Essay

“Quitline 2.0”: A Hybrid Framework for AI Chatbots Delivering Psychosocial Interventions for Cannabis Use

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"Quitline 2.0": A Hybrid Framework for AI Chatbots Delivering Psychosocial Interventions for Cannabis Use

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Abstract

Cannabis use remains a significant public health concern, yet access to evidence-based treatment is limited. This paper proposes a hybrid artificial intelligence chatbot framework for delivering psychosocial interventions for cannabis use. The model combines rule-based components to maintain structure, safety, and intervention fidelity with generative AI to enable more natural, personalized, and responsive interactions. By integrating these approaches, hybrid chatbots may expand access to scalable, private, and on-demand support while addressing key limitations of fully scripted or fully generative systems. This framework highlights the potential of AI-assisted intervention delivery and the need for future research on safety, effectiveness, and implementation.

Keywords: addiction; artificial intelligence; counseling; internet; mental health; reach; scalability; substance-related disorders

Introduction

Cannabis use in the United States has become increasingly legalized and normalized; cannabis products are more commercially available and consumed in more diverse and often higher-potency forms (e.g., vapes, concentrates). Results from the National Survey on Drug Use and Health underscore the scale of this issue. In 2024, an estimated 22.3% of people aged 12 years and above (64.2 million) reported using cannabis in the past year, 15.4% (44.3 million) reported past month use, and 7.2% (20.6 million) met criteria for cannabis use disorder. Among the underage (12–20 years) population, past-month use was also notable, at 10.5% (4.0 million) [1]. These figures place cannabis use among the most prevalent behavioral health challenges in the US.

Cannabis use has been associated with poorer health. A meta-review identified evidence that associate cannabis use with a variety of adverse health outcomes, including physical health (higher risks for stroke, pulmonary function, and testicular cancer), mental health (higher risks for onset or relapse of psychosis, mania, and schizophrenia), neurocognitive outcomes (decreased hippocampal volume, poorer global functioning and memory), reproduction (low birth weight and birth complications), and others (impaired driving) [2]. Moreover, cannabis use disproportionately affects disadvantaged populations, which contributes to health disparities. A large-scale US survey suggests that individuals who are Black or Native American (vs. White) or with lower education or income status are significantly more likely to use cannabis [3]. Taken together, current evidence positions cannabis use as a pressing public health challenge and calls for a timely response; however, existing approaches may be insufficient. In this work, we propose a hybrid model for AI chatbots delivering psychosocial interventions for cannabis use that are safe, effective, and scalable.

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Current Interventions for Cannabis Use: Successes and Challenges

Currently, there are no established pharmacological treatments for cannabis use, unlike opioid or tobacco use. This lack of pharmacological options makes psychosocial interventions the mainstay of evidence-based treatment for cannabis use. Psychosocial interventions target behavior change by strengthening motivation, coping skills, and self-regulation. For example, motivational interviewing (MI)/motivational enhancement therapy (MET) helps individuals resolve ambivalence and build readiness to change, while cognitive behavioral therapy (CBT) focuses on identifying triggers, restructuring unhelpful thoughts, and practicing skills for craving management and relapse prevention. MI/MET, CBT, or some combination of both are the most studied and rigorously evaluated psychosocial interventions in the literature [4,5].

Existing evidence collectively suggests that MI/MET- and CBT-based treatments can meaningfully reduce cannabis use. In a systematic review of 26 randomized controlled trials (RCTs) with general cannabis users, CBT (4–14 sessions) significantly improved outcomes including reduced cannabis use, lower severity of dependence, and fewer cannabis-related problems, compared with controls; MI/MET (often shorter, 1–2 sessions) also improved cannabis use and dependence outcomes but less consistently across studies or measures [4]. More recently, another systematic review of 21 RCTs with individuals diagnosed with cannabis use disorder also supported the efficacy of combined MET-CBT interventions, with one study reporting up to 17 times higher odds for abstinence compared with waitlist controls [5]. Notably, these interventions have been evaluated under diverse settings and participant demographics, supporting generalizability [4,5]. Overall, psychosocial interventions, especially MI/MET and CBT, are our best available tool against cannabis use.

