Palli Sahayak

Voice AI Helpline for Palliative Care

"Companion in Care" — A Digital Public Good for India and Beyond

15+ Indian Languages | 24/7 Availability | Clinically Grounded | Open Source

Acknowledgements
Funded by Grand Challenges India

The Palliative Care Crisis

Only 1-2%
of 10+ million Indians needing palliative care receive it

57M people globally need palliative care

78% live in low & middle income countries

10M health worker shortage projected by 2030

98% of patients and families are left without support

India's Digital Infrastructure: An Opportunity

500M+ WhatsApp Users

1.2B Mobile Subscribers

22 Scheduled Languages

Bhashini AI Language Platform

Voice-first AI can reach anyone with a phone — no app, no internet, no literacy required

Introducing Palli Sahayak

AI Voice Helpline for Palliative Care

Phone Calls: Dial in any language, get clinically-grounded answers

WhatsApp: Text or voice messages in 15+ Indian languages

Web Voice: Real-time voice streaming via browser

Always Safe: Emergency detection & professional referral

Answering questions at 2 AM when families need help most

System Architecture

Input Channels: Phone (Bolna.ai) | WhatsApp (Twilio) | Web Voice (Gemini Live)

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Voice Router & Smart Query Classifier

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Hybrid RAG Pipeline

ChromaDB Vector Search + Neo4j Knowledge Graph + GraphRAG Community Reports

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Clinically Validated Voice/Text Response

Why Voice-First Design?

Literacy: Voice works for everyone regardless of reading ability

Technology: No smartphone needed — just a basic phone call

Language: Speak in your mother tongue — 15+ Indian languages

Geography: Rural areas with voice-only connectivity

Timing: 24/7 availability — help at 2 AM

Dignity: Understood in your language, respected in your culture

Voice AI democratizes access to quality healthcare information

15+ Indian Languages

Speaking to users in their mother tongue

P0 (Priority): Hindi (■■■■■■), English, Bengali (■■■■■), Tamil (■■■■■)

P1: Telugu (■■■■■■), Marathi (■■■■■), Gujarati (■■■■■■■), Kannada (■■■■■)

P2: Malayalam (■■■■■■), Punjabi (■■■■■■), Odia (■■■■■)

P3: Assamese (■■■■■■■) and more...

Powered by Bhashini — India's Government AI Language Platform

Free API access for Digital Public Goods | 22 scheduled languages supported

Clinical RAG Foundation

Retrieval-Augmented Generation with Medical Guidelines

1. User Question → Voice or text query in any language

2. Query Processing → Translation + entity extraction

3. Knowledge Retrieval → Search clinical guidelines

4. Response Generation → Contextual answer with citations

Grounded in Clinical Guidelines:

WHO Palliative Care | IAHPC Essential Practices | IAPC Handbook | Pallium India Protocols

Every response is grounded in verified medical sources

Triple-Layer Knowledge Architecture

ChromaDB — Vector Search

Semantic similarity with 384-dimensional embeddings

Neo4j — Knowledge Graph

Structured relationships with 18 entity types

GraphRAG — Community Reports

Multi-hop reasoning with Leiden clustering

Intelligent Context Fusion

FUSE: When multiple contexts are equally relevant (distance < 0.15)

FOCUS: When one context is clearly best

Clinical Validation Pipeline

Ensuring Safe, Accurate Medical Information

Dosage Check: Validate medication doses against ranges

Safety Keywords: Detect emergencies and urgent situations

Hallucination Check: Verify response against source documents

Citation Verify: Ensure proper source attribution

Expert Review Sampling:

5% Normal queries | 50% High-risk topics | 100% Critical/Emergency

Target: 95%+ Accuracy | <2% Hallucination | 90%+ Expert Agreement

Adaptive User Experience

Automatic Role Detection

Patient: Personal symptom management ("■■■■ ■■■■ ■■ ■■■ ■■")

Caregiver: Care guidance for family member ("my mother has...")

Healthcare Worker: Clinical decision support ("my patient needs...")

