WELLNESSHUB: AN AI-POWERED MENTAL HEALTH SUPPORT AND CRISIS MANAGEMENT SYSTEM

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Abstract - *Mental health disorders remain among the most underserved healthcare challenges globally, and access to timely digital support is still severely limited in low-resource settings. Existing tools either lack clinical depth or fail to connect assessment, crisis detection, and therapeutic support in a single coherent system. This paper presents WellnessHub, a full-stack AI-powered mental health support and crisis management platform. The system uses React.js on the frontend, Node.js with Express on the backend, and MongoDB Atlas for data storage. Google Gemini 2.0 Flash drives seven evidence-based therapeutic modules and the Sage multi-turn crisis chatbot. Twilio SMS API handles emergency alerting when clinical thresholds are crossed. The platform is built around the TAF-9 (Triadic Assessment Framework — 9 Scale) protocol, which measures Affective, Behavioral, and Cognitive dimensions of patient functioning across nine scales. SMS alerts go out automatically when the composite Total Impairment Score exceeds 33, or when the Sage chatbot detects trigger levels 2 or 3. The platform also includes a transcrisis detection engine, an SOS intervention toolkit with seven evidence-based tools, a Stanley–Brown Safety Plan Builder, longitudinal progress monitoring, and a clinician burnout reflection module.*

***Key Words*: Mental Health, Crisis Management, AI Chatbot, TAF-9 Assessment, Gemini AI, Twilio SMS, Automated Alerting, Cultural Sensitivity**

1. INTRODUCTION

Mental health disorders affect over one billion people worldwide, yet treatment gaps remain severe — particularly in countries like India, where the psychiatrist-to-population ratio can drop as low as 1 per 100,000 people [1]. The result is that most people in distress never receive professional help at all.

Traditional mental healthcare is reactive by design. Patients must typically reach a crisis point before a clinician intervenes. Between appointments, there is no monitoring, no early warning, and no automated escalation pathway [2]. Most digital mental health tools do not fix this structural gap. They tend to be either static informational resources, shallow mood trackers, or consumer apps without proper crisis infrastructure [3]. Very few use a validated multi-dimensional assessment framework, and fewer still combine automated emergency alerting with real-time AI analysis of what a patient is actually saying.

WellnessHub was built to address this. It is a full-stack, clinically informed platform that integrates real-time psychological assessment, AI-powered therapeutic support, autonomous crisis detection, and multi-channel emergency alerting into one application. The system is built on the TAF-9 protocol — a nine-scale framework with a transcrisis detection engine that tracks each patient against their own personal baseline over time [5]. Sage, the AI crisis chatbot powered by Gemini 2.0 Flash, can dispatch SMS alerts without waiting for manual intervention [6].

2. REVIEW OF LITERATURE STUDY

World Health Organization [1]. The WHO World Mental Health Report documents that over one billion people globally live with a mental health condition, with treatment gaps exceeding 70% in low and middle-income countries, pointing to the need for scalable, technology-enabled interventions.

Kroenke, Spitzer, and Williams [2]. This foundational study established the PHQ-9 as a validated instrument for digital depression screening, showing that multi-item clinical scales can be reliably administered online. This directly informs the multi-dimensional structure of the TAF-9 protocol.

Spitzer, Kroenke, Williams, and Lowe [3]. The GAD-7 validation study showed that anxiety can be measured effectively through a short digital instrument, supporting the inclusion of anxiety as a primary Affective scale in TAF-9.

Barlow, Farchione, Fairholme et al. [4]. The Unified Protocol for Transdiagnostic Treatment of Emotional Disorders provides the theoretical basis for treating anxiety, depression, and anger as separable but correlated Affective constructs directly informing the three Affective scales in TAF-9.

Foa and Kozak [5]. Emotional Processing Theory and the role of behavioral inhibition underpin the inclusion of approach, avoidance, and immobility as the three Behavioral scales in the TAF-9 protocol.

Fitzpatrick, Darcy, and Vierhile [6]. The Woebot randomized controlled trial showed that CBT principles can be delivered through an automated conversational agent, providing the evidence base for WellnessHub's seven AI therapeutic modules.

