Juan Heart Web Application

Product Requirements Document (PRD)

Version 1.0 | October 2025

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1. Executive Summary

The Juan Heart Web Application is a centralized clinical management platform designed for the Philippine Heart Center (PHC), healthcare providers, and administrators to monitor, validate, and coordinate cardiovascular health data collected through the Juan Heart mobile application. This web-based system enables real-time referral management, population health analytics, and clinical decision support to reduce CVD mortality rates across the Philippines.

Key Value Propositions

- **Clinical Oversight**: Real-time monitoring and validation of mobile app assessments
- **Data-Driven Insights**: Population-level CVD risk analytics and trend analysis
- **Referral Coordination**: Seamless patient journey from assessment to care delivery
- **Research Platform**: Evidence-based model improvement and clinical validation

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2. Product Vision & Goals

Vision Statement

To create a national cardiovascular health intelligence platform that empowers healthcare providers with actionable insights, streamlines referral pathways, and supports evidence-based policy making for CVD prevention and management in the Philippines.

Strategic Goals

1. **Enable Clinical Validation**: Provide tools for healthcare professionals to review and validate AI/ML assessment results
2. **Optimize Referral Networks**: Create efficient pathways from community screening to specialist care
3. **Generate Public Health Intelligence**: Transform individual assessments into population health insights
4. **Support Research & Innovation**: Enable continuous improvement of risk assessment models
5. **Ensure Healthcare Equity**: Monitor and address disparities in cardiovascular care access

Success Metrics

- Referral completion rate > 70%
- Clinical validation turnaround < 24 hours
- User adoption: 100+ healthcare facilities within Year 1
- Assessment accuracy validation > 85%
- System uptime > 99.9%

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3. User Personas & Roles

3.1 Super Administrator (PHC IT Team)

Responsibilities:

- System configuration and maintenance
- User management and access control
- Data security and compliance monitoring
- Integration management with external systems
- System performance optimization

Key Needs:

- Comprehensive system monitoring dashboard
- Automated backup and disaster recovery
- Role-based access control management
- API monitoring and management tools

3.2 PHC Administrator

Responsibilities:

- National CVD program oversight
- Partner facility management
- Clinical protocol updates
- Research coordination
- Policy compliance monitoring

Key Needs:

- National health metrics dashboard
- Facility performance analytics
- Clinical guideline management
- Research data export capabilities

3.3 Hospital Administrator

Responsibilities:

- Facility profile management
- Staff assignment and scheduling
- Resource allocation
- Performance monitoring
- Referral capacity management

Key Needs:

- Facility dashboard with key metrics
- Staff management interface
- Appointment and capacity planning
- Revenue and utilization reports

3.4 Cardiologist/Specialist

Responsibilities:

- Clinical assessment validation
- Referral review and acceptance
- Treatment recommendations
- Patient consultation scheduling
- Clinical notes and documentation

Key Needs:

- Patient assessment queue
- Clinical decision support tools
- Telemedicine integration
- Medical history access
- Prescription management

3.5 Primary Care Physician

Responsibilities:

- Initial referral triage
- Basic assessment review
- Patient education
- Follow-up coordination

Key Needs:

- Simplified referral interface
- Risk stratification tools
- Patient communication features
- Care coordination calendar

3.6 Nurse/Clinical Staff

Responsibilities:

- Patient data verification
- Vital signs validation
- Appointment coordination
- Patient follow-up

Key Needs:

- Patient list management
- Data entry interfaces
- Communication tools
- Task management system

3.7 Data Analyst/Researcher

Responsibilities:

- Population health analysis

- Model performance evaluation
- Research study coordination
- Report generation

Key Needs:

- Advanced analytics tools
- Data export capabilities
- Visualization builders
- Statistical analysis features

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4. Functional Requirements

4.1 Authentication & Access Management

4.1.1 Multi-Factor Authentication

- **Email/Password** with strong password requirements
- **SMS OTP** for sensitive operations
- **Biometric** support for compatible devices
- **SSO Integration** with PHC systems
- **Session Management** with configurable timeout
- **Device Trust** management

