SPEC-1—Dr. Patel 4th-Trimester Tutor Chatbot

Background

Problem. New parents often face urgent, anxiety-provoking questions at 1–3 AM about a newborn's feeding, sleep, temperature, breathing, jaundice, and postpartum recovery. Dr. Sonal Patel (pediatrician/ neonatologist; founder of NayaCare) focuses on comprehensive "4th trimester" care, but cannot be on-call 24/7 for non-emergent education and guidance.

Vision. A friendly, compassionate chatbot embedded on NayaCare's homepage that serves as an educational tutor and resource hub for postpartum families (0–12+ weeks after delivery). It should: - Offer clear, empathetic, evidence-informed education for both infant and birthing parent topics. - Triage concerns to **educational guidance vs. seek-care-now** messaging, without diagnosing or replacing medical care. - Surface only **physician-vetted resources** (Dr. Patel's curated library) by default; optionally cite reputable clinical guidelines for generic, low-risk topics. - Generate take-home **PDF summaries** and handouts personalized to the conversation context. - Maintain **HIPAA compliance** (data minimization, secure storage/ transit, auditability, BAAs with vendors), and default to *no PHI retention* beyond what's essential for safe operation.

Primary users. New parents/caregivers of newborns during the 4th trimester; secondary users include Dr. Patel and staff (content curation, analytics, quality review), and site visitors seeking general education.

Content sources. Dr. Patel's authored articles, clinic handouts, vetted PDFs, and selected guidelines. The bot prioritizes Dr. Patel's voice and materials; external sources are used conservatively and transparently.

Non-goals (initial MVP). No diagnosis, prescription, or treatment orders; no integration to EMR/PHI systems; no free-text intake of sensitive PHI unless strictly necessary for triage wording; no multilingual support beyond English (unless specified later).

Success (MVP). 24/7 availability; <60s time-to-useful-answer; high parent satisfaction; safe escalation wording for red-flag symptoms; minimal hallucinations; PDFs with correct, vetted content; zero known HIPAA incidents.

Requirements

Must Have (M)

- **On-site chat widget (web)** embedded on `nayacare.org` homepage; mobile-first; WCAG 2.2 AA; clear emergency disclaimer & consent gate before first use.
- *Acceptance:* Loads in <2s on 4G; keyboard + screen-reader accessible; privacy notice shown before first message.
- **Scope guardrails**: education + risk-screening only; no diagnosis, no prescriptions, no dosing unless from Dr. Patel–approved handouts; always include "does not replace care" footer.
- *Acceptance:* 100% conversations include scope footer; red-flag flows never output a diagnosis.

