Software Requirements Specification (SRS)

ICU Department Management System

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1. Introduction

1.1 Purpose

This Software Requirements Specification (SRS) document provides a complete description of the ICU Department Management System. It describes the functional and non-functional requirements for the system designed to manage Intensive Care Unit operations in hospitals.

1.2 Scope

The ICU Management System is a web-based application that provides:

- Real-time patient monitoring and management
- Room and bed allocation tracking
- Medical staff scheduling and attendance
- Medication management and drug sheets
- Clinical notes and patient history tracking
- Reporting and analytics capabilities

1.3 Definitions, Acronyms, and Abbreviations

- **ICU**: Intensive Care Unit
- **CRUD**: Create, Read, Update, Delete
- **SRS**: Software Requirements Specification
- **UI**: User Interface
- **NSTEMI**: Non-ST Elevation Myocardial Infarction
- **COPD**: Chronic Obstructive Pulmonary Disease
- **BP**: Blood Pressure
- **SpO2**: Peripheral Oxygen Saturation
- **ECG**: Electrocardiogram

1.4 References

- HTML5 Standard
- Bootstrap 5.3.0 Documentation
- Chart.js Documentation
- Font Awesome 6.4.0 Icon Library

1.5 Overview

This document is organized into sections describing:

- System overview and context
- Detailed functional requirements
- Interface requirements
- Performance and quality attributes
- Design constraints

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2. Overall Description

2.1 Product Perspective

The ICU Management System is a standalone web application that operates within hospital environments. It interfaces with:

- Web browsers (Chrome, Firefox, Safari, Edge)
- LocalStorage for data persistence
- Hospital network infrastructure

2.2 Product Functions

Major functions include:

- User authentication and authorization
- Patient admission, monitoring, and discharge
- Room allocation and status management
- Medical staff scheduling and attendance tracking
- Medication administration tracking
- Clinical documentation
- Statistical reporting and analytics

2.3 User Classes and Characteristics

2.3.1 System Administrator

- **Frequency of Use:** Daily
- **Functions:** User management, system configuration, access control
- **Technical Expertise:** High
- **Security Level:** Full access

2.3.2 Medical Doctor

- **Frequency of Use:** Multiple times per shift
- **Functions:** Patient diagnosis, treatment planning, clinical notes, medication orders
- **Technical Expertise:** Medium
- **Security Level:** High access to patient data

2.3.3 Nurse

- **Frequency of Use:** Continuous during shift
- **Functions:** Vital signs recording, medication administration, patient monitoring
- **Technical Expertise:** Medium
- **Security Level:** Medium access to patient data

2.3.4 Receptionist/Admin Staff

- **Frequency of Use:** Daily
- **Functions:** Patient admission, room assignment, basic data entry
- **Technical Expertise:** Low-Medium
- **Security Level:** Limited access

2.4 Operating Environment

- **Client Side:** Modern web browsers (Chrome 90+, Firefox 88+, Safari 14+, Edge 90+)
- **Server Side:** Any web server (Apache, Nginx, IIS)
- **Database:** LocalStorage (prototype), expandable to SQL/NoSQL databases
- **Network:** LAN/WAN with HTTPS support
- **Devices:** Desktop computers, laptops, tablets

2.5 Design and Implementation Constraints

- Must support Right-to-Left (RTL) and Left-to-Right (LTR) layouts
- Must be responsive (mobile, tablet, desktop)
- Must work offline with LocalStorage
- Must comply with HIPAA regulations (in production)
- Must support multiple concurrent users (in production)

2.6 Assumptions and Dependencies

- Users have basic computer literacy
- Stable internet connection for cloud deployment
- JavaScript enabled in browsers
- Minimum screen resolution of 1024x768
- LocalStorage enabled in browsers

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3. System Features

3.1 User Authentication Module

3.1.1 Description

Secure user login and session management system.

3.1.2 Functional Requirements

FR-AUTH-001: System shall provide login page with username/email and password fields
Priority: High
Source: Security Requirements

FR-AUTH-002: System shall validate user credentials against stored data
Priority: High
Source: Security Requirements

FR-AUTH-003: System shall provide password visibility toggle
Priority: Medium
Source: Usability Requirements

FR-AUTH-004: System shall support "Remember Me" functionality
Priority: Low
Source: User Request

FR-AUTH-005: System shall provide "Forgot Password" functionality
Priority: Medium
Source: User Support Requirements

FR-AUTH-006: System shall maintain user session using LocalStorage
Priority: High
Source: Technical Requirements

FR-AUTH-007: System shall redirect unauthenticated users to login page
Priority: High
Source: Security Requirements

FR-AUTH-008: System shall provide logout functionality with confirmation
Priority: Medium
Source: Security Requirements

FR-AUTH-009: System shall support user registration with validation
Priority: High
Source: User Management

FR-AUTH-010: System shall validate password strength (minimum 8 characters)
Priority: High
Source: Security Requirements

3.2 Dashboard Module

3.2.1 Description

Central overview of ICU operations with real-time statistics and visualizations.