Context Memory Across Sessions

Patient Condition | Current Symptoms | Medications | Allergies

"Last time you asked about pain management..." — *Continuity of care*

Real-time Analytics Dashboard

Response Time: P50: 400ms | P95: 800ms | P99: 1.2s

RAG Success: 89.3% retrieval rate

Validation Rate: 95.2% pass rate

User Satisfaction: 4.6/5.0 average

Language Distribution: Hindi 45% | Bengali 18% | Tamil 12% | English 10% | Others 15%

Topic Distribution: Pain Mgmt 32% | Symptoms 24% | Medications 18% | Caregiver 14% | End-of-Life 12%

System Health: HEALTHY | Alerts: 0 | Uptime: 99.9%

A Digital Public Good (DPG)
Open Source | Replicable | Sustainable

✓ **Open Source**: MIT License, Publicly on GitHub

✓ **SDG Aligned**: SDG 3: Good Health | SDG 10: Reduced Inequalities

✓ **Privacy First**: No personal health data, Anonymized interactions

✓ **Do No Harm**: Medical guardrails, Professional referral

✓ **Interoperable**: REST APIs, Modular architecture

✓ **Data Standards**: SNOMED, ICD-10, Medical ontologies

Aligned with Digital Public Goods Alliance (DPGA) Standards

Beyond India: Global Replicability

A model for palliative care AI worldwide

Configuration-Based Adaptation — Just change config.yaml

Potential Adaptations:

Sub-Saharan Africa: Kenya, Nigeria, South Africa

Southeast Asia: Indonesia, Philippines, Vietnam

Latin America: Brazil, Mexico, Colombia

Middle East: Egypt, Jordan, Lebanon

Developed Nations: Rural US, UK NHS, Australia

Partnership Opportunities: WHO | UNICEF | Open Source Pharma | Local Health Ministries | IAHPC

Impact Metrics & Targets

V1 → V2 Improvements:

Monthly Active Users: 1,000 → 100,000 (100x)

Languages Supported: 6 → 15+ (2.5x)

Response Accuracy: 85% → 95%+ (+10%)

Voice Latency: 2.5s → <0.5s (5x faster)

Healthcare Workers: 100 → 10,000 (100x)

Cost per Query: $0.02 → $0.005 (4x cheaper)

2-Year Vision: 1M Users | 500K Care Decisions/Year | 10 Countries | 5 State Adoptions

Partners & Collaborations

Clinical Partners: Pallium India | Max Healthcare | CanSupport | DNipCare

Academic: Ashoka University | KCDH | ASAR/Nivarana

Government: BIRAC-DBT | Grand Challenges India | Bhashini

Funders: Gates Foundation | BIRAC

Mentorship: Padma Shri Dr. M.R. Rajagopal — Father of Palliative Care in India

Technology Stack

Framework: FastAPI • Uvicorn • Gradio Admin

Voice AI: Bolna.ai • Gemini Live • Groq Whisper • Edge TTS

RAG Pipeline: ChromaDB • Neo4j • Microsoft GraphRAG

LLMs: Groq (llama-3.1-8b) • Qwen3-32B • GPT-4o-mini

Languages: Bhashini • Deepgram • ElevenLabs

Infrastructure: Python 3.11 • Docker • ngrok

100% Open Source • github.com/inventcures/rag_gci • MIT License

Situated in Indian Socio-Cultural Context

Family-Centered Care: Healthcare decisions are family matters. Palli Sahayak supports family caregivers.

Spiritual Dimensions: End-of-life care integrates spiritual practices. Respectful of diverse beliefs.

Home-Based Care: Most palliative care happens at home. Designed for caregivers, not just professionals.

Language Diversity: India's linguistic diversity is respected. 15+ languages with cultural responses.

India-Specific Case Scenarios Dataset

Curated with Pallium India & Max Healthcare — Reflecting local clinical contexts

Development Roadmap

Q1-Q2 2026: Scale & Validate

GraphRAG integration | Clinical validation | 15 language rollout | Sub-500ms latency

Q3-Q4 2026: Expand & Partner

100K user target | 5+ hospice integrations | Research publications | State pilot programs

2027+: Global Impact

1M users target | 10 country adaptations | Policy integration | Research platform

Current Status: V2 Development — Clinical Validation, Analytics, Personalization

How You Can Help

Healthcare Professionals: Validate clinical content | Provide feedback | Refer patients and caregivers

Researchers: Collaborate on effectiveness studies | Contribute to datasets | Co-author publications

Technologists: Contribute to open source code | Adapt for your region | Build integrations

Funders & Partners: Support infrastructure scaling | Fund regional adaptations | Policy advocacy

GitHub: github.com/inventcures/rag_gci

Docs: deepwiki.com/inventcures/rag_gci

Thank You

Palli Sahayak — Compassionate AI for Palliative Care

Contact & Resources

GitHub: github.com/inventcures/rag_gci

Documentation: deepwiki.com/inventcures/rag_gci

Grant: gcgh.grandchallenges.org

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