 FHIR, DICOM, and ICD-10/11 compliance

1.3 Target Markets

Primary Markets	Secondary Markets
South Africa, Nigeria, Kenya, Ghana	Uganda, Tanzania, Zimbabwe, Zambia

1.3.1 Language Support

English (Default), Zulu, Swahili, Shona, Yoruba, Hausa, Amharic, French, Portuguese

1.4 Platform Components

The IthalaMed platform consists of 8 specialized applications serving different stakeholders:

#	Application	Primary Users & Purpose
1	**Patient Mobile App**	Patients & Guardians - Health management, appointments, prescriptions, telemedicine, emergencies
2	**Healthcare Provider App**	Doctors, Nurses, Specialists - Clinical documentation, patient management, orders, telemedicine
3	**Pharmacy Management**	Pharmacists - E-prescriptions, inventory management, dispensing, claims processing
4	**Laboratory System**	Lab Technicians - Order management, result reporting, quality control, DICOM integration

#	Application	Primary Users & Purpose
5	**EMS Operations App**	Dispatchers, Paramedics - Dispatch, GPS tracking, patient data access, hospital coordination
6	**Hospital Operations**	Administrators - Staff management, rounds, bed management, device monitoring, triage
7	**Medical Aid Portal**	Insurance Staff - Member management, claims processing, pre-authorizations, fraud detection
8	**Government Dashboard**	Regulators - Public health surveillance, facility registration, health data analytics

2. Patient Mobile Application

The Patient Mobile App is the primary interface for patients to manage their healthcare journey, access medical records, book appointments, conduct telemedicine consultations, and request emergency services.

2.1 Authentication & Onboarding Module

2.1.1 Functional Requirements

- **FR-PAT-001:** System shall support multi-method authentication (Phone, Email, Biometric)
- **FR-PAT-002:** System shall implement two-factor authentication via SMS OTP or Email OTP
- **FR-PAT-003:** System shall support guardian/dependent management for minors and elderly
- **FR-PAT-004:** System shall perform age verification for users under 18
- **FR-PAT-005:** System shall integrate with medical aid providers for membership verification
- **FR-PAT-006:** System shall require minimum 2 emergency contacts during registration
- **FR-PAT-007:** System shall support POPIA/GDPR compliant privacy consent management
- **FR-PAT-008:** System shall provide offline-capable login with cached credentials
- **FR-PAT-009:** System shall support multi-language selection at login (9 languages)

2.1.2 Screen Specifications

Screen 1: Splash Screen

- Display IthalaMed brand logo centered on screen
- Show loading animation (circular progress indicator)
- Auto-transition to Welcome screen after 2-3 seconds
- Background color: #00BFFF gradient to white

Screen 2: Welcome/Onboarding Carousel

- Slide 1: "Your Health, Connected" - Unified medical records feature
- Slide 2: "Book Appointments Easily" - Provider search and booking
- Slide 3: "Virtual Consultations" - Telemedicine feature
- Slide 4: "Emergency Help" - One-tap ambulance request
- Slide 5: "Manage Prescriptions" - Digital prescription management
- Navigation: Swipe left/right, dot indicators, Skip button
- Final slide: "Get Started" and "Login" buttons

Screen 3: Registration Flow

Step 1 - Personal Details:

  - Full Name (First, Middle, Last) - Required
  - Date of Birth (Date picker, age calculated) - Required
  - Gender (Male, Female, Other, Prefer not to say) - Required
  - National ID Number / Passport Number - Required
  - Validation: ID format validation per country

Step 2 - Contact Details:

  - Mobile Phone Number (with country code selector) - Required, OTP verified
  - Email Address - Required, email verified
  - Physical Address (Street, City, Province, Postal Code) - Required

- Google Maps integration for address autocomplete

Step 3 - Medical Aid Details (Optional):

- Medical Aid Provider (Dropdown: Discovery, Momentum, Bonitas, etc.)
- Membership Number
- Main Member / Dependent selection
- Real-time membership verification with medical aid API

Step 4 - Emergency Contacts (Minimum 2 Required):