Stade, Stirman, Ungar et al. [7]. This study examined large language models in therapeutic contexts and identified a concerning absence of safety guardrails. WellnessHub addresses this through a mandatory trigger detection mechanism embedded in every Sage chatbot response.

Maslach, Jackson, and Leiter [8]. The Maslach Burnout Inventory identifies emotional exhaustion, depersonalisation, and reduced personal accomplishment as the primary dimensions of clinician burnout, informing the Doctor Wellbeing module.

Morse, Salyers, Rollins et al. [9]. This meta-analysis found burnout prevalence rates of 21 to 67 percent among mental health workers and identified structured debriefing and reflective journaling as evidence-based mitigation strategies.

Stanley and Brown [10]. The Safety Planning Intervention provides the clinical framework for the six-step Stanley–Brown Safety Plan Builder in WellnessHub.

Prochaska and DiClemente [11]. The Transtheoretical Model of Change underpins the Substance Use Guidance module, which delivers stage-matched motivational support.

Kubler-Ross [12]. The Five Stages of Grief model underlies the Grief Support module, providing stage-matched AI counseling across denial, anger, bargaining, depression, and acceptance.

Mishara and Weisstub [13]. Research on cultural dimensions of digital mental health support found that Western CBT frameworks are often poorly suited to users from collectivist backgrounds, motivating WellnessHub's cultural context toggle.

Walker and Finer [16]. This review found that users in acute distress have reduced working memory capacity, which informed the minimalist single-action design of the SOS dashboard.

Ji, Pan, Li et al. [17]. This review of machine learning methods for suicidal ideation detection informed the design of the Sage chatbot's four-level trigger detection mechanism.

3. METHODOLOGY

WellnessHub is a full-stack three-tier web application. After authentication via email/password or Google Sign-In, the user accesses a main dashboard with tab-based navigation across five areas: Check-In (TAF-9 assessment), SOS Tools, Talk to Sage, Progress, and Clinician Wellbeing.

The TAF-9 assessment follows a three-step wizard. In Step 1, the patient completes a profile. In Step 2, the patient adjusts nine clinical sliders across three domains, with the composite Total Impairment Score calculated and displayed live. In Step 3, the patient reviews and submits. Upon submission, the server calculates the score, saves it to MongoDB, runs the transcrisis detection algorithm, and dispatches an SMS alert via Twilio if the score exceeds 33.

The crisis detection system operates at three independent levels: absolute threshold detection (score ≥ 33 triggers SMS), transcrisis detection (personal baseline deviation ≥ 10 triggers an in-app banner), and conversational risk assessment through Sage (trigger levels 2 and 3 dispatch independent SMS alerts).

3.1 TAF-9 Assessment Framework

The Triadic Assessment Framework-9 measures patient functioning across three clinical domains: Affective (anxiety, anger, depression), Behavioral (approach, avoidance, immobility), and Cognitive (physical, psychological, social impairment). The maximum composite score is 90, with a clinical alert threshold of 33. A lethality sentinel checks the composite of depression, immobility, and psychological scores, triggering a safety check modal when this combination exceeds 25.

3.2 Sage Chatbot — Crisis Detection Architecture

The Sage chatbot runs on Google Gemini 2.0 Flash using the multi-turn chat API, with a clinical system prompt injected as the first exchange. Every AI response includes a hidden metadata block |||SAGE_META|||{triggerLevel, reason}||| parsed server-side. Trigger levels 2 and 3 dispatch immediate SMS to the admin and patient phone, and activate a persistent crisis banner.

3.3 AI Therapeutic Modules

Seven distinct AI modules provide evidence-based therapeutic support: Thought Reframer (CBT), Journal Analyzer (Narrative Therapy with cultural context toggle), Grief Support (Kubler-Ross model), Substance Use Guidance (Prochaska Stages of Change), Trigger Pattern Analyzer, Clinician Wellbeing Reflection, and Trend Analyzer.