4.1.2 Role-Based Access Control (RBAC)

- Hierarchical role structure
- Granular permission management
- Dynamic role assignment
- Audit trail for access changes
- Emergency access protocols

4.2 Dashboard & Analytics

4.2.1 National Overview Dashboard

- **Real-time Metrics**
  - Active assessments nationwide
  - Risk distribution heatmap
  - Referral flow visualization
  - System health indicators
- **Trend Analysis**
  - CVD risk trends by region
  - Seasonal patterns
  - Demographics analysis
  - Intervention effectiveness
- **Predictive Analytics**
  - Risk projection models
  - Resource demand forecasting
  - Outbreak early warning

4.2.2 Facility Dashboard

- Patient flow metrics
- Referral acceptance rate
- Average response time
- Capacity utilization
- Revenue analytics
- Staff productivity

4.2.3 Clinical Dashboard

- Assessment queue management
- Patient risk stratification
- Clinical decision support
- Treatment outcome tracking
- Follow-up compliance

4.3 Referral Management System

4.3.1 Referral Workflow Engine

- **Intake Processing**
    - Automatic risk categorization
    - Priority queuing system
    - Facility matching algorithm
    - Load balancing
- **Review & Validation**
    - Clinical assessment interface
    - Annotation tools
    - Second opinion requests
    - Escalation protocols
- **Acceptance & Scheduling**
    - Real-time availability checking
    - Automated appointment booking
    - Patient notification system
    - Transportation coordination

4.3.2 Communication Hub

- Secure messaging between providers
- Patient communication templates
- Automated reminders
- Emergency alerts
- Broadcast notifications

4.4 Clinical Tools

4.4.1 Assessment Validation Interface

- Side-by-side comparison (AI vs Clinical)
- ECG/imaging viewer integration
- Clinical notes and annotations
- Risk score adjustment
- Validation feedback loop

4.4.2 Clinical Decision Support

- Evidence-based guidelines
- Drug interaction checker
- Clinical pathways
- Best practice alerts
- Reference materials

4.4.3 Telemedicine Integration

- Video consultation scheduling
- Screen sharing capabilities
- Digital stethoscope support
- Prescription generation
- Follow-up scheduling

4.5 Data Management

4.5.1 Patient Registry

- Comprehensive patient profiles
- Medical history timeline
- Risk factor tracking
- Family history management
- Document management

4.5.2 Facility & Provider Directory

- Facility profiles and capabilities
- Provider credentials and specializations
- Service catalog
- Operating hours and availability
- Geographic mapping

4.5.3 Research Data Platform

- De-identified data export
- Cohort builder
- Statistical analysis tools
- Visualization generator
- Research protocol management

4.6 Reporting & Compliance

4.6.1 Standard Reports

- Daily operational reports
- Monthly performance metrics
- Quarterly health trends
- Annual compliance reports
- Custom report builder

4.6.2 Regulatory Compliance

- GDPR/Data Privacy compliance
- Clinical audit trails
- Consent management
- Data retention policies
- Security incident reporting

4.7 Integration Capabilities

4.7.1 External System Integration

- HIS/EMR integration (HL7 FHIR)
- Laboratory Information Systems
- PhilHealth API
- DOH reporting systems
- Payment gateways

4.7.2 Mobile App Synchronization

- Real-time data sync
- Offline capability support
- Conflict resolution
- Version management
- Push notification service

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5. Non-Functional Requirements

5.1 Performance Requirements

- **Page Load Time**: < 2 seconds for 95th percentile
- **API Response Time**: < 500ms for critical endpoints
- **Concurrent Users**: Support 10,000+ simultaneous users
- **Data Processing**: Process 100,000+ assessments/day
- **Search Performance**: < 1 second for complex queries
- **Report Generation**: < 30 seconds for standard reports

