

DENTRA - Complete Project Plan

AI Voice Agent for Dental Appointment Automation

July
17

PROJECT TIMELINE OVERVIEW

Total Duration: 8 months (32 weeks)

Start Date: Week 1

MVP Completion: Week 8

Full Feature Set: Week 32



PHASE 1: MVP DEVELOPMENT (Weeks 1-8)

Week 1-2: Foundation & Infrastructure Setup

Tasks:

- [] Set up NestJS backend project structure
- [] Configure PostgreSQL database
- [] Design database schema (patients, appointments, calls, clinics)
- [] Set up Prisma ORM and migrations
- [] Configure development environment
- [] Set up version control and CI/CD
- [] Create Twilio developer account
- [] Configure Twilio phone number
- [] Set up Deepgram API
- [] Set up OpenAI API
- [] Set up ElevenLabs API

Deliverables:

- Working backend skeleton
- Database schema deployed
- All API credentials configured
- Twilio phone number active

Week 3-4: Core AI Agent Development

Tasks:

- [] Implement Voice Agent service
- Speech-to-text integration (Deepgram)
- Text-to-speech integration (ElevenLabs)
- Natural language processing (OpenAI)
- Conversation state management
- [] Build multi-agent architecture
- Voice Agent (conversation handling)

- Scheduler Agent (appointment logic)
- Policy Agent (business rules)
- Ops Agent (monitoring & escalations)
- [] Implement conversation flow logic
- [] Create intent recognition system
- [] Build context retention mechanism
- [] Develop error handling and recovery

Deliverables:

- Working AI agent that can hold conversations
 - Multi-agent system operational
 - Intent recognition functional
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Week 5: Patient Recognition & History

Tasks:

- [] Implement Caller ID matching
- Phone number indexing in database
- Fast patient lookup algorithm
- [] Build patient history retrieval
- Load previous visits
- Load treatment history
- Load preferences and notes
- [] Create patient context builder
- Format history for AI context
- Build conversation prompts with patient data
- [] Implement new patient flow
- Collect basic information
- Create patient record
- Welcome messaging
- [] Implement returning patient flow
- Personalized greetings
- History references
- Preference-aware suggestions

Deliverables:

- Caller ID system operational
 - Patient history loaded into conversations
 - Differentiated new vs returning patient flows
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Week 6: Insurance & Appointment Scheduling

Tasks:

- [] Build insurance collection workflow
- Ask about insurance
- Collect provider name and ID
- Log to patient record
- Handle “no insurance” gracefully

- Handle “don’t have card” scenario
- [] Implement appointment scheduling logic
- Real-time availability checking
- Multiple appointment types support
- Time slot search algorithm
- Booking confirmation
- [] Build doctor preference system
- Save preferred doctor to patient record
- Priority search for preferred doctor
- Fallback to other doctors
- Handle “any doctor” requests
- [] Create calendar management
- Add appointments to database
- Check conflicts
- Handle overlapping bookings
- Update availability in real-time

Deliverables:

- Insurance collection functional (non-blocking)
 - Appointment booking operational
 - Doctor preferences honored
 - Calendar system working
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Week 7: Dashboard Development

Tasks:

- [] Set up Next.js dashboard project
- [] Build dashboard layout and navigation
- [] Create Overview page
- Stats cards (calls, appointments, success rate)
- Quick actions
- System health indicator
- [] Create Appointments page
- List all appointments
- Filter by status, clinic, date
- Pagination
- View appointment details
- [] Create Calls page
- Call log with transcripts
- Filter and search
- Audio playback
- Call outcomes
- [] Create Escalations page
- Active escalations list
- Escalation details
- Resolve/close actions
- Priority indicators
- [] Create Clinics page
- Multi-clinic selector

- Clinic information display
- Stats per clinic
- [] Build API endpoints for dashboard
- Stats API
- Appointments API
- Calls API
- Escalations API
- Health check API

Deliverables:

- Fully functional web dashboard
 - All dashboard pages operational
 - Real-time data display
 - Dashboard APIs working
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Week 8: Testing, Integration & MVP Launch

Tasks:

- [] End-to-end testing
- Test complete call flows
- Test new patient booking
- Test returning patient booking
- Test insurance collection
- Test doctor preferences
- Test escalations
- [] Create test scenarios
- Emergency calls
- Complex requests
- Cancellations and rescheduling
- Information-only calls
- [] Bug fixes and refinements
- [] Database seeding with sample data
- [] Performance optimization
- [] Deploy to production
- [] User acceptance testing
- [] Documentation creation
- [] Training materials for clinic staff

