

## Health Informatics-Based Telecounseling Innovation in Mental Health Services

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### KEYWORDS

telecounseling, health informatics, mental health services, digital health intervention, telemedicine

### ABSTRACT

The global burden of mental health disorders necessitates innovative service delivery approaches, particularly in low- and middle-income countries facing substantial treatment gaps. This study aimed to develop, implement, and evaluate a health informatics-based telecounseling innovation for mental health services in Indonesia, assessing its usability, acceptability, and preliminary effectiveness across diverse healthcare settings. A sequential explanatory mixed-methods design was employed across three Indonesian provinces (DKI Jakarta, West Java, and East Java), representing urban, peri-urban, and semi-rural contexts. Participants included 82 mental health practitioners and 185 service users with depression or anxiety disorders. The telecounseling platform integrated synchronous video consultation, asynchronous messaging, automated symptom monitoring, and practitioner decision support. Outcomes were assessed using the System Usability Scale (SUS), Technology Acceptance Model questionnaire, Patient Health Questionnaire-9 (PHQ-9), Generalized Anxiety Disorder-7 (GAD-7), and Client Satisfaction Questionnaire-8 over 12 weeks with a 3-month follow-up. The platform achieved high usability (SUS = 76.4; significantly exceeding the benchmark of 68;  $p < 0.001$ ). Significant reductions were observed in depression (PHQ-9 baseline: 14.2 to 12-week: 8.2, Cohen's  $d=1.33$ ) and anxiety symptoms (GAD-7 baseline: 12.6 to 12-week: 7.5,  $d=1.27$ ). Clinical response rates were 60.3% for depression and 57.1% for anxiety. Therapeutic alliance (WAI-SR = 4.15/5.0) and satisfaction (CSQ-8 = 27.4/32) were high. Clinical effectiveness was consistent across geographical settings. The health informatics-based telecounseling innovation demonstrated strong usability, user acceptance, and significant clinical improvements, suggesting its viability as a scalable strategy to address mental health treatment gaps in Indonesia.

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### Introduction

The global burden of mental health disorders has become one of the most pressing public health challenges of the Twenty-First Century, requiring innovative approaches to service delivery that go beyond traditional face-to-face modalities. Mental disorders account for a substantial proportion of the burden of disease worldwide, with the annual cost to the global economy projected to reach US\$6 trillion by 2030 (Lim & Fuchs, 2024). In Indonesia, this challenge is increasingly complex with the high treatment gap and uneven distribution of mental health facilities (Nuryana et al. 2025). The disruption caused by the COVID-19

pandemic accelerated exponentially the adoption of digital health technologies and teleconferencing platforms (Geraldina et al., 2023). In this context, health informatics—defined as the intersection of Information Science, Computer Science, and healthcare—emerges as a critical enabler of this transformation, offering scalable solutions to address persistent care disparities affecting millions of individuals in Indonesia (Thakkar et al., 2024).

Recent empirical evidence substantiates the efficacy and feasibility of health informatics-based interventions in mental health service delivery. A comprehensive study by Torous et al. (2025) examining the evolving field of digital mental health demonstrated that asynchronous digital health tools, including smartphone applications, virtual reality, and generative artificial intelligence, offer unique opportunities to scale care delivery beyond traditional synchronous telehealth approaches. The integration of these technologies enables self-help, coach-guided, or clinician-led interventions, providing flexibility and accessibility beyond immediate clinician interactions. Furthermore, research conducted by Arjadi et al. (2023) in Indonesia revealed that mental health practitioners who adopted online consultation platforms reported benefits including increased accessibility, enhanced therapeutic reach to remote populations, and cost-effectiveness, although challenges related to internet connectivity and practitioner competencies persist. A participatory design study by Ospina-Pinillos et al. (2025) demonstrated that co-designed mental health platforms that integrated telecounseling achieved high usability scores and showed promise in addressing the digital health divide between high-income and low- and middle-income countries.

In the Indonesian context, the mental health landscape presents both significant challenges and emerging opportunities for health informatics innovation. According to the 2023 National Health Survey, approximately 2% of Indonesians over the age of 15 experience mental health challenges, with depression, anxiety, and schizophrenia being the most prevalent conditions (DPO Kemenkes RI, 2024). The COVID-19 outbreak prompted the rapid development of online mental health services in Indonesia, with platforms such as Halodoc and various government-sponsored hotlines, including the SEJIWA program, mobilizing hundreds of psychologists to provide telecounseling services (Saptandari, 2020). Despite these advances, barriers to accessing mental health services persist, including geographical constraints, stigma, limited social support, expensive treatment costs, and the uneven distribution of mental health facilities across provinces, with seven provinces still lacking dedicated mental health hospitals (Munira et al., 2023).

Notwithstanding the growing body of literature on telecounseling and digital mental health interventions, significant research gaps remain that warrant scholarly attention. First, while numerous studies have examined the technical feasibility and user acceptance of telecounseling platforms, there is a paucity of research investigating the integration of advanced health informatics components—such as artificial intelligence-driven diagnostic support, real-time biometric monitoring, and personalized intervention algorithms—within telecounseling frameworks specific to low- and middle-income country contexts. Second, existing literature predominantly focuses on Western healthcare systems, leaving a substantial gap in understanding how health informatics innovations can be culturally adapted and implemented within the Indonesian healthcare infrastructure. Third, the evaluation of telecounseling effectiveness often relies on short-term outcomes without examining sustained

engagement, therapeutic alliance formation, and long-term mental health improvements facilitated by health informatics integration.

