

# DENTRA - MVP Features Document

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## AI Voice Agent for Automated Dental Appointment Booking

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### MVP SCOPE (Current Release)

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#### 1. Inbound Call Handling via Twilio

**Feature:** Patients call a dedicated Twilio phone number and interact with AI voice agent

- Patient dials clinic's Twilio number
- AI agent answers immediately with personalized greeting
- Natural conversation flow using voice recognition
- Handles multiple concurrent calls simultaneously
- 24/7 availability (after-hours, weekends, holidays)

**What this does:** Eliminates missed calls and ensures every patient inquiry is captured, even when staff is unavailable.

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#### 2. Caller ID & Patient Recognition

**Feature:** Automatic identification of returning patients based on phone number

- **Returning Patient Flow:**
  - System matches caller's phone number against patient database
  - AI greets patient by name: "Hi Sarah, welcome back to Smile Dental!"
  - Loads patient's complete history into conversation context
  - References last visit, upcoming appointments, preferences
- **New Patient Flow:**
  - System identifies caller as new patient
  - AI provides welcoming first-time greeting
  - Collects basic information (name, phone, reason for visit)
  - Creates new patient record in database

**What this does:** Creates personalized experience for returning patients while efficiently onboarding new patients.

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#### 3. Patient History Retrieval & Context

**Feature:** AI accesses patient's complete history during conversation

**Information Available to AI:**

- Previous visits and treatment history
- Upcoming scheduled appointments

- Doctor preferences
- Insurance information
- Medical notes and allergies
- Past appointment patterns (preferred times, no-show history)

**Conversation Examples:**

- "I see you had a cleaning 6 months ago. Ready for your next one?"
- "You usually prefer morning appointments with Dr. Smith. Would you like the same?"
- "Your insurance is active with Delta Dental. We'll verify coverage."

**What this does:** Enables AI to have informed, contextual conversations rather than starting from scratch each time.

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## 4. Insurance Verification

**Feature:** AI collects and validates insurance information during call

**Workflow:**

**A. Patient Has Insurance:**

- AI asks: "Do you have dental insurance?"
- Patient provides insurance company name and ID
- AI logs insurance details to patient record
- AI confirms: "Great! We have your Delta Dental information. Our staff will verify coverage before your appointment."
- **Appointment booking proceeds**

**B. Patient Doesn't Have Insurance:**

- AI asks: "Do you have dental insurance?"
- Patient says "No" or "I'm not sure"
- AI responds: "No problem! Our staff will discuss payment options when you arrive. Let's get you scheduled."
- **Appointment booking proceeds** (insurance is not a blocker)

**C. Insurance ID Not Available:**

- Patient says: "Yes, but I don't have my card with me"
- AI responds: "That's okay! A staff member will help you with insurance details later. Let's book your appointment now."
- **Appointment booking proceeds**
- Staff follows up before appointment for insurance verification

**What this does:** Collects insurance information when available but never blocks appointment booking. Ensures patients get scheduled regardless of insurance status.

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## 5. Doctor Preference Handling

**Feature:** AI honors patient's doctor preferences during scheduling

**Workflow:**

**A. Returning Patient with Saved Preference:**

- System loads patient's preferred doctor from database
- AI offers: "Would you like to see Dr. Smith again? You saw her last time."
- If yes → Search availability for Dr. Smith
- If no → Ask which doctor they'd prefer

**B. Patient Requests Specific Doctor:**

- Patient says: "I'd like to see Dr. Johnson"
- AI searches Dr. Johnson's available appointment slots
- Presents options: "Dr. Johnson has availability on Tuesday at 2 PM or Thursday at 10 AM"

**C. No Doctor Preference:**

- Patient says: "Any doctor is fine" or "I don't have a preference"
- AI searches availability across all doctors
- Presents first available slots with doctor names
- Example: "We have Tuesday 3 PM with Dr. Martinez or Wednesday 11 AM with Dr. Kim"

**D. Preferred Doctor Not Available:**

- AI checks preferred doctor's schedule first
- If no slots in patient's timeframe:
- AI: "Dr. Smith is fully booked this week. Would you like to wait for her next availability, or see another doctor sooner?"
- Patient chooses: wait or see another doctor

**What this does:** Respects patient-doctor relationships while ensuring flexible scheduling options.

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## 6. Intelligent Appointment Scheduling