3.2.2 Functional Requirements

FR-DASH-001: System shall display total number of ICU rooms
Priority: High
Source: Operational Requirements

FR-DASH-002: System shall display current patient count
Priority: High
Source: Operational Requirements

FR-DASH-003: System shall display total medical staff count
Priority: Medium
Source: Staff Management

FR-DASH-004: System shall display number of critical cases
Priority: High
Source: Clinical Requirements

FR-DASH-005: System shall show number of available rooms
Priority: High
Source: Bed Management

FR-DASH-006: System shall show number of staff on duty
Priority: Medium
Source: Staff Management

FR-DASH-007: System shall display weekly occupancy rate chart
Priority: Medium
Source: Analytics Requirements

FR-DASH-008: System shall display room status distribution chart (doughnut)
Priority: Medium
Source: Analytics Requirements

FR-DASH-009: System shall show recent activities feed with timestamps
Priority: Medium
Source: Audit Requirements

FR-DASH-010: System shall display current shift information
Priority: Medium
Source: Staff Scheduling

FR-DASH-011: System shall list on-duty staff members with photos
Priority: Low
Source: Usability Requirements

FR-DASH-012: System shall animate statistics counters on page load
Priority: Low
Source: UX Requirements

FR-DASH-013: System shall update all statistics from real-time data
Priority: High
Source: Data Accuracy Requirements

3.3 Room Management Module

3.3.1 Description

Management of ICU rooms including status tracking, patient assignment, and availability.

3.3.2 Functional Requirements

FR-ROOM-001: System shall display all ICU rooms in grid/card layout
Priority: High
Source: Operational Requirements

FR-ROOM-002: System shall show room status (Available, Occupied, Cleaning)
Priority: High
Source: Bed Management

FR-ROOM-003: System shall display patient information for occupied rooms
Priority: High
Source: Patient Tracking

FR-ROOM-004: System shall allow filtering rooms by status
Priority: Medium
Source: Usability Requirements

FR-ROOM-005: System shall display filter counts for each status
Priority: Medium
Source: Usability Requirements

FR-ROOM-006: System shall allow assigning patients to available rooms
Priority: High
Source: Bed Allocation

FR-ROOM-007: System shall validate room availability before assignment
Priority: High
Source: Business Logic

FR-ROOM-008: System shall allow evacuating (discharging) patients from rooms
Priority: High
Source: Patient Discharge

FR-ROOM-009: System shall update room status automatically when patient assigned/discharged
Priority: High
Source: Data Integrity

FR-ROOM-010: System shall display critical condition indicator for critical patients
Priority: High
Source: Clinical Safety

FR-ROOM-011: System shall show patient admission date in room card
Priority: Medium
Source: Information Display

FR-ROOM-012: System shall provide room search functionality
Priority: Medium
Source: Usability Requirements

FR-ROOM-013: System shall confirm before evacuating room
Priority: High

Source: Safety Requirements

FR-ROOM-014: System shall persist room status changes to database
Priority: High
Source: Data Persistence

FR-ROOM-015: System shall allow viewing patient details from room card
Priority: High
Source: Navigation Requirements

3.4 Patient Management Module

3.4.1 Description

Comprehensive patient information management including medical records, medications, and clinical notes.

3.4.2 Functional Requirements

FR-PAT-001: System shall display all patients in sortable table format
Priority: High
Source: Operational Requirements

FR-PAT-002: System shall provide patient search by name, ID, room number
Priority: High
Source: Usability Requirements

FR-PAT-003: System shall allow filtering patients by condition (Stable/Critical/Moderate)
Priority: Medium
Source: Clinical Requirements

FR-PAT-004: System shall display patient count for each condition filter
Priority: Medium
Source: Statistics Requirements

FR-PAT-005: System shall allow adding new patients with complete information
Priority: High
Source: Patient Admission

FR-PAT-006: System shall validate required fields before saving patient
Priority: High
Source: Data Integrity

FR-PAT-007: System shall auto-generate unique patient ID
Priority: High
Source: Database Requirements

FR-PAT-008: System shall allow deleting patients with confirmation
Priority: Medium
Source: Data Management

FR-PAT-009: System shall navigate to patient detail view when row clicked
Priority: High
Source: Navigation Requirements

FR-PAT-010: System shall display patient avatar/photo
Priority: Low
Source: Visual Enhancement

FR-PAT-011: System shall show vital signs summary in patient list
Priority: Medium
Source: Quick Reference

FR-PAT-012: System shall display room assignment for each patient
Priority: High
Source: Bed Tracking

3.5 Patient Detail Module

3.5.1 Description

Detailed patient medical record view with complete history, diagnosis, and treatment information.

3.5.2 Functional Requirements

FR-PATD-001: System shall display patient demographic information
Priority: High
Source: Medical Records

FR-PATD-002: System shall display chief complaint section
Priority: High
Source: Clinical Documentation

FR-PATD-003: System shall display complete medical history
Priority: High
Source: Clinical Documentation

FR-PATD-004: System shall display current diagnosis
Priority: High
Source: Clinical Documentation

FR-PATD-005: System shall display treatment plan
Priority: High
Source: Clinical Documentation

FR-PATD-006: System shall display medication schedule (drug sheet)
Priority: High
Source: Medication Management

FR-PATD-007: System shall allow marking medications as "Given"
Priority: High
Source: Medication Administration

FR-PATD-008: System shall update medication status in real-time
Priority: High
Source: Real-time Updates

FR-PATD-009: System shall display all vital signs (BP, Temp, Pulse, SpO2)
Priority: High
Source: Patient Monitoring

FR-PATD-010: System shall allow updating vital signs via modal
Priority: High
Source: Clinical Workflow

FR-PATD-011: System shall validate vital signs input ranges
Priority: Medium
Source: Clinical Safety

FR-PATD-012: System shall display clinical notes timeline
Priority: High
Source: Clinical Documentation

FR-PATD-013: System shall allow adding new clinical notes
Priority: High
Source: Clinical Workflow

FR-PATD-014: System shall timestamp all clinical notes automatically
Priority: High
Source: Audit Requirements

FR-PATD-015: System shall display note author information
Priority: Medium
Source: Accountability

FR-PATD-016: System shall calculate and display days in ICU
Priority: Medium
Source: Statistical Tracking

FR-PATD-017: System shall provide print functionality for patient record
Priority: Medium
Source: Documentation Requirements

FR-PATD-018: System shall persist all changes to patient data
Priority: High
Source: Data Integrity

FR-PATD-019: System shall provide back navigation to patient list
Priority: Medium
Source: Navigation Requirements

FR-PATD-020: System shall display patient condition with color-coded badge
Priority: Medium
Source: Visual Communication

3.6 Staff Management Module

3.6.1 Description

Management of medical staff including doctors, nurses, and administrative personnel.