- Contact Name, Relationship, Phone Number
- Option to import from device contacts
- Priority order (Primary, Secondary)

Step 5 - Profile Photo & Terms:

- Profile Photo upload (Camera or Gallery) - Optional
- Terms & Conditions checkbox - Required
- Privacy Policy checkbox - Required
- Data processing consent - Required

2.1.3 Registration Workflow

The following workflow defines the complete patient registration process:

Step 1: User launches app and views splash screen
Step 2: User swipes through onboarding carousel or taps 'Skip'
Step 3: User taps 'Get Started' to begin registration
Step 4: System displays language selection modal
Step 5: User enters personal details; system validates ID format
Step 6: User enters phone number; system sends OTP
Step 7: User enters OTP; system verifies and proceeds
Step 8: User enters email; system sends verification link
Step 9: User clicks email link; account marked as email-verified
Step 10: User optionally enters medical aid details
Step 11: If medical aid entered, system verifies membership in real-time
Step 12: User adds minimum 2 emergency contacts
Step 13: User optionally uploads profile photo
Step 14: User accepts Terms & Conditions and Privacy Policy
Step 15: System creates account and redirects to PIN setup
Step 16: User creates 4-6 digit PIN for quick access
Step 17: System prompts for biometric enrollment (optional)
Step 18: System redirects to Patient Dashboard

2.2 Patient Dashboard Module

2.2.1 Functional Requirements

- **FR-PAT-010:** Dashboard shall display family health overview with dependent switching capability
- **FR-PAT-011:** Dashboard shall show health status summary with vital sign trends
- **FR-PAT-012:** Dashboard shall display upcoming appointment countdown
- **FR-PAT-013:** Dashboard shall show active medication reminders with next dose time
- **FR-PAT-014:** Dashboard shall display recent activity feed (last 10 activities)
- **FR-PAT-015:** Dashboard shall always display visible Emergency SOS button (red, prominent)

2.2.2 Dashboard UI Components

Header Section

- Profile switcher dropdown (Patient/Dependents)
- Notification bell with unread badge count
- Settings gear icon
- Emergency SOS button (red circular, always visible, top-right)

Health Summary Cards

- **Vital Signs Card:** Latest BP, Heart Rate, Temperature, O2 Saturation with trend arrows
- **Medication Card:** Current medications with next dose time countdown
- **Appointments Card:** Next appointment details with provider name and countdown
- **Health Score Card:** AI-generated health score (0-100) based on vitals and compliance

Quick Actions Grid (8 buttons)

- Book Appointment, Request Ambulance, Telemedicine, Prescriptions
- Test Results, Medical Records, Health Tracking, Find Provider

Activity Timeline

- Recent consultations (date, provider, diagnosis summary)
- Lab results (date, test name, status)
- Prescription refills (date, medication, pharmacy)
- Immunizations (date, vaccine name, next due)

2.3 Appointments Module

2.3.1 Functional Requirements

- **FR-PAT-020:** System shall provide provider search by specialty, location, rating, availability
- **FR-PAT-021:** System shall display real-time availability from provider calendars
- **FR-PAT-022:** System shall support both in-person and virtual (telemedicine) appointments
- **FR-PAT-023:** System shall integrate with device calendar for appointment sync
- **FR-PAT-024:** System shall send appointment reminders (24hr, 1hr before) via Push, SMS, Email
- **FR-PAT-025:** System shall support QR code check-in at facilities
- **FR-PAT-026:** System shall support geo-fence auto check-in when patient arrives
- **FR-PAT-027:** System shall enforce cancellation policies (24hr notice for free cancellation)

2.3.2 Appointment Booking Workflow

Step 19: Patient taps 'Book Appointment' from dashboard
Step 20: System displays provider search screen with filters
Step 21: Patient selects filters: Specialty, Location (radius), Gender, Language, Rating
Step 22: System displays matching providers in list view (with map toggle)
Step 23: Patient taps on provider card to view full profile
Step 24: System displays provider profile: photo, bio, qualifications, ratings, fees
Step 25: Patient taps 'Book Appointment' on profile
Step 26: System displays calendar with available dates highlighted in blue
Step 27: Patient selects date; system shows available time slots
Step 28: Patient selects time slot (15/30/60 min options)
Step 29: Patient selects consultation type: In-person or Virtual
Step 30: Patient selects patient (Self or Dependent from list)
Step 31: Patient enters reason for visit (text field + common reasons dropdown)