Deliverables:

- MVP fully tested and operational
 - Production deployment complete
 - Documentation delivered
 - **MVP LAUNCH COMPLETE**
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PHASE 2: POST-MVP ENHANCEMENTS (Weeks 9-32)

BATCH 4: Screen Pop & Enhanced Patient Context (Weeks 9-10)

Features:

- Real-time screen pop notifications
- WebSocket integration for live updates
- Desktop/browser notifications
- Enhanced patient profile display
- Call alerts with patient information

Tasks:

- [] Implement WebSocket server (Socket.io)
- [] Create screen pop gateway
- [] Build screen pop UI component
- [] Integrate browser notifications API
- [] Add notification sound alerts
- [] Create patient profile pop-up
- [] Test real-time updates

Timeline:

Week 9:		Backend WebSocket implementation
Week 10:		Frontend screen pop UI & testing

BATCH 5: Machine Learning & Analytics Infrastructure (Weeks 11-14)

Features:

- Conversation logging and analytics
- Call quality metrics
- Human review dashboard
- Training data collection
- Model fine-tuning preparation
- A/B testing framework

Tasks:

- [] Implement comprehensive conversation logging
- [] Build call review dashboard for staff
- [] Create rating and feedback system
- [] Implement quality metrics tracking
- [] Build training data export pipeline
- [] Set up OpenAI fine-tuning workflow
- [] Create A/B testing infrastructure
- [] Implement experiment tracking

Timeline:

Week 11:		Logging infrastructure
Week 12:		Review dashboard
Week 13:		Fine-tuning pipeline
Week 14:		A/B testing framework

BATCH 6: Practice Management System Integration (Weeks 15-18)

Features:

- Dentrix integration
- Open Dental integration
- Curve Dental integration
- Real-time two-way calendar sync
- Patient data synchronization

Tasks:

- [] Research PMS APIs (Dentrix, Open Dental, Curve)
- [] Design PMS adapter interface
- [] Implement Dentrix adapter
- [] Implement Open Dental adapter
- [] Implement Curve Dental adapter
- [] Build patient sync mechanism
- [] Build appointment sync mechanism
- [] Create configuration UI for PMS settings
- [] Test two-way synchronization
- [] Handle sync conflicts and errors

Timeline:

Week 15:		API research & adapter design
Week 16:		Dentrix integration
Week 17:		Open Dental & Curve integration
Week 18:		Testing & conflict resolution

BATCH 7: Outbound Calling System (Weeks 19-21)

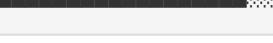
Features:

- Appointment reminder calls
- Confirmation calls
- Recall campaigns
- Post-treatment follow-ups
- Automated retry logic

Tasks:

- [] Design outbound calling architecture
- [] Implement job queue system (Bull/BullMQ)
- [] Build outbound call scheduler
- [] Create reminder call workflows
- [] Create confirmation call workflows
- [] Create recall campaign system
- [] Implement retry and fallback logic
- [] Build outbound call monitoring
- [] Create campaign management UI
- [] Test outbound call flows

Timeline:

- Week 19: [] Architecture & job queue
 Week 20: [] Call workflows & campaigns
 Week 21: [] Monitoring UI & testing

BATCH 8: SMS & Email Integration (Weeks 22-23)**Features:**

- SMS confirmations
- Email confirmations with calendar invite
- Reminder texts
- Two-way SMS conversations
- Email templates

Tasks:

- [] Set up Twilio SMS
- [] Implement SMS sending service
- [] Create SMS templates
- [] Implement inbound SMS handling
- [] Set up email service (SendGrid/AWS SES)
- [] Create email templates
- [] Generate calendar invites (iCal format)
- [] Build two-way SMS conversation handler
- [] Test SMS/email workflows

Timeline:

- Week 22: [] SMS implementation
 Week 23: [] Email integration & testing

BATCH 9: Advanced Analytics & Reporting (Weeks 24-26)**Features:**

- Revenue analytics dashboard
- AI performance metrics
- Patient insights and trends
- Conversion funnel analysis
- Custom report builder
- Data export functionality

Tasks:

- [] Design analytics database schema
- [] Build data aggregation services
- [] Create revenue analytics page
- Revenue by time period
- Revenue per clinic
- Revenue per service type

- [] Create AI performance page
- Success rate trends
- Average call duration
- Common failure points
- [] Create patient insights page
- Call volume patterns
- Peak hours analysis
- Patient demographics
- [] Build conversion funnel visualization
- [] Implement custom report builder
- [] Add data export (CSV, PDF)