3.6.2 Functional Requirements

FR-STAFF-001: System shall display all staff members in card/grid layout
Priority: High
Source: Operational Requirements

FR-STAFF-002: System shall show staff photos/avatars
Priority: Low

Source: Visual Enhancement

FR-STAFF-003: System shall display staff role and specialty
Priority: High
Source: Staff Information

FR-STAFF-004: System shall show attendance status (Present/Absent)
Priority: High
Source: Attendance Tracking

FR-STAFF-005: System shall display check-in time for present staff
Priority: Medium
Source: Time Tracking

FR-STAFF-006: System shall allow filtering staff by role
Priority: Medium
Source: Usability Requirements

FR-STAFF-007: System shall display staff statistics (total, doctors, nurses, on-duty)
Priority: Medium
Source: Analytics Requirements

FR-STAFF-008: System shall allow registering attendance (check-in/check-out)
Priority: High
Source: Attendance Management

FR-STAFF-009: System shall auto-fill current time in attendance modal
Priority: Low
Source: Usability Enhancement

FR-STAFF-010: System shall allow adding new staff members
Priority: High
Source: Staff Management

FR-STAFF-011: System shall validate staff information before saving
Priority: High
Source: Data Integrity

FR-STAFF-012: System shall auto-generate unique employee IDs
Priority: High
Source: Database Requirements

FR-STAFF-013: System shall display contact information (phone, email)
Priority: Medium
Source: Communication Needs

FR-STAFF-014: System shall allow editing staff information
Priority: Medium
Source: Data Management

FR-STAFF-015: System shall provide staff search functionality
Priority: Medium
Source: Usability Requirements

3.7 Scheduling Module

3.7.1 Description

Management of staff shift schedules including assignment and conflict detection.

3.7.2 Functional Requirements

FR-SCHED-001: System shall support three shift types (Morning, Evening, Night)
Priority: High
Source: Operational Requirements

FR-SCHED-002: System shall display shift time ranges
Priority: High
Source: Information Display

FR-SCHED-003: System shall show staff count per shift
Priority: Medium
Source: Capacity Planning

FR-SCHED-004: System shall display weekly schedule in table format
Priority: High
Source: Schedule Visualization

FR-SCHED-005: System shall show assigned staff for each shift with badges
Priority: Medium
Source: Visual Communication

FR-SCHED-006: System shall differentiate staff by role in schedule (doctors vs nurses)
Priority: Medium
Source: Role Identification

FR-SCHED-007: System shall allow adding new shifts
Priority: High
Source: Schedule Management

FR-SCHED-008: System shall support multi-select staff assignment
Priority: High
Source: Batch Operations

FR-SCHED-009: System shall detect and display scheduling conflicts
Priority: High
Source: Conflict Prevention

FR-SCHED-010: System shall validate shift assignments before saving
Priority: High
Source: Data Integrity

FR-SCHED-011: System shall allow editing existing shifts
Priority: Medium
Source: Schedule Adjustment

FR-SCHED-012: System shall provide schedule printing functionality
Priority: Medium
Source: Documentation

FR-SCHED-013: System shall support custom date range viewing
Priority: Low
Source: Flexibility Requirements

FR-SCHED-014: System shall display shift notes/comments
Priority: Low
Source: Communication

3.8 Reports & Analytics Module

3.8.1 Description

Statistical reporting and analytics for patients, rooms, and staff performance.

3.8.2 Functional Requirements

FR-REP-001: System shall provide date range filtering for reports
Priority: High
Source: Report Customization

FR-REP-002: System shall support multiple report types (Patient, Room, Staff, Comprehensive)
Priority: High
Source: Analytics Requirements

FR-REP-003: System shall display patient trend chart over time
Priority: Medium
Source: Statistical Analysis

FR-REP-004: System shall show patient distribution by condition (pie chart)
Priority: Medium
Source: Visual Analytics

FR-REP-005: System shall display room occupancy rate chart
Priority: Medium
Source: Capacity Planning

FR-REP-006: System shall show staff attendance rate chart
Priority: Medium
Source: HR Analytics

FR-REP-007: System shall calculate and display weekly summary statistics
Priority: Medium
Source: Summary Reports

FR-REP-008: System shall display performance ranking for top staff
Priority: Low
Source: Performance Management

FR-REP-009: System shall provide PDF download for all report types
Priority: High
Source: Export Requirements

FR-REP-010: System shall show loading indicators during report generation
Priority: Low
Source: User Feedback

FR-REP-011: System shall calculate average patient stay duration
Priority: Medium
Source: Statistical Metrics

FR-REP-012: System shall track new admissions vs discharges
Priority: Medium

Source: Capacity Tracking

3.9 Medication Management (Drug Sheet)

3.9.1 Description

Tracking and management of patient medications including dosing schedules and administration.