5.2 Security Requirements

- **Encryption**: AES-256 for data at rest, TLS 1.3 for data in transit
- **Authentication**: OAuth 2.0 / JWT implementation
- **Authorization**: Attribute-based access control (ABAC)
- **Audit Logging**: Comprehensive activity logging
- **Vulnerability Management**: Quarterly security assessments
- **Compliance**: ISO 27001, HIPAA, Philippine Data Privacy Act

5.3 Availability & Reliability

- **Uptime SLA**: 99.9% availability
- **Disaster Recovery**: RPO < 1 hour, RTO < 4 hours
- **Backup Strategy**: Daily incremental, weekly full backups
- **Failover**: Automatic failover to secondary site
- **Data Redundancy**: Multi-region replication

5.4 Scalability Requirements

- **Horizontal Scaling**: Auto-scaling based on load
- **Database Sharding**: Support for data partitioning
- **Caching Strategy**: Multi-layer caching (CDN, Redis, Application)
- **Load Balancing**: Geographic load distribution
- **Microservices**: Service-oriented architecture

5.5 Usability Requirements

- **Accessibility**: WCAG 2.1 AA compliance
- **Responsive Design**: Optimized for desktop, tablet, mobile
- **Browser Support**: Chrome, Firefox, Safari, Edge (latest 2 versions)
- **Localization**: English, Filipino, major regional languages
- **Training**: In-app tutorials and contextual help

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6. Technical Architecture

6.1 Technology Stack

Frontend (Next.js 14+)


```
- Framework: Next.js 14 with App Router

- Language: TypeScript 5.0+

- Styling: Tailwind CSS 3.4+

- UI Components: shadcn/ui

- State Management: Zustand / TanStack Query

- Charts: Recharts / D3.js

- Forms: React Hook Form + Zod

- Testing: Jest, React Testing Library, Playwright
```

Backend (Laravel 11+)

- Framework: Laravel 11
- Language: PHP 8.3+
- API: RESTful + GraphQL (Lighthouse)
- Authentication: Laravel Sanctum
- Authorization: Spatie Laravel Permission
- Queue: Laravel Horizon (Redis)
- WebSockets: Laravel Echo + Pusher/Soketi
- Testing: PHPUnit, Pest

Database & Storage

- Primary DB: MySQL 8.0+ (Aurora)
- Cache: Redis 7.0+
- Search: Elasticsearch 8.0+
- File Storage: AWS S3 / MinIO
- CDN: CloudFront / Cloudflare