Timeline:

Week 24:	[<div style="width: 25%; background-color: #ccc; height: 10px;"></div>]	Database & aggregation
Week 25:	[<div style="width: 30%; background-color: #ccc; height: 10px;"></div>]	Analytics pages
Week 26:	[<div style="width: 35%; background-color: #ccc; height: 10px;"></div>]	Reports & exports

BATCH 10: HIPAA Compliance & Security (Weeks 27-29)

Features:

- Audit logging system
- Data encryption at rest and in transit
- Role-based access control
- Multi-factor authentication
- Session management
- Security monitoring

Tasks:

- [] Implement comprehensive audit logging
- Track all PHI access
- Log user actions
- Timestamp and IP tracking
- [] Implement encryption for sensitive fields
- Patient SSN encryption
- Insurance ID encryption
- Credit card data encryption
- [] Build role-based access control (RBAC)
- Admin role
- Staff role
- Read-only role
- [] Implement multi-factor authentication (MFA)
- SMS-based MFA
- Authenticator app support
- [] Build session management
- Auto-logout after inactivity
- Secure session storage
- [] Create security monitoring dashboard

- [] Conduct security audit
- [] Prepare HIPAA compliance documentation

Timeline:

Week 27:	[]	Audit logging & encryption
Week 28:	[]	RBAC & MFA
Week 29:	[]	Monitoring & documentation

BATCH 11: Payment Processing (Weeks 30-31)

Features:

- Credit card payment collection
- Copay processing
- Payment plan setup
- Stripe integration
- Payment history tracking

Tasks:

- [] Set up Stripe account and API
- [] Implement payment collection service
- [] Build payment form UI
- [] Implement copay collection at booking
- [] Create payment plan management
- [] Build payment history view
- [] Implement refund handling
- [] Test payment flows
- [] Ensure PCI compliance

Timeline:

Week 30:	[]	Stripe integration & payment collection
Week 31:	[]	Payment plans & testing

BATCH 12: Multi-Language Support (Week 32)

Features:

- Spanish language support
- Auto-language detection
- Language preference saving
- Multilingual UI

Tasks:

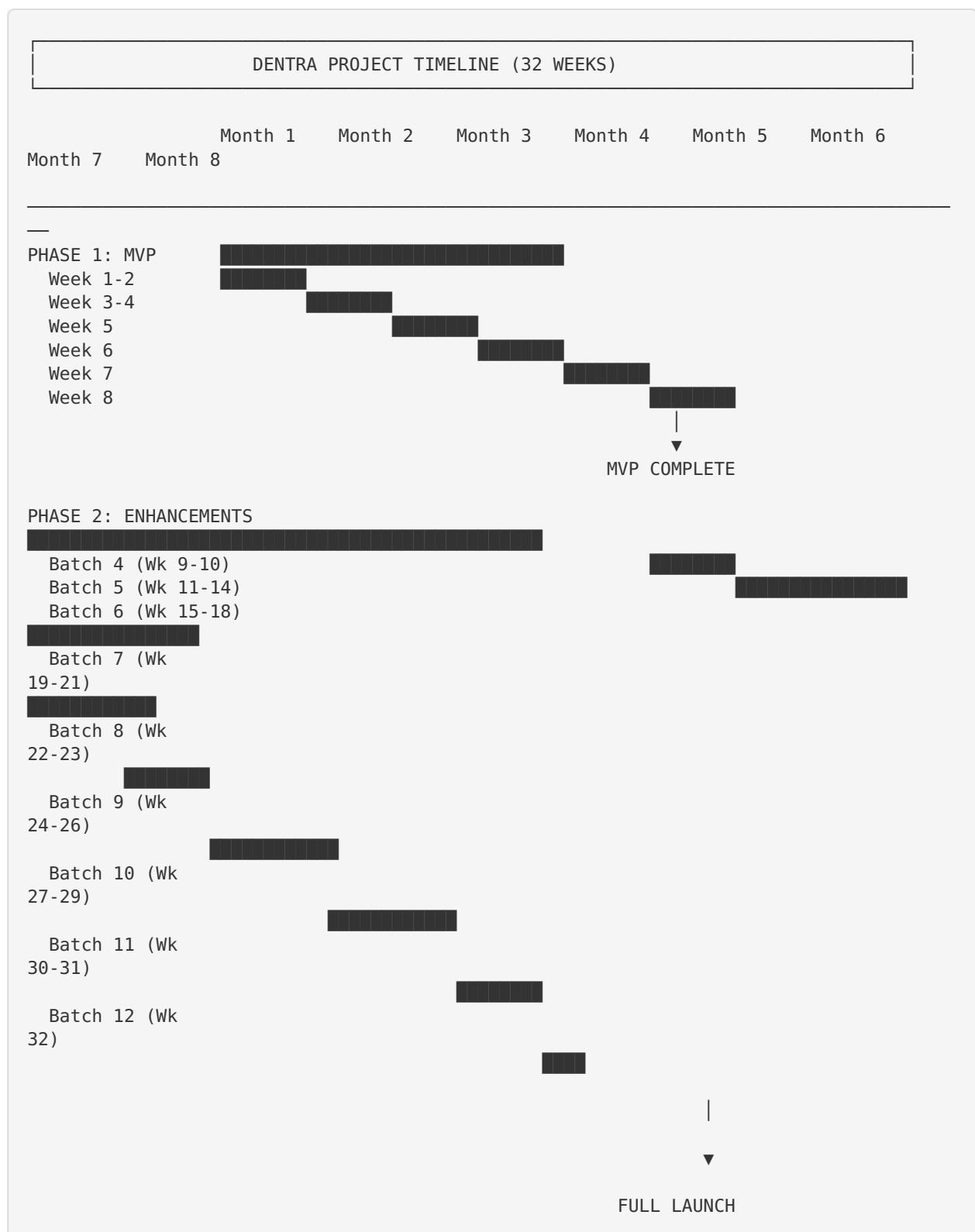
- [] Implement language detection
- [] Create Spanish conversation prompts
- [] Translate UI elements
- [] Test Spanish call flows
- [] Add language preference to patient profile