3.9.2 Functional Requirements

FR-MED-001: System shall display complete medication list for each patient
Priority: High
Source: Medication Safety

FR-MED-002: System shall show medication name, dose, and frequency
Priority: High
Source: Clinical Requirements

FR-MED-003: System shall display medication administration times
Priority: High
Source: Dosing Schedule

FR-MED-004: System shall show medication status (Given/Pending/Available)
Priority: High
Source: Administration Tracking

FR-MED-005: System shall allow marking medications as administered
Priority: High
Source: Medication Administration

FR-MED-006: System shall update medication status in real-time
Priority: High
Source: Real-time Updates

FR-MED-007: System shall persist medication status changes
Priority: High
Source: Data Persistence

FR-MED-008: System shall support adding new medications to patient
Priority: High
Source: Treatment Management

FR-MED-009: System shall validate medication data before saving
Priority: High
Source: Clinical Safety

3.10 Clinical Notes Module

3.10.1 Description

Documentation system for clinical observations, assessments, and interventions.

3.10.2 Functional Requirements

FR-NOTE-001: System shall display all clinical notes in chronological order
Priority: High
Source: Clinical Documentation

FR-NOTE-002: System shall allow adding new clinical notes
Priority: High
Source: Clinical Workflow

FR-NOTE-003: System shall auto-timestamp all notes
Priority: High
Source: Audit Trail

FR-NOTE-004: System shall record note author (user making entry)
Priority: High
Source: Accountability

FR-NOTE-005: System shall support multi-line text entry for notes
Priority: Medium
Source: Documentation Needs

FR-NOTE-006: System shall validate note content before saving
Priority: Medium
Source: Data Quality

FR-NOTE-007: System shall display notes in timeline format
Priority: Low
Source: Visual Organization

FR-NOTE-008: System shall persist all notes to patient record
Priority: High
Source: Data Persistence

3.11 Vital Signs Monitoring

3.11.1 Description

Real-time tracking and updating of patient vital signs.

3.11.2 Functional Requirements

FR-VITAL-001: System shall track Blood Pressure (systolic/diastolic)
Priority: High
Source: Clinical Monitoring

FR-VITAL-002: System shall track Temperature (Fahrenheit)
Priority: High
Source: Clinical Monitoring

FR-VITAL-003: System shall track Pulse rate (beats per minute)
Priority: High
Source: Clinical Monitoring

FR-VITAL-004: System shall track SpO2 (oxygen saturation percentage)
Priority: High
Source: Clinical Monitoring

FR-VITAL-005: System shall display vital signs with visual indicators
Priority: Medium
Source: Visual Communication

FR-VITAL-006: System shall allow updating all vital signs via modal
Priority: High
Source: Clinical Workflow

FR-VITAL-007: System shall validate vital signs ranges
Priority: High
Source: Clinical Safety

FR-VITAL-008: System shall update vital signs display in real-time
Priority: High
Source: Real-time Monitoring

FR-VITAL-009: System shall show vital signs in patient list summary
Priority: Medium
Source: Quick Reference

FR-VITAL-010: System shall persist vital signs changes
Priority: High
Source: Data Persistence

3.12 Notification System

3.12.1 Description

Alert and notification system for critical events and system messages.

3.12.2 Functional Requirements

FR-NOTIF-001: System shall display notification badge with count
Priority: Medium
Source: User Awareness

FR-NOTIF-002: System shall show notification dropdown when bell clicked
Priority: Medium
Source: Notification Access

FR-NOTIF-003: System shall display notification type, message, and timestamp
Priority: Medium
Source: Information Display

FR-NOTIF-004: System shall color-code notifications by severity
Priority: Low
Source: Visual Communication

FR-NOTIF-005: System shall allow closing notification dropdown
Priority: Low
Source: Usability

FR-NOTIF-006: System shall close dropdown when clicking outside

Priority: Low
Source: UX Standards

FR-NOTIF-007: System shall support toast notifications for actions
Priority: Medium
Source: User Feedback

FR-NOTIF-008: System shall auto-dismiss toast messages after timeout
Priority: Low
Source: UX Standards

3.13 Search & Filter System

3.13.1 Description

Global search and filtering capabilities across all modules.

3.13.2 Functional Requirements

FR-SEARCH-001: System shall provide search box in top navigation
Priority: High
Source: Usability Requirements

FR-SEARCH-002: System shall support live/instant search
Priority: Medium
Source: User Experience

FR-SEARCH-003: System shall filter results as user types
Priority: Medium
Source: Real-time Feedback

FR-SEARCH-004: System shall support keyboard shortcut (Ctrl+K)
Priority: Low
Source: Power User Features

FR-SEARCH-005: System shall search across multiple fields (name, ID, room)
Priority: High
Source: Comprehensive Search

FR-SEARCH-006: System shall highlight or show/hide matching results
Priority: Medium
Source: Visual Feedback

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4. External Interface Requirements

4.1 User Interfaces

4.1.1 General UI Requirements

- **UI-001:** Interface shall be responsive and adapt to screen sizes 320px to 2560px
- **UI-002:** Interface shall support both LTR (English) and RTL (Arabic) layouts
- **UI-003:** Interface shall use consistent color scheme (Primary: #4F46E5, Success: #10B981, Danger: #EF4444, Warning: #F59E0B)
- **UI-004:** Interface shall provide hover effects on interactive elements
- **UI-005:** Interface shall show loading states during data operations
- **UI-006:** Interface shall display error messages clearly to users
- **UI-007:** Interface shall use icons from Font Awesome 6.4.0
- **UI-008:** Interface shall maintain fixed sidebar and sticky top navigation