Step 32: Patient optionally attaches relevant documents (PDFs, images)
Step 33: System displays appointment summary for confirmation
Step 34: Patient selects payment method: Medical Aid, Cash, Card
Step 35: If Medical Aid: System performs real-time coverage verification
Step 36: Patient accepts terms and confirms booking
Step 37: System reserves slot and sends confirmation
Step 38: System generates appointment reference number
Step 39: System offers 'Add to Calendar' option
Step 40: System sends confirmation via Push, SMS, and Email
Step 41: Patient can view directions to facility from confirmation screen

2.4 Telemedicine Module

2.4.1 Functional Requirements

- **FR-PAT-030:** System shall support HD video consultations using Jitsi Meet SDK
- **FR-PAT-031:** System shall provide screen sharing capability during consultations
- **FR-PAT-032:** System shall support file sharing during consultations
- **FR-PAT-033:** System shall provide in-call chat messaging
- **FR-PAT-034:** System shall support session recording with explicit patient consent
- **FR-PAT-035:** System shall provide virtual waiting room with countdown timer
- **FR-PAT-036:** System shall display connection quality indicator (green/yellow/red)
- **FR-PAT-037:** System shall auto-fallback to audio-only if video fails (below 2 Mbps)
- **FR-PAT-038:** System shall provide auto-reconnect on connection loss

2.4.2 Telemedicine Consultation Workflow

Pre-Consultation Phase:

Step 42: Patient receives reminder 15 minutes before appointment
Step 43: Patient opens app and navigates to appointment
Step 44: System displays pre-consultation checklist
Step 45: Patient completes pre-consultation questionnaire
Step 46: Patient uploads any required documents
Step 47: System runs connection test (camera, microphone, internet speed)
Step 48: Patient enters virtual waiting room with countdown timer

During Consultation Phase:

Step 49: Provider admits patient from waiting room
Step 50: System establishes encrypted video connection (AES-256)
Step 51: Video interface displays: Provider large, Patient small (PIP)
Step 52: Controls available: Mute, Camera off, Screen share, Chat, End call
Step 53: Timer displays consultation duration
Step 54: Connection quality indicator shows status
Step 55: If recording enabled, recording indicator displays
Step 56: Emergency SOS button remains accessible during call

Post-Consultation Phase:

Step 57: Provider ends call; connection terminates
Step 58: System displays consultation summary
Step 59: Patient receives digital prescription (if issued)
Step 60: System prompts for follow-up appointment booking
Step 61: System processes payment (if applicable)
Step 62: Patient completes satisfaction feedback form
Step 63: Recording saved to cloud (7-day retention) if consented

2.5 Emergency Services Module

2.5.1 Functional Requirements

- **FR-PAT-040:** System shall provide one-tap emergency ambulance request
- **FR-PAT-041:** System shall automatically share GPS location with dispatch
- **FR-PAT-042:** System shall auto-transmit patient medical profile to EMS
- **FR-PAT-043:** System shall provide real-time ambulance tracking on map
- **FR-PAT-044:** System shall display ETA countdown
- **FR-PAT-045:** System shall enable direct communication with paramedics
- **FR-PAT-046:** System shall auto-notify emergency contacts with location link
- **FR-PAT-047:** System shall integrate with What3Words for precise location