4. DESIGN DETAILS

WellnessHub uses a standard three-tier architecture. The four figures below illustrate the system from different angles: the overall block diagram showing system flow, the layered architecture showing components, the actor-level user flow showing swimlane interactions, and the message-level sequence diagram showing the full protocol trace.

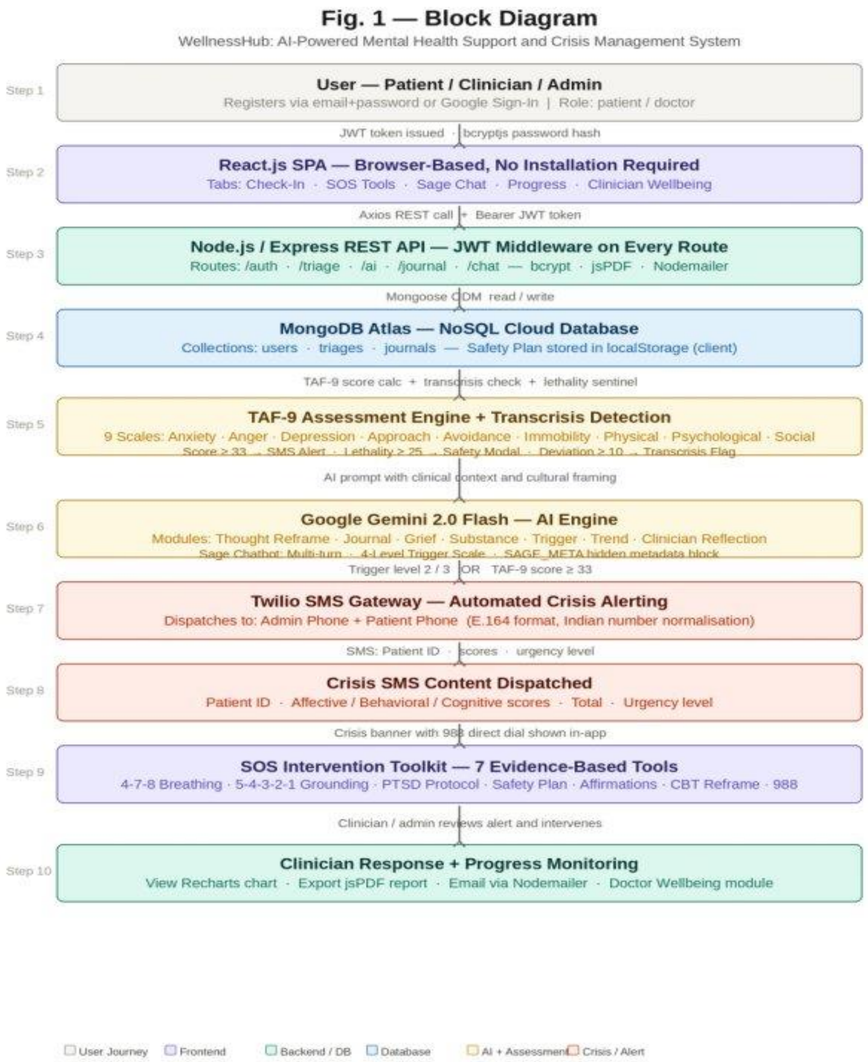

Fig. 1: Block Diagram — WellnessHub Complete End-to-End System Flow

Fig. 1 shows the complete end-to-end flow across ten steps. The user registers or logs in via email/password or Google Sign-In. The React.js SPA communicates with the Node.js backend through JWT-authenticated REST API calls. The backend reads and writes to MongoDB Atlas. The TAF-9 engine calculates scores, runs lethality checks, and executes the transcrisis detection engine. Google Gemini 2.0 Flash powers all seven AI modules and the Sage chatbot. When clinical thresholds are crossed, Twilio dispatches SMS crisis alerts. The SOS toolkit and Safety Plan Builder provide in-app intervention. The clinician response module enables longitudinal monitoring and PDF report delivery via Nodemailer.