4.1.2 Sidebar Navigation

- **UI-009:** Sidebar shall be 260px wide and fixed to left side
- **UI-010:** Sidebar shall display logo and system name
- **UI-011:** Sidebar shall highlight active page
- **UI-012:** Sidebar shall show all module icons and names
- **UI-013:** Sidebar shall collapse on mobile devices (<991px)
- **UI-014:** Sidebar shall include logout button at bottom

4.1.3 Top Navigation Bar

- **UI-015:** Top navbar shall be 70px height and sticky
- **UI-016:** Top navbar shall display page title
- **UI-017:** Top navbar shall include search box
- **UI-018:** Top navbar shall show notification bell with badge count
- **UI-019:** Top navbar shall display user profile with avatar
- **UI-020:** Top navbar shall include hamburger menu button on mobile

4.1.4 Forms and Modals

- **UI-021:** Forms shall use Bootstrap 5 form controls
- **UI-022:** Forms shall display validation errors inline
- **UI-023:** Forms shall auto-focus first input field
- **UI-024:** Forms shall auto-fill current date/time where appropriate
- **UI-025:** Modals shall have consistent header, body, footer layout
- **UI-026:** Modals shall show loading state on submit
- **UI-027:** Modals shall reset on close
- **UI-028:** Modals shall be closeable via Escape key

4.1.5 Tables and Lists

- **UI-029:** Tables shall be responsive with horizontal scroll on small screens
- **UI-030:** Table rows shall be clickable where applicable
- **UI-031:** Table rows shall show hover effect
- **UI-032:** Tables shall use consistent column headers
- **UI-033:** Tables shall display empty state when no data

4.1.6 Charts and Visualizations

- **UI-034:** Charts shall use Chart.js library
- **UI-035:** Charts shall be responsive and interactive
- **UI-036:** Charts shall display tooltips on hover
- **UI-037:** Charts shall use consistent color scheme
- **UI-038:** Charts shall include legends where appropriate

4.2 Hardware Interfaces

- **HW-001:** System shall run on standard PC hardware
- **HW-002:** System shall support touchscreen devices
- **HW-003:** System shall require minimum 2GB RAM
- **HW-004:** System shall require minimum 1280x720 display resolution

4.3 Software Interfaces

4.3.1 Browser Requirements

- **SW-001:** System shall support Chrome 90+
- **SW-002:** System shall support Firefox 88+
- **SW-003:** System shall support Safari 14+
- **SW-004:** System shall support Edge 90+
- **SW-005:** System shall require JavaScript enabled

4.3.2 Libraries and Frameworks

- **SW-006:** System shall use Bootstrap 5.3.0 for UI components
- **SW-007:** System shall use Tailwind CSS 2.2.19 for utilities
- **SW-008:** System shall use Font Awesome 6.4.0 for icons
- **SW-009:** System shall use Chart.js for data visualization

4.3.3 Data Storage

- **SW-010:** System shall use LocalStorage API for data persistence
- **SW-011:** System shall support minimum 10MB LocalStorage capacity
- **SW-012:** System shall handle LocalStorage quota exceeded errors

4.4 Communication Interfaces

- **COM-001:** System shall communicate via HTTPS protocol (production)
- **COM-002:** System shall support RESTful API architecture (production)
- **COM-003:** System shall use JSON for data exchange
- **COM-004:** System shall implement CORS policies (production)

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5. System Requirements

5.1 Functional Requirements Summary

5.1.1 Authentication & Authorization (10 requirements)

- User login, logout, registration
- Session management
- Password validation
- Access control

5.1.2 Dashboard (13 requirements)

- Statistics display
- Chart visualizations
- Activity feed
- Shift information

5.1.3 Room Management (15 requirements)

- Room listing and filtering
- Patient assignment
- Room evacuation
- Status tracking

5.1.4 Patient Management (12 requirements)

- Patient listing
- Search and filter
- Add/delete patients
- Navigation to details

5.1.5 Patient Detail (20 requirements)

- Complete medical record
- Vital signs monitoring
- Medication tracking
- Clinical notes
- History and diagnosis

5.1.6 Staff Management (15 requirements)

- Staff listing and filtering
- Attendance tracking
- Add/edit staff
- Contact information

5.1.7 Scheduling (14 requirements)

- Shift management
- Staff assignment
- Conflict detection
- Schedule viewing

5.1.8 Reports (12 requirements)

- Multiple report types
- Chart visualizations
- PDF export
- Statistical summaries

5.1.9 Medication Management (9 requirements)

- Drug sheet display
- Administration tracking
- Status updates
- Dosing schedules

5.1.10 Clinical Notes (8 requirements)

- Note creation
- Timeline display
- Author tracking
- Timestamping

5.1.11 Vital Signs (10 requirements)

- Multiple vital sign types
- Real-time updates
- Range validation
- Visual indicators

5.1.12 Notifications (8 requirements)

- Alert system
- Dropdown display
- Toast messages
- Auto-dismiss

5.1.13 Search & Filter (6 requirements)

- Global search
- Live filtering
- Keyboard shortcuts
- Multi-field search

Total Functional Requirements: 152

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6. Non-Functional Requirements

6.1 Performance Requirements

NFR-PERF-001: System shall load pages within 2 seconds
Priority: High
Measurement: Page load time