DevOps & Infrastructure

- Container: Docker + Kubernetes
- CI/CD: GitHub Actions / GitLab CI
- Monitoring: Prometheus + Grafana
- Logging: ELK Stack
- APM: New Relic / DataDog
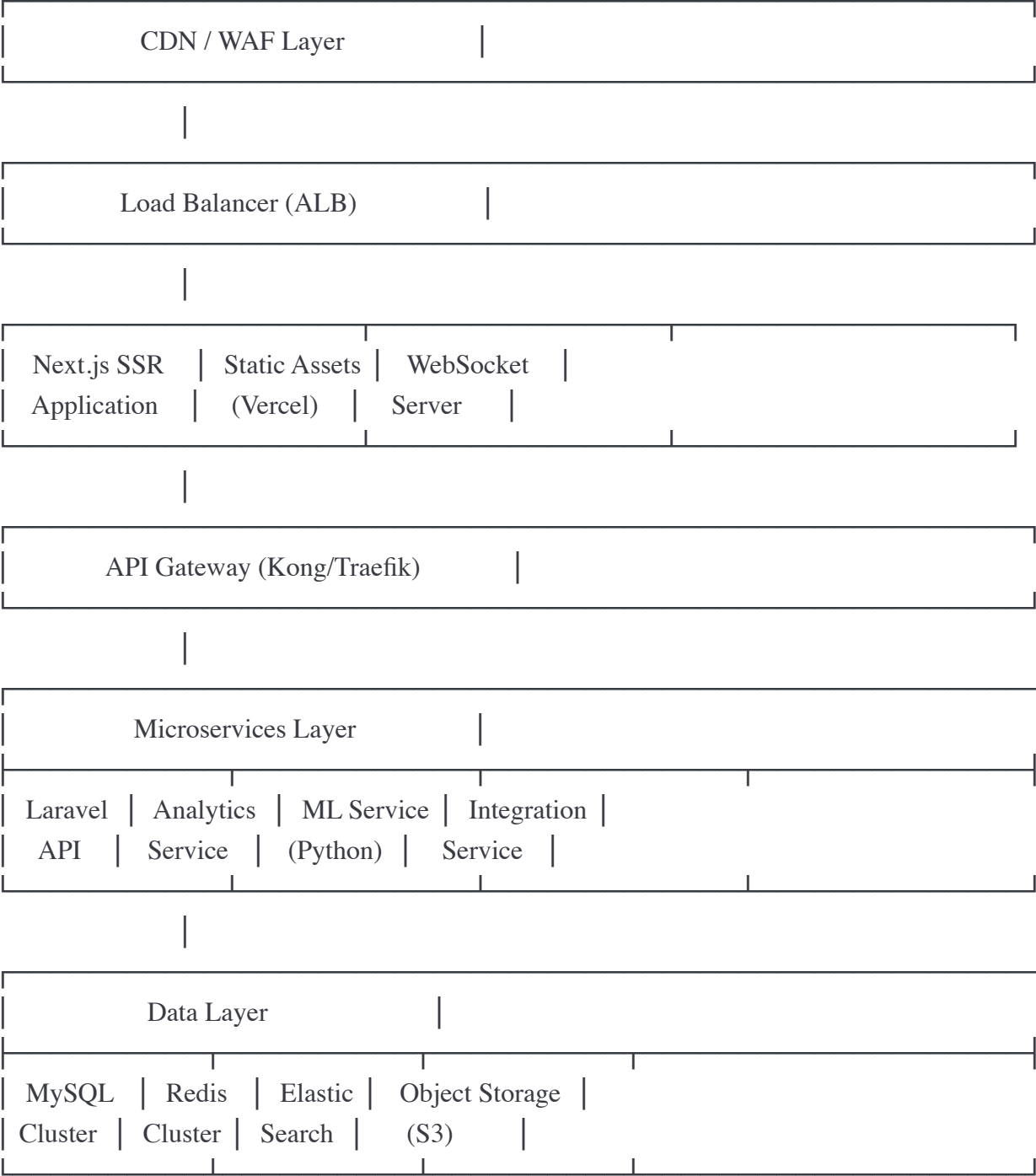- Infrastructure: AWS / Azure

Additional Tools

- API Documentation: OpenAPI 3.0 / Swagger
- Message Queue: RabbitMQ / AWS SQS
- ML Pipeline: Python FastAPI microservice
- Email: AWS SES / SendGrid
- SMS: Twilio / Local providers
- Maps: Mapbox / Google Maps API

6.2 System Architecture

```
┌─────────────────────────────────────────────────────┐
│          CDN / WAF Layer            │                 │
└─────────────────────────────────────────────────────┘
            │
┌─────────────────────────────────────────────────────┐
│       Load Balancer (ALB)           │                 │
└─────────────────────────────────────────────────────┘
            │
┌─────────────────────────────────────────────────────┐
│  Next.js SSR  │ Static Assets │  WebSocket  │         │
│  Application  │    (Vercel)   │   Server    │         │
└─────────────────────────────────────────────────────┘
            │
┌─────────────────────────────────────────────────────┐
│       API Gateway (Kong/Traefik)         │            │
└─────────────────────────────────────────────────────┘
            │
┌─────────────────────────────────────────────────────┐
│       Microservices Layer           │                 │
├─────────────────────────────────────────────────────┤
│ Laravel │ Analytics │ ML Service │ Integration │      │
│  API    │  Service  │  (Python)  │   Service   │      │
└─────────────────────────────────────────────────────┘
            │
┌─────────────────────────────────────────────────────┐
│       Data Layer             │                        │
├─────────────────────────────────────────────────────┤
│ MySQL   │ Redis   │ Elastic │ Object Storage │        │
│ Cluster │ Cluster │ Search  │    (S3)        │        │
└─────────────────────────────────────────────────────┘
```