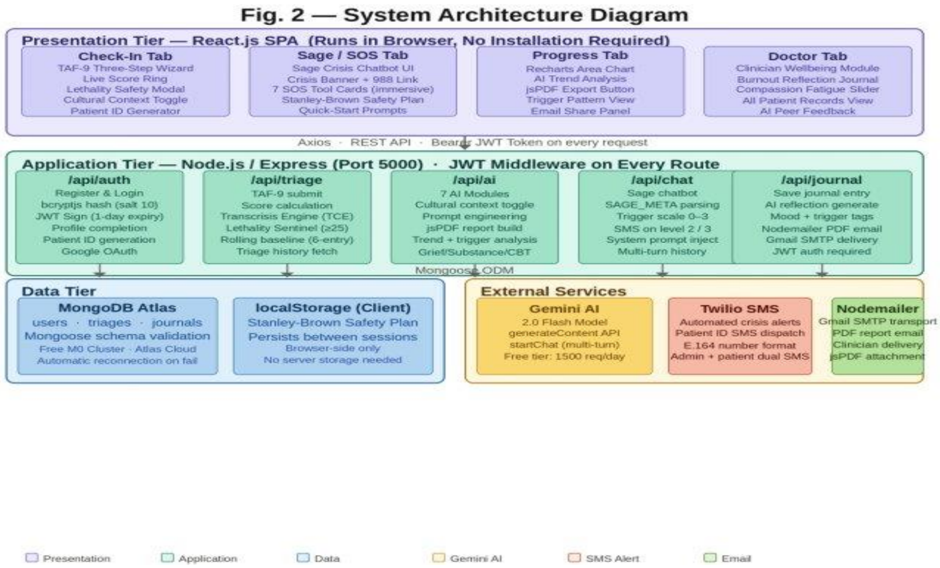

Fig. 2: System Architecture Diagram — Three-Tier Architecture with All External Services

Fig. 2 shows the layered system architecture. The Presentation Tier is the React.js SPA with four tabs. The Application Tier provides five route groups: /api/auth (registration, bcryptjs, JWT, Patient ID), /api/triage (TAF-9, score calculation, transcrisis engine, lethality sentinel), /api/ai (seven AI modules with cultural context, jsPDF), /api/chat (Sage with SAGE_META parsing and trigger 0–3), and /api/journal (journal, AI reflection, Nodemailer). The Data Tier uses MongoDB Atlas and browser localStorage. Three external services integrate: Google Gemini AI, Twilio SMS, and Nodemailer with Gmail SMTP.