2.5.2 Emergency Request Workflow

Step 64: Patient taps Emergency SOS button (always visible, red)
Step 65: System displays emergency type selection: Medical, Accident, Trauma, Pregnancy
Step 66: Patient selects severity level: Critical, Urgent, Non-urgent
Step 67: System auto-detects GPS location
Step 68: Patient confirms or manually corrects address
Step 69: Patient optionally adds landmark description
Step 70: Patient selects patient (Self or Dependent)
Step 71: System auto-sends medical profile: allergies, conditions, medications
Step 72: Patient optionally describes current symptoms/condition
Step 73: Patient confirms emergency request
Step 74: System submits request to EMS dispatch center
Step 75: System displays dispatch confirmation with assigned unit
Step 76: System shows assigned unit details: Vehicle ID, Paramedic names
Step 77: System displays ETA countdown timer
Step 78: System shows live map with ambulance location tracking
Step 79: System provides 'Call Paramedic' button for direct communication
Step 80: System auto-sends SMS/Push to emergency contacts with location link
Step 81: Emergency contacts receive real-time updates
Step 82: System displays 'Prepare for arrival' checklist
Step 83: Paramedic arrival triggers notification
Step 84: Medical data transferred to EMS system automatically
Step 85: Patient transported; family notified of destination hospital
Step 86: Trip log and report generated for patient records

3. Healthcare Provider Application

The Healthcare Provider App serves doctors, nurses, specialists, and other medical professionals. It supports 40+ medical specialties with customized workflows, clinical documentation, patient management, and telemedicine capabilities.

3.1 Provider Dashboard

3.1.1 Functional Requirements

- **FR-PRV-001:** Dashboard shall display daily schedule in Day/Week/Month views
- **FR-PRV-002:** Dashboard shall show patient queue sorted by check-in time with priority flags
- **FR-PRV-003:** Dashboard shall display critical alerts: lab results, abnormal vitals, urgent messages
- **FR-PRV-004:** Dashboard shall show quick stats: patients seen, pending tasks, revenue
- **FR-PRV-005:** Dashboard shall provide tasks & to-dos list with pending actions

3.1.2 Dashboard Components

Schedule View

- Day View: Hourly slots with appointments color-coded by type
- Week View: 7-day overview with appointment density
- Month View: Calendar with appointment counts per day

Patient Queue

- Auto-sorted by check-in time
- Priority flags: Urgent (red), Routine (green)
- Patient status: Checked-in, In-progress, Completed
- Estimated wait time per patient
- Quick actions: Start consultation, Reschedule, Cancel

Alert Center

- Critical lab results requiring immediate attention
- Abnormal vitals from connected monitoring devices
- Prescription approvals needed
- Urgent messages from patients
- Expiring certifications warnings

3.2 Clinical Documentation

3.2.1 Functional Requirements

- **FR-PRV-010:** System shall support SOAP note format for clinical documentation
- **FR-PRV-011:** System shall provide specialty-specific templates for 40+ specialties
- **FR-PRV-012:** System shall support voice-to-text dictation for note entry
- **FR-PRV-013:** System shall provide ICD-10/11 diagnosis code lookup with auto-suggest
- **FR-PRV-014:** System shall support digital signature for note finalization
- **FR-PRV-015:** System shall maintain version history for all clinical notes

3.2.2 SOAP Note Structure

- **Subjective:** Chief complaint, history of present illness, patient-reported symptoms
- **Objective:** Vital signs, physical examination findings, test results

- **Assessment:** Diagnosis (ICD-10 coded), differential diagnoses, clinical impression
- **Plan:** Treatment plan, medications, referrals, follow-up instructions

3.2.3 Consultation Workflow

Step 87: Provider selects patient from queue
Step 88: System displays patient profile with medical history, allergies (highlighted)
Step 89: Provider reviews pre-consultation questionnaire responses
Step 90: Provider conducts consultation (in-person or telemedicine)
Step 91: Provider enters Subjective section: chief complaint, HPI
Step 92: Provider records vital signs (or imports from nurse entry)
Step 93: Provider documents physical examination findings
Step 94: Provider reviews/orders lab tests and imaging
Step 95: Provider enters diagnosis using ICD-10 code lookup
Step 96: Provider creates treatment plan
Step 97: Provider issues e-prescription (if applicable)
Step 98: Provider creates referrals (if applicable)
Step 99: Provider documents follow-up instructions
Step 100: Provider applies digital signature
Step 101: System saves finalized consultation note
Step 102: System sends consultation summary to patient app

4. Pharmacy Management System

The Pharmacy Management System enables pharmacies to receive e-prescriptions, manage inventory, dispense medications, and process insurance claims efficiently.