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7. User Interface Design

7.1 Design Principles

- **Minimalist**: Clean, uncluttered interfaces focusing on essential information
- **Consistent**: Maintain visual harmony with Juan Heart mobile app
- **Accessible**: High contrast, clear typography, keyboard navigation
- **Responsive**: Fluid layouts adapting to various screen sizes
- **Data-Focused**: Emphasis on data visualization and insights
- **Professional**: Clinical-grade interface inspiring trust

7.2 Visual Design System

Color Palette

css

Primary Colors:
- Heart Red: #DC2626 (Primary actions, alerts)
- Midnight Blue: #1E293B (Headers, primary text)
- Cloud White: #FFFFFF (Backgrounds)
- Soft Gray: #F8FAFC (Secondary backgrounds)

Semantic Colors:
- Success: #16A34A
- Warning: #F59E0B
- Danger: #DC2626
- Info: #0EA5E9

Gradient:
- Primary: linear-gradient(135deg, #DC2626 0%, #B91C1C 100%)

Typography

css

- Headings: Inter (Bold, Semi-bold)
- Body: Inter (Regular, Medium)
- Data: JetBrains Mono (Monospace)
- Font Sizes: 12px, 14px, 16px, 18px, 24px, 32px, 48px

Component Design

- **Cards**: Soft shadows, 8px border radius, subtle hover effects
- **Buttons**: Flat design with subtle gradients, clear CTAs
- **Forms**: Floating labels, inline validation, clear error states
- **Tables**: Zebra striping, sticky headers, inline actions
- **Charts**: Consistent color scheme, interactive tooltips
- **Navigation**: Fixed sidebar, breadcrumbs, contextual menus

7.3 Key Interface Screens

7.3.1 Login Screen

- Clean, centered design with Juan Heart branding
- Multi-factor authentication flow
- Remember device option
- Password recovery link
- PHC branding elements

7.3.2 Main Dashboard

- **Header**: Logo, user profile, notifications, search
- **Sidebar**: Role-based navigation, collapsible
- **Content Area**: Metric cards, charts, activity feed
- **Footer**: System status, support links

7.3.3 Referral Management

- Kanban-style board for referral stages
- Quick filters and search
- Patient card preview
- Drag-and-drop functionality
- Bulk actions toolbar

7.3.4 Clinical Review Interface

- Split-screen layout (assessment data | clinical tools)
- Floating action buttons
- Timeline view of patient history
- Annotation and note-taking panel
- Quick access to guidelines

7.3.5 Analytics Dashboard

- Customizable widget layout
- Interactive data visualizations
- Export and sharing tools
- Date range selectors
- Comparison views

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8. Data Model

8.1 Core Entities

sql

-- *Users and Authentication*

users (id, email, password, phone, role_id, status, mfa_enabled, last_login)

roles (id, name, description, permissions)

permissions (id, name, module, action)

user_sessions (id, user_id, token, ip_address, user_agent, expires_at)

-- *Healthcare Facilities*

facilities (id, name, type, level, address, coordinates, contact_info, capacity)

facility_services (id, facility_id, service_type, availability, price_range)

facility_staff (id, facility_id, user_id, designation, schedule)

-- *Patients and Assessments*

patients (id, user_id, medical_record_no, demographics, risk_factors)

assessments (id, patient_id, type, ml_score, rule_score, risk_level, status)

assessment_details (id, assessment_id, vital_signs, symptoms, lifestyle)

clinical_validations (id, assessment_id, doctor_id, validated_score, notes)

-- *Referrals*

referrals (id, assessment_id, source_facility, target_facility, priority, status)

referral_timeline (id, referral_id, action, actor_id, timestamp, notes)

appointments (id, referral_id, patient_id, doctor_id, scheduled_at, status)