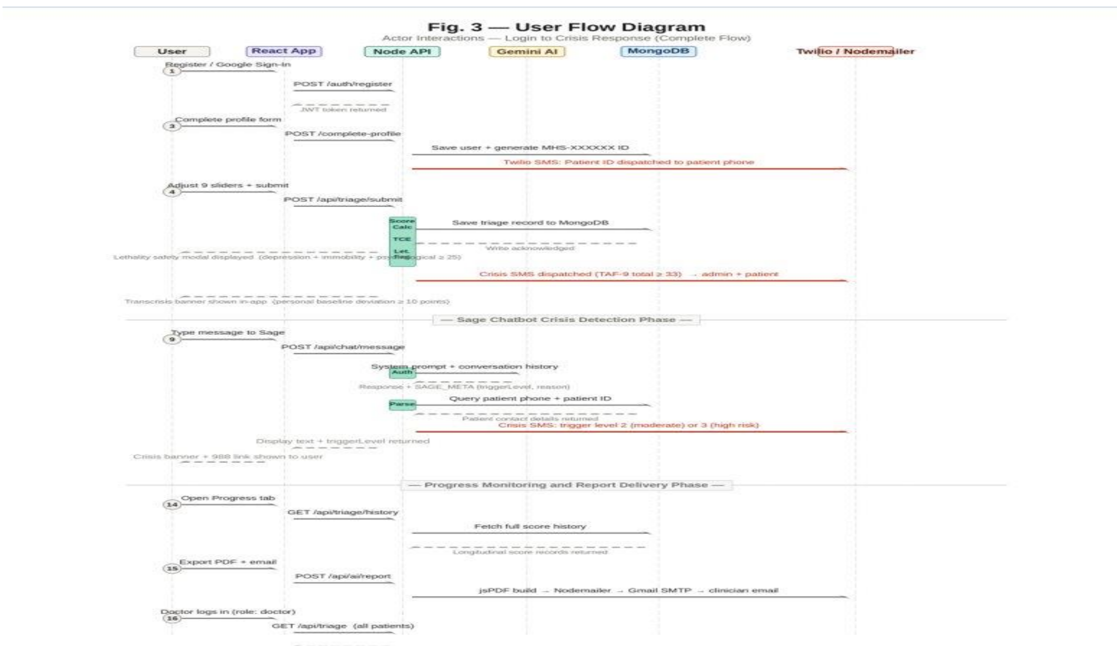

Fig. 3: User Flow Diagram — Complete Actor Interaction from Login to Crisis Response

Fig. 3 shows the sequential journey across six swimlane actors: User, React App, Node API, Gemini AI, MongoDB, and Twilio/Nodemailer. The flow starts at registration, moves through profile completion and Patient ID SMS, to TAF-9 submission. The Node API processing block runs score calculation, transcrisis detection, and lethality flagging. Lethality ≥ 25 returns a safety modal. Score ≥ 33 dispatches crisis SMS. Deviation ≥ 10 shows a transcrisis banner. The Sage phase covers SAGE_META parsing, phone lookup, and conditional crisis SMS. The progress phase handles chart retrieval, PDF export, email delivery, doctor records view, and clinician wellbeing reflection.

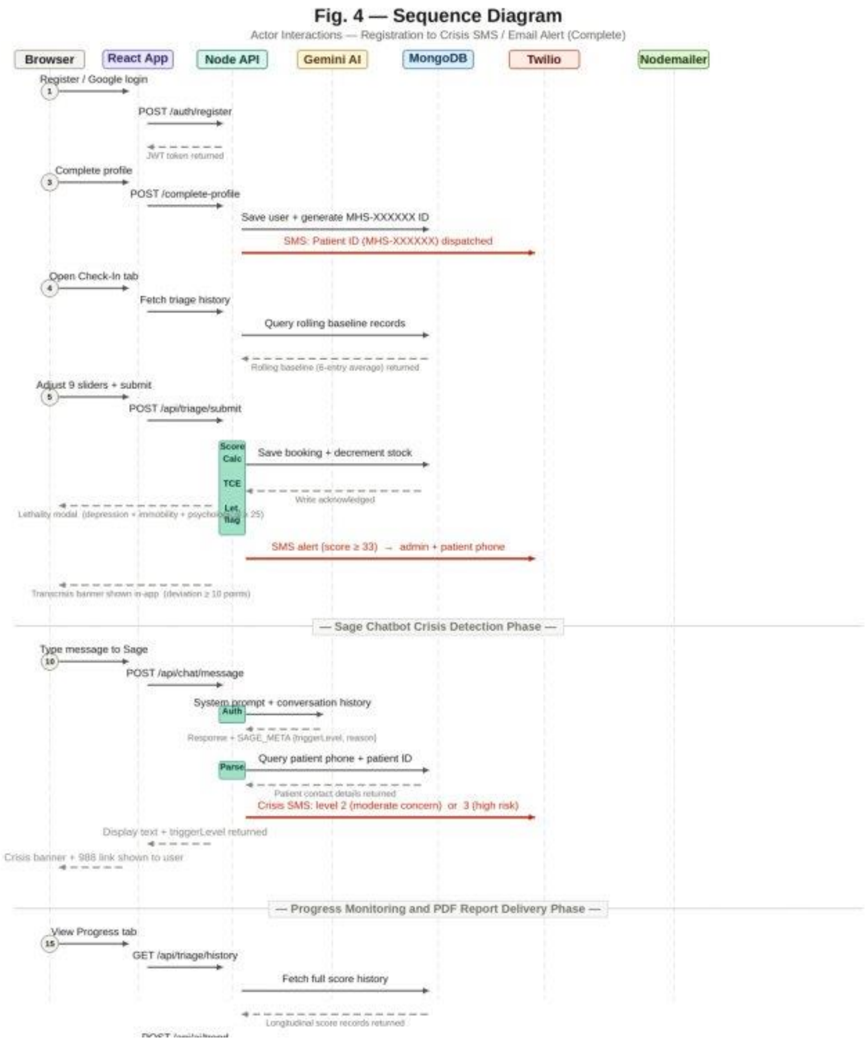

Fig. 4: Sequence Diagram — Complete Message-Level Trace from Registration to Alert Dispatch