Still, psychosocial interventions face several key limitations as a public health solution. First, the uptake of intervention is low at a population level. In 2024, only 6.1% of people in need received any cannabis use treatment in the past year [1]. This issue is two-fold: on the "supply" side, interventions are costly to implement and require key resources such as trained clinicians and other supporting personnel, which are scarce and unevenly distributed across regions and health systems; on the "demand" side, cannabis users often face barriers including preference for self-reliance and fear of stigma [6]. Moreover, existing intervention protocols typically last 12 weeks or less and are evaluated with follow-up of no more than 12 months [4,5]. Treatment effects are often strongest during or shortly after the intervention period, with attenuation over time. With a lack of longer-term support, there is a substantial risk of relapse among those who receive intervention. Ultimately, these limitations need to be addressed in future innovations for psychosocial interventions to have a larger-scale and longer-term impact.

A Framework Model for AI Chatbots Delivering Psychosocial Interventions for Cannabis Use

Chatbots could be an ideal candidate for delivering psychosocial interventions for cannabis use, either telephone- or web-based, because they are well positioned to address the limitations of traditional approaches. First, while they would require more engineering efforts to develop, they can be deployed at large scales at exceptionally low marginal costs. Second, they are more accessible for people in rural areas or those facing transportation barriers, so long as they have internet connection. Third, chatbots may appeal to those hesitant about interventions by offering a private, nonjudgmental channel that may reduce perceived stigma and increase willingness to disclose. Fourth, chatbots can provide on-demand, real-time coping support outside of usual operating hours of clinics and quitlines. Lastly, chatbots can sustain support over extensive time periods through check-ins and relapse prevention interactions, improving long-term maintenance.

While there has not been any chatbot specifically built to deliver psychosocial intervention for cannabis use, many have been developed and evaluated for adjacent tasks. For example, QuitBot is a chatbot for smoking cessation that delivers a 42-day program of structured coaching conversations to enhance motivations to quit, coping skills, and recovery from lapses and relapses [7]. A recent

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systematic review that included 12 chatbot-based MI/CBT interventions for tobacco, alcohol, or general substance use showed evidence for feasibility and effectiveness: significant improvements in substance use related outcomes were reported across experimental or quasi-experimental studies, alongside generally high acceptability and user satisfaction. The studies also identified facilitators including personalization and relevant, timely tips and barriers including technical issues and "off" responses [8]. These findings motivate the design of chatbots in cannabis use interventions.

Chatbots for behavioral change generally fall into two categories. Rule-based chatbots follow predefined decision trees, scripted dialogue, and fixed content modules. They can maintain intervention structures and enforce safety boundaries with high fidelity, but it can feel rigid and sometimes completely fail when users ask unexpected questions or seek support with complex situations. In contrast, generative AI chatbots can sustain more natural, open-ended conversations and adapt language to a user's context in real time, but they also have shortcomings in clinical applications, most notably risks for hallucination and unsafe guidance. Thus, we propose a pragmatic framework for a hybrid AI chatbot aiming to combine the strengths of both (Figure 1). In this framework, a router will classify user intent; accordingly, a structured, rule-based backbone will execute intervention flow and respond to high-risk questions, whereas a generative AI component handles open-ended requests and clarifications. Additional governance components and human-in-the-loop are included to ensure fidelity and safety.