-- *Clinical Data*

medical_histories (id, patient_id, condition, diagnosis_date, treatment)

prescriptions (id, patient_id, doctor_id, medications, instructions)

lab_results (id, patient_id, test_type, results, ordered_by, performed_at)

-- *Analytics*

analytics_events (id, user_id, event_type, metadata, timestamp)

aggregated_metrics (id, metric_type, dimension, value, period, calculated_at)

8.2 Data Privacy & Security

- **Encryption**: All PII encrypted at rest
- **Anonymization**: De-identification for research data
- **Audit Trail**: Complete audit log of data access
- **Retention**: Configurable retention policies
- **Consent Management**: Patient consent tracking
- **Data Portability**: Export capabilities for GDPR compliance

9. API Specifications

9.1 RESTful API Design

Base URL Structure

Production: https://api.juanheart.ph/v1
Staging: https://api-staging.juanheart.ph/v1

Authentication Headers

```http
Authorization: Bearer {jwt_token}
X-API-Version: 1.0
X-Client-ID: {client_identifier}
```

9.2 Core Endpoints

Assessment Management

```
GET    /assessments           # List assessments
POST   /assessments           # Create assessment
GET    /assessments/{id}      # Get assessment details
PUT    /assessments/{id}/validate # Validate assessment
POST   /assessments/{id}/refer   # Create referral
```

Referral Management

```
GET    /referrals              # List referrals
GET    /referrals/{id}         # Get referral details
PUT    /referrals/{id}/accept  # Accept referral
PUT    /referrals/{id}/reject  # Reject referral
POST   /referrals/{id}/schedule # Schedule appointment
```

Analytics

```
GET    /analytics/dashboard    # Dashboard metrics
GET    /analytics/trends       # Trend analysis
POST   /analytics/export       # Export data
GET    /analytics/reports/{type} # Generate reports
```

9.3 GraphQL Schema (Selected Operations)

graphql

```graphql
type Query {
  assessments(
    filters: AssessmentFilters
    pagination: PaginationInput
  ): AssessmentConnection!

  referralMetrics(
    facilityId: ID
    dateRange: DateRangeInput
  ): ReferralMetrics!

  populationHealth(
    region: String
    riskFactors: [String]
  ): PopulationHealthData!
}

type Mutation {
  validateAssessment(
    id: ID!
    validation: ValidationInput!
  ): Assessment!

  createReferral(
    input: CreateReferralInput!
  ): Referral!

  updateFacilityCapacity(
    facilityId: ID!
    capacity: CapacityInput!
  ): Facility!
}

type Subscription {
  assessmentCreated(facilityId: ID): Assessment!
  referralStatusChanged(id: ID!): Referral!
}
```

10. Implementation Roadmap

Phase 1: Foundation (Months 1-2)

- **Week 1-2**: Environment setup, CI/CD pipeline
- **Week 3-4**: Authentication system, RBAC
- **Week 5-6**: Core database schema, migrations
- **Week 7-8**: Basic admin dashboard, facility management

Phase 2: Core Features (Months 3-4)

- **Week 9-10**: Assessment review interface
- **Week 11-12**: Referral workflow engine
- **Week 13-14**: Clinical validation tools
- **Week 15-16**: Basic analytics dashboard

Phase 3: Advanced Features (Months 5-6)

- **Week 17-18**: Advanced analytics and reporting
- **Week 19-20**: Integration with mobile app
- **Week 21-22**: Telemedicine capabilities
- **Week 23-24**: External system integrations

Phase 4: Optimization & Launch (Month 7)

- **Week 25-26**: Performance optimization, load testing
- **Week 27**: Security audit, penetration testing
- **Week 28**: UAT with pilot facilities
- **Week 29-30**: Production deployment, monitoring

Phase 5: Post-Launch (Ongoing)

- Continuous monitoring and optimization
- Feature enhancements based on feedback
- Scaling and infrastructure improvements
- Research platform development