NFR-PERF-002: System shall respond to user actions within 500ms
Priority: High
Measurement: Response time

NFR-PERF-003: System shall support minimum 50 concurrent users
Priority: Medium
Measurement: Load testing

NFR-PERF-004: System shall handle 1000+ patient records without degradation
Priority: Medium
Measurement: Database size

NFR-PERF-005: Charts shall render within 1 second
Priority: Medium
Measurement: Render time

NFR-PERF-006: Search shall return results within 100ms
Priority: Medium
Measurement: Query time

6.2 Safety Requirements

NFR-SAFE-001: System shall confirm before data deletion
Priority: High
Risk: Data loss

NFR-SAFE-002: System shall validate all input data
Priority: High
Risk: Invalid data entry

NFR-SAFE-003: System shall prevent double-submission of forms
Priority: Medium
Risk: Duplicate records

NFR-SAFE-004: System shall highlight critical patient conditions prominently
Priority: High
Risk: Missed critical cases

NFR-SAFE-005: System shall validate vital signs ranges for clinical accuracy
Priority: High
Risk: Medical errors

NFR-SAFE-006: System shall require confirmation for room evacuation
Priority: High
Risk: Accidental discharge

6.3 Security Requirements

NFR-SEC-001: System shall require authentication for all pages
Priority: High
Threat: Unauthorized access

NFR-SEC-002: System shall implement password strength requirements
Priority: High
Threat: Weak passwords

NFR-SEC-003: System shall encrypt passwords (production)
Priority: High
Threat: Password exposure

NFR-SEC-004: System shall implement session timeout (production)
Priority: Medium
Threat: Abandoned sessions

NFR-SEC-005: System shall log all data modifications (production)
Priority: High

Threat: Unauthorized changes

NFR-SEC-006: System shall implement role-based access control (production)
Priority: High
Threat: Privilege escalation

NFR-SEC-007: System shall sanitize all user inputs
Priority: High
Threat: XSS attacks

NFR-SEC-008: System shall use HTTPS for all communications (production)
Priority: High
Threat: Data interception

6.4 Software Quality Attributes

6.4.1 Availability

NFR-AVAIL-001: System shall have 99.9% uptime (production)
NFR-AVAIL-002: System shall handle browser crashes gracefully
NFR-AVAIL-003: System shall support offline mode with LocalStorage

6.4.2 Maintainability

NFR-MAINT-001: Code shall be modular and well-commented
NFR-MAINT-002: System shall use consistent naming conventions
NFR-MAINT-003: System shall separate concerns (HTML/CSS/JS)
NFR-MAINT-004: System shall use version control

6.4.3 Portability

NFR-PORT-001: System shall work on Windows, macOS, Linux
NFR-PORT-002: System shall work on mobile devices (iOS, Android)
NFR-PORT-003: System shall not require installation
NFR-PORT-004: System shall be browser-based only

6.4.4 Reliability

NFR-REL-001: System shall handle errors without crashing
NFR-REL-002: System shall validate all data before processing
NFR-REL-003: System shall provide error messages for failures
NFR-REL-004: System shall maintain data integrity across operations

6.4.5 Scalability

NFR-SCALE-001: System architecture shall support database migration
NFR-SCALE-002: System shall support adding new modules
NFR-SCALE-003: System shall handle increasing data volume
NFR-SCALE-004: System design shall support multi-facility deployment

6.4.6 Usability

NFR-USE-001: System shall be learnable within 1 hour
NFR-USE-002: System shall provide intuitive navigation
NFR-USE-003: System shall use familiar UI patterns
NFR-USE-004: System shall provide keyboard shortcuts
NFR-USE-005: System shall display helpful error messages
NFR-USE-006: System shall provide visual feedback for all actions
NFR-USE-007: System shall support multiple languages (English, Arabic)

---

7. Data Requirements

7.1 Patient Data Model

```
{
  id: String (Unique, Auto-generated, Format: P#####),
  name: String (Required, Max 100 chars),
  age: Integer (Required, Range: 0-120),
  gender: String (Required, Values: Male/Female/Other),
  room: String (Required, References Room ID),
  admissionDate: Date (Required, Format: YYYY-MM-DD),
  condition: String (Required, Values: Stable/Moderate/Critical),
  complaint: String (Optional, Max 500 chars),
  history: String (Optional, Max 2000 chars),
  diagnosis: String (Optional, Max 1000 chars),
  treatment: String (Optional, Max 1000 chars),
  vitals: {
    bp: String (Format: ###/##),
    temp: String (Format: ##.#),
    pulse: String (Format: ###),
    spo2: String (Format: ##)
  },
  drugs: Array [{
    name: String,
    dose: String,
    frequency: String,
    time: String,
    status: String (Values: Given/Pending/Available)
  }],
  notes: Array [{
    date: DateTime,
    author: String,
    note: String
  }]
}
```

7.2 Room Data Model

```
{
  id: Integer (Unique, Primary Key),
  status: String (Required, Values: Available/Occupied/Cleaning),
  patientId: String (Nullable, References Patient ID)
}
```

7.3 Staff Data Model

```
{
  id: String (Unique, Format: S###),
  name: String (Required, Max 100 chars),
  role: String (Required, Values: Doctor/Nurse/Admin),
  specialty: String (Optional, Max 100 chars),
  phone: String (Required, Format: +# ###-###-####),
  email: String (Required, Email format),
  status: String (Required, Values: Present/Absent),
  checkInTime: String (Nullable, Format: HH:MM),
  checkOutTime: String (Nullable, Format: HH:MM)
}
```