Fig. 4 traces the complete interaction between all seven system actors: Browser, React App, Node API, Gemini AI, MongoDB, Twilio, and Nodemailer. The sequence starts with registration and JWT issuance, then profile completion and Patient ID SMS dispatch. The TAF-9 submission activates the processing block covering score calculation, TCE, and lethality flagging. The triage record saves to MongoDB and the lethality modal returns if triggered. If score ≥ 33, SMS alerts go out via Twilio. The Sage phase covers system prompt injection, SAGE_META parsing, patient phone query, and conditional crisis SMS. The final phase covers longitudinal history retrieval, AI trend analysis, and jsPDF report delivery via Nodemailer to Gmail SMTP.

5. IMPLEMENTATION RESULTS

WellnessHub was implemented using React.js 18, Node.js with Express 5, MongoDB Atlas, Google Gemini 2.0 Flash, and Twilio SDK 5.13.1. The application was tested on Android smartphones, iPhones, and desktop browsers, with consistent UI rendering and functional performance across all platforms.

5.1 Login and Registration Interface

The login interface is a dark-themed screen with email/password and Google Sign-In options. On successful authentication, a JWT token is stored in localStorage and the user is taken to the main dashboard.

5.2 TAF-9 Check-In Assessment

Step 2 of the assessment presents three category cards for Affective, Behavioral, and Cognitive domains, each with three slider controls spanning 1 to 10. A live score bar updates in real time showing the Total Impairment Score, color-coded status, and three domain subtotals.

5.3 Clinical Safety Check Modal and SMS Alert

When the lethality composite score exceeds 25, the lethality modal appears as a full-screen overlay. When the Total Impairment Score exceeds 33, an automated SMS goes out via Twilio to the clinician and patient, containing the patient identifier, domain scores, and composite total.

5.4 Sage Crisis Chatbot Interface and Crisis Banner

The Sage chat interface supports multi-turn conversation with quick-start prompts. When trigger level 2 or above is detected, a persistent crisis banner appears above the chat window with direct access to the 988 crisis line and Crisis Text Line.

5.5 SOS Intervention Dashboard

The SOS dashboard has a hero banner with direct 988 access and a responsive grid of seven clinical intervention tool cards. Each card opens into a focused single-tool view that removes surrounding navigation to reduce cognitive load during moments of acute distress.

5.6 Progress Monitoring and Longitudinal Chart

The Progress tab shows a Recharts area chart of TAF-9 Total Impairment Scores over time. AI-powered trend analysis and trigger pattern identification are available as one-tap functions. The share panel enables jsPDF report generation and Nodemailer email delivery.

6. CONCLUSION

This paper presented the design, architecture, and implementation of WellnessHub, an AI-powered mental health support and crisis management platform. By combining multi-dimensional clinical assessment through the TAF-9 protocol, automated crisis detection and SMS alerting through Twilio, AI-powered therapeutic support across seven evidence-based modules, and a culturally sensitive multi-turn crisis chatbot, WellnessHub addresses core structural gaps in existing digital mental health tools.

The system shows that proactive, continuous mental health monitoring can be delivered through a browser-based application without specialized hardware. The TAF-9 framework provides a multi-dimensional alternative to single-scale mood logging. The Sage chatbot's four-level trigger detection allows autonomous, real-time crisis escalation. The transcrisis detection engine surfaces personal deterioration before absolute thresholds are reached, enabling earlier intervention.

The dual-mode AI framing for cultural context supports both individualistic and collectivist users. The clinician wellbeing module offers evidence-based burnout monitoring for mental health professionals. Future work includes wearable biometric integration, multi-language support, a shared clinical dashboard, and an offline-capable progressive web application mode.

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BIOGRAPHIES

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