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11. Success Metrics & KPIs

11.1 System Performance KPIs

- **Availability**: > 99.9% uptime
- **Response Time**: < 2s page load (p95)
- **Error Rate**: < 0.1% of requests
- **Throughput**: > 1000 requests/second

11.2 Clinical Impact KPIs

- **Assessment Validation Rate**: > 80% within 24 hours
- **Referral Completion**: > 70% of high-risk referrals
- **Time to Care**: < 48 hours for urgent cases

- **Clinical Agreement**: > 85% ML vs clinical validation

11.3 User Adoption KPIs

- **Active Users**: 500+ healthcare providers in Year 1
- **Daily Active Usage**: > 60% of registered users
- **Feature Adoption**: > 40% using advanced analytics
- **User Satisfaction**: NPS > 50

11.4 Public Health Impact KPIs

- **Population Coverage**: 1M+ assessments in Year 1
- **Risk Detection**: 20% increase in early detection
- **Geographic Reach**: Coverage in 50+ provinces
- **Health Outcomes**: 10% reduction in CVD emergencies

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12. Risk Management

12.1 Technical Risks

```
        Risk        Impact                Mitigation
Data breach         High   Multi-layer security, regular audits
System downtime     High   Redundancy, disaster recovery plan
Integration failures Medium Fallback mechanisms, retry logic
Scalability issues  Medium Auto-scaling, performance monitoring
```

12.2 Operational Risks

```
        Risk        Impact                 Mitigation
Low user adoption   High   Training programs, user incentives
Data quality issues Medium Validation rules, data governance
Regulatory changes  Medium Compliance monitoring, flexible architecture
Resource constraints Low   Phased rollout, priority features
```

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13. Compliance & Regulatory

13.1 Healthcare Regulations

- Philippine Data Privacy Act of 2012
- DOH Administrative Orders on Digital Health
- PhilHealth IT Standards
- Telemedicine Act of 2020

13.2 International Standards

- ISO 27001 (Information Security)
- ISO 13485 (Medical Devices)
- HL7 FHIR (Healthcare Interoperability)
- WCAG 2.1 (Web Accessibility)

13.3 Security Standards

- OWASP Top 10 compliance
- PCI DSS (if processing payments)
- NIST Cybersecurity Framework
- SOC 2 Type II certification

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14. Support & Maintenance

14.1 Support Structure

- **Level 1**: Help desk, password resets, basic troubleshooting
- **Level 2**: Application support, bug investigation
- **Level 3**: Development team, critical issues
- **Emergency**: 24/7 on-call rotation for critical systems

14.2 Maintenance Windows

- **Routine**: Weekly, Sundays 2-4 AM PHT
- **Major Updates**: Monthly, with 72-hour notice
- **Emergency**: As needed with incident communication

14.3 Documentation

- User manuals for each role
- API documentation
- System administration guide
- Troubleshooting playbooks
- Video tutorials and webinars

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15. Future Enhancements

Year 2 Roadmap

- AI-powered predictive analytics
- Wearable device integration
- Advanced telemedicine features
- Community health programs
- International expansion readiness

Research & Innovation

- Continuous ML model improvement
- Clinical trial platform
- Real-world evidence generation
- Population health research tools
- Precision medicine capabilities

Ecosystem Development

- Third-party developer APIs
- Marketplace for health services
- Integration with insurance providers
- Patient empowerment tools
- Family health management

Appendices

A. Glossary of Terms

- **CVD**: Cardiovascular Disease
- **PHC**: Philippine Heart Center
- **RHC**: Regional Heart Center
- **ML**: Machine Learning
- **RBAC**: Role-Based Access Control
- **API**: Application Programming Interface
- **FHIR**: Fast Healthcare Interoperability Resources

B. Reference Documents

- Philippine Heart Center Research Roadmap 2023-2028
- DOH Digital Health Framework
- Juan Heart Mobile Application Documentation
- Clinical Practice Guidelines for CVD

C. Contact Information

- Product Owner: [PHC Representative]
- Technical Lead: [Development Team Lead]
- Project Manager: [PM Name]
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