7.4 User Data Model

```
{
  username: String (Unique, Required),
  email: String (Unique, Required, Email format),
  password: String (Required, Hashed, Min 8 chars),
  firstName: String (Required),
  lastName: String (Required),
  role: String (Required, Values: doctor/nurse/admin/receptionist),
  phone: String (Required)
}
```

7.5 Database Requirements

DR-001: System shall use LocalStorage for prototype
DR-002: System shall support migration to SQL database
DR-003: System shall maintain referential integrity
DR-004: System shall backup data regularly (production)
DR-005: System shall support data export/import
DR-006: System shall handle concurrent data access (production)

---

8. Security Requirements

8.1 Authentication

- **SEC-AUTH-001:** All pages except login/signup require authentication
- **SEC-AUTH-002:** Passwords must be minimum 8 characters
- **SEC-AUTH-003:** Failed login attempts shall be logged
- **SEC-AUTH-004:** Sessions shall expire after inactivity (production)
- **SEC-AUTH-005:** Password reset must verify user identity

8.2 Authorization

- **SEC-AUTHZ-001:** System shall implement role-based access control
- **SEC-AUTHZ-002:** Doctors shall have full patient access
- **SEC-AUTHZ-003:** Nurses shall have limited patient access
- **SEC-AUTHZ-004:** Admins shall have system configuration access
- **SEC-AUTHZ-005:** Receptionists shall have limited admission access

8.3 Data Protection

- **SEC-DATA-001:** Patient data shall be encrypted at rest (production)
- **SEC-DATA-002:** Data transmission shall use TLS/SSL (production)
- **SEC-DATA-003:** System shall comply with HIPAA regulations
- **SEC-DATA-004:** Audit logs shall track all data access
- **SEC-DATA-005:** Personal health information shall be protected

8.4 Privacy

- **SEC-PRIV-001:** System shall not share patient data without consent
- **SEC-PRIV-002:** System shall anonymize data for reports
- **SEC-PRIV-003:** System shall provide privacy policy
- **SEC-PRIV-004:** System shall allow data deletion requests

---

9. Appendices

9.1 Technology Stack

Frontend

- HTML5
- CSS3 (Custom + Bootstrap + Tailwind)
- JavaScript ES6+
- Bootstrap 5.3.0
- Tailwind CSS 2.2.19
- Font Awesome 6.4.0
- Chart.js

Data Storage

- LocalStorage API (prototype)
- Expandable to PostgreSQL/MySQL/MongoDB

Development Tools

- VS Code / Cursor IDE
- Git version control
- Chrome DevTools

9.2 File Structure

```
ICU Management/
│
├── index.html              # Login page
├── signup.html             # Registration page
├── dashboard.html          # Main dashboard
├── rooms.html              # Room management
├── patients.html           # Patient list
├── patient-detail.html     # Patient medical record
├── staff.html              # Staff management
├── schedules.html          # Shift schedules
├── reports.html            # Reports & analytics
│
├── css/
│   └── style.css          # Main stylesheet (1300+ lines)
│
├── js/
│   ├── data-manager.js    # CRUD operations
│   ├── patient-detail.js  # Patient detail logic
│   ├── main.js            # Global functions
│   └── notifications.js   # Toast system
│
└── SRS_Document.md        # This document
```

9.3 Sample Data Sets

9.3.1 Sample Patients (4)

1. John Smith - 45M, NSTEMI, Stable, Room 101
2. Emily Davis - 52F, COPD/Pneumonia, Critical, Room 103
3. Michael Brown - 38M, Post-op appendectomy, Stable, Room 104
4. Sarah Johnson - 29F, Status Migrainosus, Stable, Room 106

9.3.2 Sample Rooms (6)

- Rooms 101-106
- 4 Occupied, 2 Available, 0 Cleaning

9.3.3 Sample Staff (4)

1. Dr. James Johnson - Cardiologist
2. Dr. Sarah Williams - Pulmonologist
3. Nurse Emily Anderson - ICU Nurse
4. Nurse Michael Chen - Critical Care Nurse

9.4 Use Case Diagrams

Use Case 1: Patient Admission

```
Actor: Receptionist/Doctor
Precondition: Available room exists
Main Flow:
1. User clicks "Add New Patient"
2. System displays patient form
3. User enters patient details (name, age, gender, complaint, history)
4. User selects available room
5. User selects condition
6. User clicks "Save Patient"
7. System validates data
8. System creates patient record
9. System assigns patient to room
10. System updates room status to "Occupied"
11. System displays success message
12. System refreshes patient list
Postcondition: Patient admitted, room occupied
```

Use Case 2: Update Vital Signs

```
Actor: Nurse/Doctor
Precondition: Patient exists in system
Main Flow:
1. User navigates to patient detail page
2. System displays patient information
3. User clicks "Update Vitals"
4. System displays vitals form with current values
5. User enters new BP, Temp, Pulse, SpO2
6. User clicks "Update"
7. System validates vital sign ranges
8. System saves new vitals
9. System updates display
10. System shows success message
Postcondition: Vital signs updated and persisted
```

Use Case 3: Administer Medication

```
Actor: Nurse
Precondition: Patient has medication orders
Main Flow:
1. User navigates to patient detail page
2. System displays medication schedule
3. User reviews medication to be given
4. User clicks checkmark button
5. System confirms action
6. System updates medication status to "Given"
7. System persists change
8. System displays success message
Postcondition: Medication administration recorded
```