- **Triage safety net** with newborn & maternal red-flags and automatic escalation messaging: e.g., infant fever ≥100.4°F/38°C, respiratory distress, cyanosis, persistent vomiting, lethargy, dehydration, worsening jaundice; maternal heavy bleeding, severe headache, chest pain/SOB, wound infection, suicidal ideation.
- *Acceptance:* Scenario tests route correctly 100% of the time; "call 911/ED now" style messaging appears when triggered.
- **Physician-vetted Knowledge Base (KB)** with ingestion & versioning of PDFs, DOCX, HTML (including NayaCare blog/pages); required metadata:
- `topic`, `audience` (infant|birthing parent), `age-window` (e.g., 0–7d, 8–28d, 1–3mo), `risk-level` (general|high-risk), `summary`, `author`, `reviewed-by`, `review-date`, `expiry-date`, `source-url`, `tags`.
- *Acceptance:* Upload → parse → searchable within 10 minutes; version history retained; stale items auto-flagged on `expiry-date`.
- **RAG pipeline** (retrieval-augmented generation) that strictly prefers KB content; fallback to general references only for low-risk, generic education and always cited as such.
- *Acceptance:* At least 80% of answers cite KB items when available; hallucination rate <2% in review set.
- **Persona & tone**: empathetic, calming, plain-language (≤8th-grade reading level), culturally sensitive; names Dr. Patel as supervising author of materials when applicable.
- *Acceptance:* Automated readability check ≤ Grade 8 for 95% of messages; tone guidelines unit tested on 30 canned prompts.
- **PDF generator** producing personalized handouts + visit summary with: timestamp, topic outline, vetted content excerpts, links to KB, "what's normal vs. red flags," self-care checklist, follow-up instructions.
- *Acceptance:* PDF renders in <5s; accessible tagging (PDF/UA where feasible); downloadable link expires in ≤24h by default.
- **HIPAA posture (MVP)**: data minimization (no PHI unless user explicitly opts-in), TLS 1.2+ in transit, AES-256 at rest, RBAC, audit trail, configurable retention (default 0–7 days), BAAs with all vendors, breach notification workflow.
- *Acceptance:* Security review checklist passes; BAAs executed; audit logs evidence access and admin actions.
- **Admin console** for Dr. Patel/staff: content upload, tagging, approval workflow, version diff, quick "safety notice" banner push, analytics dashboard (de-identified), and conversation redaction tools.
- *Acceptance:* Role-based access; editor → reviewer → publish states enforced.
- **Observability & QA**: conversation transcripts (de-identified by default), flagged-content queue, scenario-test harness (≥50 curated neonatal & maternal scenarios), latency/error dashboards.
- *Acceptance:* P95 response ≤8s; uptime ≥99.5% monthly; safety tests run on each release.
- **Legal & clinical disclaimers** contextualized by location (practice state), coverage hours, and emergency options; explicit consent statement when collecting any PHI.
- *Acceptance:* Dynamic banner reflects state and hours; consent stored with timestamp & policy version.

Should Have (S)

- **Age-aware guidance** based on baby's DOL/gestational age and maternal postpartum day; asks minimal questions to personalize.
- **Spanish (es-US) content parity** for top 20 topics; locale toggle persisted.

- **Voice input** (Web Speech API) with on-device transcription; opt-in only.
- **Email/SMS secure delivery** of PDFs via expiring links; patient verification via magic-link.
- **Soft handoff to on-call staff** (message dropbox) with SLA banner; no live chat required for MVP.
- **Topic maps** (guided flows) for common concerns: feeding amounts, latch pain, spit-up vs. vomiting, normal stools, safe sleep, jaundice, postpartum mood, incision care.
- **Basic analytics**: top intents, unresolved questions, KB coverage gaps, satisfaction CSAT prompt.

Could Have (C)

- **Photo intake** (e.g., rash, umbilical stump) with strict consent + PHI notice; runs only on-device classification or vendor with BAA; never stored by default.
- **EHR integration** (read-only) for patient age and care plan summaries via FHIR; behind auth wall.
- **Proactive nudges**: day-by-day tips for first 28 days (opt-in).
- **Multi-model ensemble** (Claude + GPT + Perplexity orchestrated) with cost/latency gating and safety voting.

Won't Have (W)—for MVP

- Diagnosis, prescriptions, dosing advice beyond Dr. Patel-approved dosing charts.
- Open community chat or user-generated medical content.
- Unbounded data retention.

Non-Functional Requirements

- **Performance**: P95 end-to-first-token ≤3s; P95 full-answer ≤8s.
- **Security**: OWASP ASVS L2; SAST/DAST in CI; secret rotation; IP allowlist for admin.
- **Reliability**: 99.5% uptime/month; graceful degradation if LLM vendor down; multi-region storage for KB.
- **Compliance**: HIPAA administrative/physical/technical safeguards documented; BAAs in place; quarterly access reviews.
- **Content quality**: Every KB item has `review-date ≤ 12 months`; lint checks for readability & inclusive language.

Acceptance Test Matrix (excerpt)

- 50 red-flag scenarios → 100% correct escalation messaging.
- 100 common questions → ≥95% helpfulness (clinician-rated), ≤2% hallucination.
- 10 PDF samples → all pass accessibility checks; cite correct versioned KB entries.