4.1 Prescription Processing

4.1.1 Functional Requirements

- **FR-PHR-001:** System shall receive electronic prescriptions from IthalaMed providers in real-time
- **FR-PHR-002:** System shall support manual prescription entry with OCR extraction
- **FR-PHR-003:** System shall verify patient identity before dispensing
- **FR-PHR-004:** System shall check medication availability and suggest alternatives
- **FR-PHR-005:** System shall perform drug interaction verification automatically
- **FR-PHR-006:** System shall check allergies and flag conflicts
- **FR-PHR-007:** System shall verify insurance coverage and calculate co-pay
- **FR-PHR-008:** System shall support generic substitution with patient consent
- **FR-PHR-009:** System shall generate medication labels with barcode
- **FR-PHR-010:** System shall record patient counseling documentation

4.1.2 Prescription Dispensing Workflow

Step 103: Prescription arrives in queue (electronic) or pharmacist enters manually
Step 104: System validates prescription: prescriber verification, expiry check
Step 105: Pharmacist verifies patient identity (ID, date of birth)
Step 106: System displays patient profile: allergies, current medications
Step 107: System checks medication availability in inventory
Step 108: System performs automatic drug interaction check
Step 109: System performs allergy verification
Step 110: If pregnant/breastfeeding flag, system displays warnings
Step 111: System verifies insurance coverage
Step 112: System checks formulary compliance
Step 113: System calculates patient co-pay amount
Step 114: If generic substitution available, system offers alternative
Step 115: Pharmacist selects stock batch (FEFO - First Expiry First Out)
Step 116: Pharmacist counts/measures medication
Step 117: System generates label with patient name, drug, dosage, instructions
Step 118: Pharmacist attaches auxiliary labels if needed
Step 119: Pharmacist conducts patient counseling
Step 120: System records counseling provided
Step 121: System calculates total amount
Step 122: System auto-submits insurance claim
Step 123: Patient pays remaining balance (cash/card)
Step 124: System generates receipt
Step 125: System updates inventory
Step 126: System marks prescription as dispensed
Step 127: Patient receives notification in app

4.2 Inventory Management

4.2.1 Functional Requirements

- **FR-PHR-020:** System shall maintain comprehensive stock catalog with medication details
- **FR-PHR-021:** System shall track batch numbers and expiry dates

- **FR-PHR-022:** System shall auto-generate reorder alerts at defined thresholds
- **FR-PHR-023:** System shall flag expired and expiring (within 3 months) medications
- **FR-PHR-024:** System shall support purchase order generation and supplier management
- **FR-PHR-025:** System shall track controlled substances separately with regulatory reporting
- **FR-PHR-026:** System shall support stock adjustments with mandatory reason codes

5. Laboratory Information System

The Laboratory Information System manages test orders, specimen tracking, result reporting, and quality control for diagnostic laboratories.

5.1 Test Order Management

5.1.1 Functional Requirements

- **FR-LAB-001:** System shall receive electronic orders from IthalaMed providers
- **FR-LAB-002:** System shall support manual order entry for walk-in patients
- **FR-LAB-003:** System shall maintain comprehensive test catalog with specimen requirements
- **FR-LAB-004:** System shall generate collection labels with barcodes
- **FR-LAB-005:** System shall track specimen chain of custody
- **FR-LAB-006:** System shall support STAT, Urgent, and Routine priority levels