Use Case 4: Evacuate Room

```
Actor: Doctor/Nurse
Precondition: Room is occupied
Main Flow:
1. User navigates to rooms page
2. System displays all rooms
3. User clicks "Evacuate" on occupied room
4. System displays confirmation dialog
5. User confirms action
6. System removes patient from room
7. System updates room status to "Available"
8. System persists changes
9. System reloads room display
10. System shows success message
Postcondition: Room available, patient discharged
```

9.5 Business Rules

BR-001: A room can only have one patient at a time
BR-002: Patient must be assigned to a room upon admission
BR-003: Critical patients must be flagged visibly
BR-004: Vital signs must be recorded at least every 4 hours
BR-005: All medication administrations must be documented
BR-006: Staff must check in before accessing patient data
BR-007: At least one doctor must be on duty per shift
BR-008: Maximum 4 patients per nurse ratio
BR-009: Clinical notes must include timestamp and author
BR-010: Patient data must be retained for 7 years (regulation)

9.6 Validation Rules

Patient Data

- Name: Required, alphabetic characters, 2-100 chars
- Age: Required, numeric, 0-120
- Room: Required, must be available room
- Condition: Required, enum (Stable/Moderate/Critical)
- Admission Date: Required, valid date, not future

Vital Signs

- Blood Pressure: Format ###/##, systolic 60-250, diastolic 40-150
- Temperature: Format ##.#, range 95-106°F
- Pulse: Format ###, range 40-200 bpm
- SpO2: Format ##, range 70-100%

Staff Data

- Name: Required, alphabetic, 2-100 chars
- Email: Required, valid email format
- Phone: Required, valid phone format
- Employee ID: Unique, alphanumeric

9.7 Error Handling

ERR-001: System shall display user-friendly error messages
ERR-002: System shall log errors to console for debugging
ERR-003: System shall not crash on invalid input
ERR-004: System shall handle LocalStorage quota exceeded
ERR-005: System shall handle network failures gracefully
ERR-006: System shall validate data before processing
ERR-007: System shall provide recovery options for errors

9.8 Keyboard Shortcuts

Shortcut	Action	Context
Ctrl/Cmd + K	Focus search	Global
Ctrl/Cmd + S	Save form	Modals
Escape	Close modal/dropdown	Global

Shortcut	Action	Context
Enter	Submit form	Forms
Tab	Navigate fields	Forms

9.9 Browser Compatibility Matrix

Browser	Version	Supported	Notes
Chrome	90+	✅ Yes	Recommended
Firefox	88+	✅ Yes	Full support
Safari	14+	✅ Yes	Full support
Edge	90+	✅ Yes	Chromium-based
Opera	76+	✅ Yes	Chromium-based
IE 11	-	❌ No	Not supported

9.10 Responsive Breakpoints

Device	Width	Layout
Mobile Portrait	320-575px	Single column, hamburger menu
Mobile Landscape	576-767px	Single column, collapsed sidebar
Tablet	768-991px	Two columns, collapsible sidebar
Desktop	992-1199px	Full layout, fixed sidebar
Large Desktop	1200px+	Full layout, wider content

9.11 Color Specifications

Color Name	Hex Code	Usage
Primary Indigo	#4F46E5	Primary actions, links, active states
Secondary Indigo	#6366F1	Gradients, hover states
Success Green	#10B981	Available, stable, present, success messages
Danger Red	#EF4444	Occupied, critical, errors, alerts
Warning Amber	#F59E0B	Moderate, cleaning, warnings
Info Blue	#3B82F6	Information, room numbers
Dark Gray	#1F2937	Text, sidebar background
Light Gray	#F3F4F6	Backgrounds, borders

9.12 Icon Usage Guide

Icon	Class	Usage
		Logo, vital signs, critical

Icon	Class	Usage
	fa-heartbeat	alerts
	fa-bed	Rooms, bed management
	fa-user-injured	Patients
⚕	fa-user-md	Doctors, medical staff
	fa-chart-bar	Reports, analytics
	fa-calendar-alt	Schedules
	fa-bell	Notifications
	fa-eye	View action
✏	fa-edit	Edit action
	fa-trash	Delete action
	fa-plus	Add action
	fa-pills	Medications
	fa-clipboard	Notes
	fa-door-open	Evacuate room

9.13 Future Enhancements

Phase 2 Features

- Real-time notifications via WebSocket
- Integration with medical devices (vital signs monitors)
- Barcode scanning for medication administration
- Electronic signature for clinical notes
- Advanced reporting with custom date ranges
- Export to Excel/CSV
- Email notifications
- SMS alerts for critical conditions

Phase 3 Features

- Mobile application (iOS/Android)
- Integration with Hospital Information System (HIS)
- Integration with Laboratory Information System (LIS)
- Integration with Picture Archiving and Communication System (PACS)
- Telemedicine capabilities
- AI-powered early warning system
- Voice dictation for clinical notes
- Multilingual support (10+ languages)

Phase 4 Features

- Blockchain for audit trail
- Machine learning for predictive analytics
- Integration with wearable devices
- Patient family portal
- Research data extraction
- Quality metrics dashboard
- Compliance reporting automation

Document Revision History

Version	Date	Author	Changes
1.0	2024-10-07	Development Team	Initial SRS creation

Approval

Role	Name	Signature	Date
Project Manager			
Lead Developer			
Clinical Director			
Quality Assurance			

End of Document

Total Requirements Count:

- Functional Requirements: 152
- Non-Functional Requirements: 45
- UI Requirements: 38
- Security Requirements: 13
- Data Requirements: 6

Grand Total: 254 Requirements