AEGISMEDIX

The Autonomous Medical Sentinel

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Powered by Gemini 3 • Vision-First • Agentic Safety

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01. Executive Summary

AegisMedix is the world's first **Autonomous Medical Sentinel**, designed to bridge the dangerous gap between hospital discharge and home recovery. While traditional telemedicine relies on scheduled appointments, AegisMedix provides **continuous, proactive protection**.

Powered by **Gemini 3's Native Multimodality** and **"System 2" Reasoning**, AegisMedix transforms a standard smartphone or tablet into an intelligent guardian. It watches for physical risks (falls, wound infection), listens for distress, and audits medication intake in real-time—intervening only when necessary with clinical precision.

The Mission: To reduce post-operative readmissions and medication errors to zero using Agentic AI.

02. The Critical Gap

The Problem:

- **The "Black Hole" of Discharge:** Once a patient leaves the hospital, clinical oversight vanishes.
- **Medication Errors:** 40% of elderly patients make mistakes with their post-op medication within the first 7 days.
- **Delayed Detection:** Infection or mobility issues (falls) are often detected too late, leading to costly emergency readmissions.

The Solution: AegisMedix AegisMedix is not a chatbot; it is an **active observer**.

- **It Sees:** Uses the device camera to identify pills, analyze gait stability, and monitor wound healing.
- **It Thinks:** Cross-references real-time visual data with specific uploaded medical manuals (RAG) using deep reasoning chains.
- **It Protects:** A "Human-in-the-Loop" architecture ensures that every AI decision is verified against safety protocols before advice is given.

03. Architectural Blueprint

AegisMedix is built on a high-concurrency, multimodal architecture designed for real-time safety analysis.

The AI Core (Intelligence)

- **Model: Gemini 3 Pro** (via Google Vertex AI).
    - Role: Primary reasoning engine. Handles native video/audio processing without text-to-speech intermediate layers for zero-latency analysis.
- **Agentic Framework: LangGraph**.
    - Role: Manages the "State" of the medical conversation and orchestrates the "Skeptic" validation loops.
- **Embeddings: Gecko-004** (Text-Embedding-004).
    - Role: High-dimensional vectorization of medical manuals for RAG.

The Backend (Central Nervous System)

- **Framework: FastAPI (Python)**.
    - Why: Asynchronous support for handling multiple concurrent WebSocket video streams from patients.
- **Protocol: WebSockets (wss://)**.
    - Why: Enables full-duplex communication for real-time video streaming and instant voice interruption (low latency).
- **Containerization: Docker**.
    - Why: Ensures the "Brain" is portable—running identically on Google Cloud Run today and on an NVIDIA Jetson Orin (Physical Robot) tomorrow.

The Data Layer (Memory)

- **Database: Supabase (PostgreSQL)**.
    - Role: Relational storage for Patient Profiles, Medication Logs, and Audit Trails.
- **Vector Store: pgvector**.
    - Role: Integrated directly into Postgres to store and query RAG embeddings (Medical Manuals) alongside structured patient data.

The Frontend (Interfaces)

- **Patient App: Flutter (Dart)**.
    - Why: Single codebase for iOS/Android with direct access to hardware sensors (Camera, Mic, Gyroscope).
- **Command Dashboard: Next.js (React/TypeScript)**.
    - Why: Server-Side Rendering (SSR) for high-performance data visualization of the "Risk Feed" for doctors.
- **Styling: Tailwind CSS + Framer Motion**.
    - Why: Clinical, "Dark Mode" aesthetic with fluid animations to signal real-time AI activity.

04. Features

- **Visual Pill Verification:** Show a pill bottle to the camera. AegisMedix reads the label, checks the pill shape/color, and cross-references it with your digital prescription.
- **Deep Reasoning Loop:** Before answering "Can I take this?", the AI runs a hidden simulation: *checking allergies, current time, and recent dosage history.*
- **The "Sentinel" Dashboard:** A Next.js Command Center for family members or doctors to view the "Live Risk Feed"—a scrolling log of the AI's safety evaluations.

05. The Safety Protocol (Defense-in-Depth)

AegisMedix solves the "AI Hallucination" problem with three layers of defense:

1. **The Skeptic Agent:** A secondary AI loop that attempts to disprove the primary AI's advice before it is spoken.
2. **Citation Enforcement:** The AI cannot give medical advice without citing a specific page/paragraph from the uploaded Knowledge Base.
3. **PII Airlock:** All patient video data is processed in a transient state (never used for model training) via Google Vertex AI Enterprise standards.

06. Future Outlook: From App to Android

- **Phase 1 (Now):** Mobile App & Web Dashboard.
- **Phase 2 (Q4 2026): The Sentorix Unit**. Deploying the AegisMedix container onto NVIDIA Jetson hardware to create a dedicated physical robot for elderly care facilities.
- **Phase 3 (2027):** Hospital EMR Integration (Epic/Cerner) for direct doctor-to-AI handoff.

Build Status: MVP Live

Hackathon Entry: Gemini 3 "Antigravity" Track

Domain: www.aegismedix.com