5.1.2 Test Processing Workflow

Step 128: Order received in lab system (electronic or manual entry)
Step 129: Lab accepts or rejects order (with reason if rejected)
Step 130: System generates collection labels with barcodes
Step 131: Phlebotomist collects specimen; records collection time
Step 132: System tracks specimen transport to lab
Step 133: Lab receives specimen; checks condition on arrival
Step 134: If specimen rejected (hemolyzed, clotted), system notifies ordering provider
Step 135: Technician prepares sample (centrifuge, aliquot if needed)
Step 136: Technician runs quality control samples
Step 137: System verifies QC within acceptable range
Step 138: Technician loads samples into analyzer
Step 139: Analyzer processes tests; results auto-feed to system
Step 140: System applies reference ranges by patient age/gender
Step 141: System flags abnormal values (High, Low, Critical)
Step 142: If critical value: System triggers immediate notification protocol
Step 143: Pathologist reviews results (if required)
Step 144: Pathologist adds interpretation notes
Step 145: Results finalized and signed
Step 146: System sends results to ordering provider
Step 147: System updates patient record
Step 148: Patient receives notification in app
Step 149: Sample archived per retention policy

5.2 Critical Value Notification

5.2.1 Protocol

- System immediately alerts ordering provider via SMS, Call, and Push notification
- System documents: Who was notified, Time of notification
- Provider must acknowledge notification in system
- System logs provider's intended action
- If no acknowledgment within 15 minutes, system escalates to backup provider

6. EMS Operations System

The EMS Operations System manages emergency dispatch, ambulance tracking, field operations, and hospital coordination.

6.1 Dispatch Center

6.1.1 Functional Requirements

- **FR-EMS-001:** System shall receive emergency requests from patient app in real-time
- **FR-EMS-002:** System shall display call triage interface with severity levels
- **FR-EMS-003:** System shall track all unit availability and current locations via GPS
- **FR-EMS-004:** System shall auto-suggest nearest available unit based on location and capabilities
- **FR-EMS-005:** System shall coordinate with receiving hospitals for bed availability
- **FR-EMS-006:** System shall provide communication hub between dispatch, units, and hospitals

6.1.2 Dispatch Dashboard Components

Active Calls Panel

- Call ID and timestamp
- Location (Address + GPS coordinates + What3Words)
- Patient details (if available from IthalaMed)
- Emergency type and priority level
- Status: Pending, Dispatched, En-route, On-scene, Transporting, Complete

Unit Status Board

- Unit ID (Ambulance number)
- Crew members (names and qualifications)
- Current GPS location (live tracking)
- Status: Available, Busy, Standby, Out-of-service
- Unit capability: ALS (Advanced Life Support) vs BLS (Basic Life Support)

6.2 Field Operations (Paramedic Interface)

6.2.1 Patient Assessment Workflow

Step 150: Paramedic receives dispatch notification with call details
Step 151: System displays patient medical profile (allergies, conditions, medications)
Step 152: Paramedic confirms scene safety
Step 153: Paramedic documents number of patients and mechanism of injury
Step 154: Paramedic conducts Primary Survey (ABCDE)
- Airway: Patent, Obstructed, Maintained (OPA, ETT)
- Breathing: RR, SpO2, Breath sounds, Chest movement
- Circulation: HR, BP, Cap refill, Pulses, Bleeding
- Disability: GCS (Eye, Verbal, Motor), Pupils, Glucose
- Exposure: Temperature, Injuries, Skin condition

Step 155: Paramedic records vital signs
Step 156: Paramedic collects SAMPLE history
- Signs/Symptoms, Allergies, Medications, Past medical history
- Last oral intake, Events leading to incident

Step 157: Paramedic documents interventions performed
Step 158: Paramedic records medications administered
Step 159: System sends hospital notification with ETA and patient status

Step 160: Paramedic completes handover report on arrival
Step 161: System transfers patient data to hospital system

7. Hospital Operations System

The Hospital Operations System manages staff scheduling, hospital rounds, bed management, medical device integration, and emergency department operations.