Timeline:

Week 32: [██████████] Spanish support & testing



GANNT CHART VISUALIZATION





MILESTONES

Week	Milestone	Description
2	Infrastructure Ready	Database, APIs, Twilio configured
4	AI Agent Functional	Core conversation capability working
5	Patient Recognition Live	Caller ID and history retrieval operational
6	Booking System Complete	Full appointment scheduling functional
7	Dashboard Deployed	Web dashboard accessible
8	MVP LAUNCH	Production-ready system with core features
10	Screen Pop Active	Real-time caller notifications working
14	ML Infrastructure Ready	Analytics and fine-tuning capability
18	PMS Integration Complete	Dentrix/Open Dental sync operational
21	Outbound Calling Live	Automated reminder system functional
23	Multi-Channel Active	SMS and email confirmations working
26	Analytics Suite Complete	Advanced reporting and insights
29	HIPAA Certified	Security audit passed, compliance achieved
31	Payments Enabled	Credit card processing operational
32	FULL LAUNCH	All features complete and operational

FEATURE COMPLETION TRACKER

MVP Features (Week 8)

- [x] Inbound call handling via Twilio
- [x] Caller ID & patient recognition
- [x] Patient history retrieval
- [x] Insurance verification (non-blocking)
- [x] Doctor preference handling
- [x] Intelligent appointment scheduling
- [x] AI-powered conversation flow
- [x] Human escalation workflow
- [x] Real-time dashboard
- [x] Multi-clinic support

Post-MVP Features

- [] Screen pop notifications (Week 10)
- [] Machine learning infrastructure (Week 14)
- [] PMS integration (Week 18)
- [] Outbound calling (Week 21)
- [] SMS & email integration (Week 23)
- [] Advanced analytics (Week 26)
- [] HIPAA certification (Week 29)
- [] Payment processing (Week 31)
- [] Multi-language support (Week 32)



DEVELOPMENT PHASES SUMMARY

Phase 1: MVP (Weeks 1-8)

Focus: Core functionality and production readiness

Outcome: Deployable product that solves primary problem (missed calls → automated booking)

Phase 2: Enhancement (Weeks 9-32)

Focus: Advanced features and enterprise readiness

Outcome: Comprehensive platform competitive with industry leaders



ITERATIVE DEVELOPMENT APPROACH

Each batch follows this cycle:

1. **Planning** (Day 1-2)
 - Define requirements
 - Design architecture
 - Create technical specifications

2. Development (Day 3-8)

- Backend implementation
- Frontend development
- API integration

3. Testing (Day 9-10)

- Unit tests
- Integration tests
- End-to-end tests

4. Deployment (Day 11-12)

- Staging deployment
- Production deployment
- Monitoring setup

5. Review (Day 13-14)

- Performance analysis
 - Bug fixes
 - Documentation updates
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Document Purpose: Internal project planning and execution tracking

Version: 1.0

Date: January 16, 2026

Next Review: Week 4 (post core AI agent development)