**Feature:** AI books appointments in real-time with clinic's calendar system

**Capabilities:**

- Checks real-time availability across all doctors
- Handles multiple appointment types (cleaning, checkup, emergency, consultation)
- Suggests available time slots based on patient preferences
- Handles rescheduling and cancellations
- Sends confirmation details

**Conversation Flow:**

1. AI asks: "What type of appointment do you need?" (cleaning, exam, pain, etc.)
2. Patient specifies reason for visit
3. AI asks: "Do you prefer morning or afternoon? Any specific day?"
4. Patient provides preferences
5. AI checks availability and offers 2-3 options
6. Patient selects preferred slot
7. AI confirms: "Perfect! You're booked for Tuesday, January 21st at 2 PM with Dr. Smith for a cleaning."
8. Appointment saved to database

**What this does:** Converts phone calls directly into confirmed appointments without human intervention.

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## 7. AI-Powered Conversation Flow

**Feature:** Natural language understanding and multi-turn conversations

### AI Capabilities:

- Speech-to-text conversion (Deepgram)
- Natural language understanding (OpenAI GPT-4)
- Text-to-speech synthesis (ElevenLabs)
- Context retention across conversation
- Error handling and clarification requests

### Conversation Scenarios AI Handles:

#### A. Appointment Booking:

- "I need a cleaning"
- "My tooth hurts"
- "I'd like to schedule a checkup"

#### B. Information Requests:

- "What are your hours?"
- "Do you accept my insurance?"
- "How much does a cleaning cost?"

#### C. Existing Appointment Management:

- "I need to reschedule my appointment"
- "When is my next appointment?"
- "I need to cancel"

#### D. Complex Scenarios:

- Multiple questions in one call
- Changing mind mid-conversation
- Requesting callback from staff

**What this does:** Provides human-like conversation experience that understands context and handles complex interactions.

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## 8. Human Escalation Workflow

**Feature:** AI recognizes when to transfer to human staff

### Escalation Triggers:

- Patient requests to speak with staff
- Emergency dental situations (severe pain, injury, bleeding)
- Complex insurance questions AI cannot answer
- Complaints or sensitive issues
- Technical issues preventing booking
- Questions outside AI's knowledge base

### Escalation Process:

1. AI recognizes escalation trigger
2. AI: "I'll connect you with a staff member who can help. Please hold."
3. Creates escalation ticket in dashboard

4. Logs conversation details for staff context
5. Transfers call or schedules callback

**What this does:** Ensures patients always get appropriate help while maximizing AI automation for routine tasks.

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## 9. Real-Time Dashboard & Monitoring

**Feature:** Web-based dashboard for clinic staff to monitor AI agent activity

### Dashboard Views:

#### A. Overview Stats:

- Total calls received today
- Appointments booked
- Success rate percentage
- Active escalations requiring attention

#### B. Appointments List:

- All booked appointments
- Filter by status (confirmed, pending, cancelled)
- Filter by clinic location
- Sort by date/time
- View appointment details

#### C. Call Log:

- Complete list of all incoming calls
- Call duration
- Outcome (booked, escalated, information only)
- Full conversation transcript
- Audio recording playback

#### D. Escalations Dashboard:

- Active issues requiring staff attention
- Escalation type and priority
- Patient information
- AI conversation context
- Resolve/close actions

#### E. Clinic Management:

- Manage multiple clinic locations
- View stats per location
- Switch between clinics

#### F. System Health:

- API status monitoring
- Error rate tracking
- Service uptime

**What this does:** Provides complete visibility into AI agent performance and enables staff to manage operations efficiently.

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## 10. Multi-Clinic Support

**Feature:** Single platform supports multiple dental clinic locations

- Each clinic has dedicated Twilio phone number
- Separate calendars and staff for each location
- Unified dashboard view across all locations
- Filter/switch between clinics in dashboard
- Independent service menus and pricing per clinic

**What this does:** Enables dental groups and multi-location practices to centralize operations.

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## 11. Complete Call Workflow (End-to-End)

**Feature:** Complete patient journey from call to confirmed appointment

### Step-by-Step Flow:

#### 1. Call Initiated

- Patient dials Twilio number
- System receives call webhook

#### 2. Caller Identification

- System checks phone number against patient database
- Loads patient history if found
- Creates new patient record if not found

#### 3. AI Greeting

- Returning patient: "Hi [Name], welcome back to [Clinic]!"
- New patient: "Thank you for calling [Clinic]. I'm the AI assistant. How can I help?"