7.1 Staff Management

7.1.1 Functional Requirements

- **FR-HOS-001:** System shall maintain staff profiles with credentials, certifications, and expiry dates
- **FR-HOS-002:** System shall support shift pattern creation and rotation scheduling
- **FR-HOS-003:** System shall manage leave requests and approvals
- **FR-HOS-004:** System shall track clock-in/clock-out with attendance reporting
- **FR-HOS-005:** System shall alert administrators of expiring certifications
- **FR-HOS-006:** System shall display real-time staffing levels by department

7.2 Bed Management

7.2.1 Functional Requirements

- **FR-HOS-010:** System shall display real-time bed status across all departments
- **FR-HOS-011:** System shall track bed states: Occupied, Ready, Dirty, Blocked, Reserved
- **FR-HOS-012:** System shall support bed assignment with isolation and special needs consideration
- **FR-HOS-013:** System shall integrate discharge planning with bed turnover alerts
- **FR-HOS-014:** System shall alert when capacity falls below threshold

7.3 Hospital Rounds

7.3.1 Rounds Workflow

Step 162: Attending physician initiates rounds session for ward
Step 163: System displays patient list for selected ward
Step 164: Team reviews overnight events and nursing handover notes
Step 165: For each patient, system displays:
- Current vitals and trends
- Active problems and diagnoses
- Current medications
- Recent lab results with abnormals highlighted
- Pending orders and consultations

Step 166: Physician documents progress note using SOAP format
Step 167: Physician updates orders as needed
Step 168: System tracks tasks assigned during rounds
Step 169: Rounds session completed; summary generated
Step 170: System prepares handover report for next shift

7.4 Medical Device Integration

7.4.1 Functional Requirements

- **FR-HOS-020:** System shall integrate with bedside monitors via Mirth Connect
- **FR-HOS-021:** System shall display real-time vital signs from connected devices
- **FR-HOS-022:** System shall generate critical alerts for out-of-range values

- **FR-HOS-023:** System shall support ICU central monitoring station view
- **FR-HOS-024:** System shall archive all device data with timestamps

7.5 Emergency Department (ED) Module

7.5.1 ESI Triage Levels

Level	Category	Response Time	Examples
1	Resuscitation	Immediate	Cardiac arrest, severe trauma
2	Emergent	< 10 minutes	Chest pain, stroke symptoms
3	Urgent	< 30 minutes	Abdominal pain, high fever
4	Less Urgent	< 60 minutes	Minor injuries, earache
5	Non-urgent	< 120 minutes	Cold symptoms, prescription refill

8. Medical Aid/Insurance Portal

The Medical Aid Portal enables insurance providers to manage members, process claims, handle pre-authorizations, and detect fraud.

8.1 Claims Processing

8.1.1 Functional Requirements

- **FR-INS-001:** System shall auto-receive claims from healthcare providers
- **FR-INS-002:** System shall perform eligibility verification against member database
- **FR-INS-003:** System shall verify benefits against member plan
- **FR-INS-004:** System shall perform medical necessity review
- **FR-INS-005:** System shall verify pricing against fee schedules
- **FR-INS-006:** System shall perform adjudication: Approved, Partially approved, Denied
- **FR-INS-007:** System shall notify members of claim status

8.1.2 Claims Workflow

Step 171: Claim received from provider (electronic submission)
Step 172: System performs eligibility verification
Step 173: System checks benefit verification against plan
Step 174: System performs medical necessity review
Step 175: System verifies pricing against contracted rates
Step 176: System runs fraud detection algorithms
Step 177: System performs adjudication
Step 178: If approved: System processes payment to provider
Step 179: If denied: System records rejection reason
Step 180: System sends notification to member

8.2 Fraud Detection

8.2.1 Detection Rules

- **Duplicate Claims:** Same service, same date, same provider
- **Unbundling:** Billing separately for services that should be bundled
- **Upcoding:** Billing for more expensive services than provided
- **Provider Pattern Analysis:** Abnormal billing patterns compared to peers
- **Member Utilization Analysis:** Excessive usage patterns

9. Government & Regulator Dashboard

The Government Dashboard provides regulators with public health surveillance, facility registration management, and health data analytics.