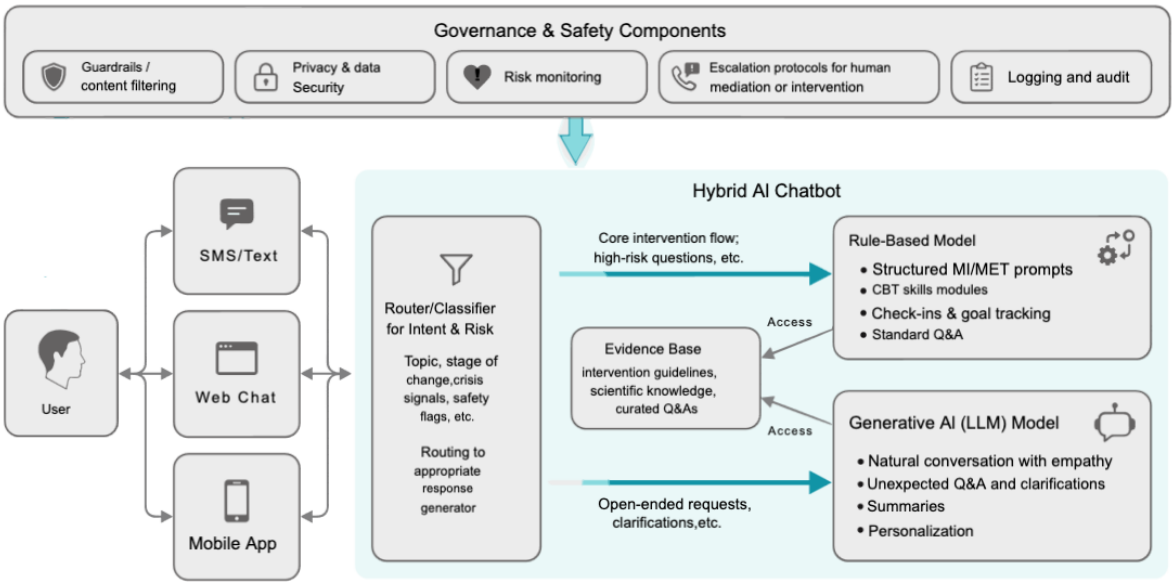

Figure 1. Hybrid framework for AI chatbots delivering psychosocial interventions for cannabis Use. Based on intent/risk classification of user inputs, either a rule-based or a generative AI model will generate appropriate responses. Both chatbot components are grounded in an evidence base and overseen by governance and safety controls (guardrails, privacy protection, risk monitoring, escalation protocols, logging and audit). Users can engage with the system via multiple channels.

Discussion

Future Directions and Public Health Impact

Hybrid AI chatbots could meaningfully reduce geographic, workforce and psychological barriers to psychosocial support for cannabis use by delivering private, on-demand intervention at low marginal cost, which could be appealing for populations such as adolescents/young adults and people in rural or underserved communities. They can also be easily adapted to alternative formats

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(e.g., SMS, mobile apps) and languages, further improving reach. Evidence suggests impact may be greatest for individuals with lower severity, while for higher-severity users the chatbot may function best as an adjunct to human counseling [8]. Therefore, two lines of chatbots as either primary or secondary intervention tools should be engineered and evaluated. At the current stage, sequential multiple assignment randomized trials (SMART) may be the most appropriate as the chatbots can be highly adaptive. Optimized systems can then be tested in efficacy trials and pragmatic trials.

Safety and Privacy

To translate their potential into practice, safety and privacy need to be carefully considered and enforced throughout the design, implementation, and deployment of hybrid AI chatbots [8]. First, these systems can increase risk to users through clinical misinformation and mishandled crises (eg, suicidality or psychosis) [9]. Therefore, they should be engineered to mitigate these risks by grounding any medical claims in evidence bases, and including proper escalation mechanisms to seek human intervention. Furthermore, privacy-by-design should be treated as a core principle, because privacy failures could become barriers to uptake and plausibly cause harm. Accordingly, hybrid AI chatbots should minimize and deidentify any health data they handle, and secure it end-to-end with strong access controls, audit trails, and encryption for data storage and transmission [10]. Finally, these safeguards should be validated through pre-deployment stress testing and continuously monitored.

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