#### 4. Conversation & Intent Recognition

- AI listens to patient request
- Identifies intent (book appointment, ask question, reschedule, etc.)
- Asks clarifying questions

#### 5. Patient History Review (if returning patient)

- AI mentions last visit
- References upcoming appointments
- Notes doctor preferences

#### 6. Insurance Collection

- AI asks about insurance
- Logs information if provided
- Proceeds regardless of insurance status

#### 7. Appointment Type Selection

- AI asks reason for visit
- Patient specifies (cleaning, pain, checkup, etc.)
- AI selects appropriate appointment duration

#### 8. Doctor Preference Handling

- AI checks if patient has preferred doctor

- Offers preferred doctor's availability
- Shows alternatives if needed

#### 9. **Time Slot Selection**

- AI asks patient's preferred day/time
- Searches real-time availability
- Presents 2-3 options
- Patient selects preferred slot

#### 10. **Booking Confirmation**

- AI confirms all details
- Saves appointment to database
- Provides confirmation: "You're all set! [Date], [Time], [Doctor], [Service]"

#### 11. **Call Completion**

- AI asks if patient needs anything else
- Provides clinic contact information if needed
- Ends call gracefully

#### 12. **Post-Call Updates**

- Appointment appears in dashboard immediately
- Staff can view call transcript and recording
- Patient record updated with new appointment

**What this does:** Delivers complete automated booking experience from first ring to confirmed appointment.



## **OUT OF SCOPE (Next Release)**

### **Features Planned for Future Releases:**

#### 1. **Outbound Calling**

- AI calls patients for appointment reminders
- Confirmation calls 24 hours before appointment
- Recall campaigns for overdue patients
- Post-treatment follow-up calls

#### 2. **SMS & Email Integration**

- Text confirmations after booking
- Email confirmations with calendar invite
- Reminder texts 24 hours before appointment
- Two-way SMS conversations

#### 3. **Practice Management System Integration**

- Direct sync with Dentrix
- Integration with Open Dental
- Curve Dental connectivity
- Real-time two-way calendar sync

#### 4. **Advanced Analytics**

- Detailed revenue reports
- Conversion funnel analysis
- Patient behavior insights
- AI performance trends over time

#### 5. **Machine Learning Enhancements**

- Fine-tuned AI model on clinic's conversations
- Continuous learning from interactions
- A/B testing of conversation strategies
- Personalized response optimization

#### 6. **Screen Pop Notifications**

- Real-time caller info displayed to staff
- Desktop/browser notifications for incoming calls
- Patient profile pop-up during call
- WebSocket-based live updates

#### 7. **HIPAA Compliance Certification**

- Formal SOC 2 Type II certification
- Third-party security audit
- Complete audit logging system
- Business Associate Agreements

#### 8. **Payment Processing**

- Collect payment over phone
- Copay collection at booking
- Integration with Stripe/Square
- Payment plan setup

#### 9. **Multi-Language Support**

- Spanish language conversations
- Additional language options
- Auto-detection of caller's language

#### 10. **Voice Biometrics**

- Patient authentication via voice
- Enhanced security for sensitive operations
- Fraud prevention

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## **TECHNOLOGY STACK**

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### **Voice & AI Services**

- **Twilio Programmable Voice** - Inbound call handling, telephony infrastructure
- **Deepgram** - Speech-to-text (STT) conversion, real-time transcription
- **OpenAI GPT-4** - Natural language understanding, conversation intelligence
- **ElevenLabs** - Text-to-speech (TTS) synthesis, natural-sounding voice



## Backend

- **NestJS** - TypeScript backend framework
- **Node.js** - Runtime environment
- **PostgreSQL** - Relational database
- **Prisma ORM** - Database management and migrations

## Frontend Dashboard

- **Next.js** - React framework for dashboard
- **React** - UI component library
- **Tailwind CSS** - Styling framework
- **Recharts** - Data visualization

## Infrastructure

- **Abacus AI Platform** - Cloud hosting and deployment
- **WebSocket (Socket.io)** - Real-time dashboard updates (future)
- **REST API** - Backend communication

## Architecture Pattern

- **Multi-Agent AI System** - 4 specialized agents:
- **Voice Agent** - Handles speech and conversation
- **Scheduler Agent** - Manages appointment booking logic
- **Policy Agent** - Enforces business rules and policies
- **Ops Agent** - Handles escalations and monitoring

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**Document Purpose:** External socialization and stakeholder communication

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