9.1 Public Health Surveillance

9.1.1 Functional Requirements

- **FR-GOV-001:** System shall track notifiable disease cases in real-time
- **FR-GOV-002:** System shall provide geographic mapping of disease outbreaks
- **FR-GOV-003:** System shall generate trend analysis and outbreak alerts
- **FR-GOV-004:** System shall track vaccination coverage by region
- **FR-GOV-005:** System shall monitor health facility compliance

9.2 Health Data Analytics

9.2.1 Analytics Capabilities

- De-identified population health data aggregation
- Disease burden analysis by region and demographics
- Healthcare resource allocation optimization
- Policy planning support with predictive modeling
- Epidemiological reports and dashboards

10. Security & Compliance Requirements

10.1 Data Protection

10.1.1 Encryption Standards

- **Data at Rest:** AES-256 encryption
- **Data in Transit:** TLS 1.3
- **Database:** Transparent Data Encryption (TDE)

10.1.2 Authentication

- **Primary:** JWT tokens with 15-minute expiry
- **MFA:** SMS OTP, Email OTP
- **Biometric:** Fingerprint, Face ID

10.2 Role-Based Access Control (RBAC)

Role	Key Permissions
Patient	View own records, book appointments, request prescriptions, emergency access
Guardian	Manage dependent records, book on behalf, view medical history
Attending Physician	Full patient access, create/sign notes, order medications/labs/imaging, view device data
Registered Nurse	View patient data, create nursing notes, acknowledge device alerts, administer medications
Pharmacist	View prescriptions, dispense medications, check interactions, manage inventory
Lab Technician	View lab orders, create results, quality control
Hospital Admin	Staff management, shift scheduling, view audit logs, system configuration

10.3 Audit Logging

- **Events:** All PHI access logged
- **Storage:** Immutable logs
- **Retention:** 7 years minimum

10.4 Compliance Standards

- **HIPAA:** Health Insurance Portability and Accountability Act compliance
- **POPIA:** Protection of Personal Information Act (South Africa)
- **HL7 FHIR:** Healthcare interoperability standard
- **DICOM:** Medical imaging standard
- **ICD-10/11:** International Classification of Diseases

11. Non-Functional Requirements

11.1 Performance Requirements

Operation	Target	Maximum
Authentication (login)	< 200ms	500ms
Patient lookup	< 300ms	800ms
Load medical records	< 500ms	1s
Real-time vital signs (WebSocket)	< 50ms	100ms
DICOM image load (preview)	< 1s	2s
App launch (cold start)	< 3s	5s
Screen transitions	60 FPS	30 FPS minimum

11.2 Scalability Targets

- **Concurrent Users:** 10,000 simultaneous connections
- **Device Connections:** 1,000 medical devices
- **API Requests:** 100,000 requests/minute
- **System Uptime:** 99.9% SLA

11.3 Infrastructure Requirements

Component	Specification	Notes
API Servers	4 cores, 16GB RAM each	Auto-scaling (2-10 instances)
Database (PostgreSQL)	8 cores, 32GB RAM	Multi-AZ, read replicas (3+)
Redis Cache	2 cores, 8GB RAM	Clustered mode
Mirth Connect	4 cores, 16GB RAM	3-node HA cluster
DICOM Server (Orthanc)	8 cores, 32GB RAM	1 PB storage (S3)

12. Appendix

12.1 Glossary

- **ALS:** Advanced Life Support
- **BLS:** Basic Life Support
- **DICOM:** Digital Imaging and Communications in Medicine
- **EMR:** Electronic Medical Record
- **EMS:** Emergency Medical Services
- **ESI:** Emergency Severity Index
- **FEFO:** First Expiry First Out
- **FHIR:** Fast Healthcare Interoperability Resources
- **GCS:** Glasgow Coma Scale
- **HIPAA:** Health Insurance Portability and Accountability Act
- **HL7:** Health Level Seven International
- **ICD:** International Classification of Diseases
- **ICU:** Intensive Care Unit
- **MFA:** Multi-Factor Authentication
- **OTP:** One-Time Password
- **PHI:** Protected Health Information
- **POPIA:** Protection of Personal Information Act
- **RBAC:** Role-Based Access Control
- **SOAP:** Subjective, Objective, Assessment, Plan (clinical note format)
- **TLS:** Transport Layer Security

12.2 Document Approval

Role	Name	Signature/Date
Product Owner	_____	_____
Technical Lead	_____	_____
Medical Advisor	_____	_____
Compliance Officer	_____	_____

— End of Document —