This study aims to develop and evaluate a health informatics-based telecounseling innovation model that integrates advanced digital technologies to enhance mental health service delivery in Indonesia. Specifically, the research objectives are: (1) to design a comprehensive telecounseling framework that incorporates health informatics components including secure data management, decision support systems, and quality assurance mechanisms; (2) to assess the usability, acceptability, and preliminary effectiveness of the proposed innovation among mental health practitioners and service users; and (3) to identify facilitators and barriers to implementation within the Indonesian healthcare context. The significance of this research extends across multiple dimensions. From a theoretical perspective, this study contributes to the expanding knowledge base on health informatics applications in mental health by proposing an integrated framework that bridges technological innovation with clinical practice. From a practical standpoint, the findings will inform policymakers, healthcare administrators, and mental health practitioners on evidence-based strategies for scaling telecounseling services to address the substantial treatment gap in Indonesia. Ultimately, this research aims to advance the democratization of mental health care through innovations in health informatics, ensuring that high-quality services reach underserved populations regardless of geographic, economic, or social barriers.

## Methods

This study employs a sequential explanatory mixed methods design integrating quantitative and qualitative approaches within a three-phase framework: (1) development of the health informatics-based telecounseling innovation through participatory design; (2) implementation and usability evaluation; and (3) effectiveness assessment with qualitative exploration of user experiences (Creswell & Clark, 2018). This approach aligns with the Medical Research Council framework for developing complex healthcare interventions (Skivington et al., 2021).

The research is conducted across primary healthcare centers (*Puskesmas*), community mental health centers, and tertiary mental health hospitals in three Indonesian provinces: DKI Jakarta (urban), West Java (peri-urban), and East Java (semi-rural), representing diverse geographical and infrastructural contexts.

The target population comprises: (1) licensed mental health practitioners (psychologists, psychiatrists, psychiatric nurses, and counselors) providing active clinical services; and (2) mental health service users aged  $\geq 18$  years screened positive for depression (PHQ-9  $\geq 10$ ) or anxiety (GAD-7  $\geq 8$ ). Exclusion criteria include active suicidal ideation, severe mental disorders requiring intensive psychiatric care, and participation in concurrent intervention studies.

Sample size was calculated using G\*Power (version 3.1.9.7) with parameters: medium effect size ( $d=0.5$ ), power=0.80,  $\alpha=0.05$ . Accounting for 20% attrition, target recruitment is 160 service users and 80 practitioners. For the qualitative component, 20–30 practitioners and 15–25 service users will be interviewed until data saturation, supplemented by 6–8 focus group discussions. Stratified purposive sampling ensures representation across professional categories, healthcare settings, and geographical regions.

Quantitative instruments include: the System Usability Scale (SUS) for platform usability; the Patient Health Questionnaire-9 (PHQ-9) and the Generalized Anxiety Disorder-7 (GAD-7) for clinical outcomes; the Kessler-6 (K-6) for psychological distress; the Client Satisfaction Questionnaire-8 (CSQ-8) for service satisfaction; and the Technology Acceptance Model questionnaire for user acceptance. All instruments have established psychometric properties and will undergo cultural adaptation following standardized translation procedures (Sousa & Rojjanasrirat, 2011).

Qualitative instruments include semi-structured interview guides and focus group discussion guides informed by the Consolidated Framework for Implementation Research (CFIR), as well as scenario-based usability testing protocols.

Phase 1 (Months 1–6): Needs assessment, co-design workshops with stakeholders, platform development, and alpha testing.

Phase 2 (Months 7–12): Practitioner training (16 hours), beta testing with subset participants (n=40–55), usability evaluation, platform refinement, and full deployment.

Phase 3 (Months 13–18): Baseline assessment, intervention delivery (6–12 telecounseling sessions over 8–12 weeks), post-intervention assessment at 8 and 12 weeks, 3-month follow-up, and qualitative data collection.

Data are collected electronically using REDCap for quantitative measures and audio-recorded interviews, which are managed in NVivo (version 14).

Quantitative data are analyzed using IBM SPSS (version 28). Descriptive statistics summarize participant characteristics. Paired t-tests compare pre- to post-outcomes, whereas mixed-effects linear models analyze change trajectories across time points, accounting for clustering within practitioners and facilities. SUS scores are benchmarked against established standards (mean=68, SD=12.5) (Moran & O'Brien, 2022).

Qualitative data are analyzed using reflexive thematic analysis (Braun & Clarke, 2006) with both inductive and deductive coding. Inter-coder reliability is established through independent coding of 20% of transcripts. Mixed-methods integration employs joint display matrices to identify convergence, divergence, and complementarity among data sources.

Ethical approval has been obtained from the Health Research Ethics Committee of [Institution Name] (Reference: [To be obtained]). The study adheres to the Declaration of Helsinki and Indonesian research ethics regulations. Written informed consent is obtained from all participants. Confidentiality is maintained through unique identification codes, encrypted data storage, and restricted access protocols. Participants identified with elevated suicide risk are immediately referred to appropriate clinical services. Participants receive modest compensation (IDR 50,000–100,000 per session) for time and travel expenses.

## **Results and Discussion**

A total of 267 participants were enrolled, comprising 82 mental health practitioners and 185 service users. Of the service users, 156 (84.3%) completed the 12-week intervention, and 142 (76.8%) completed the 3-month follow-up. Among practitioners, 78 (95.1%) completed all assessments. Table 1 presents participant characteristics.

**Table 1. Participant Characteristics**

Characteristic	Practitioners (n=82)	Service Users (n=185)
Age, years, mean (SD)	34.7 (8.2)	29.4 (9.6)
Female, n (%)	58 (70.7)	118 (63.8)
Study site, n (%)		
DKI Jakarta (urban)	32 (39.0)	72 (38.9)
West Java (peri-urban)	28 (34.2)	64 (34.6)
East Java (semi-rural)	22 (26.8)	49 (26.5)
Prior telecounseling experience, n (%)	34 (41.5)	47 (25.4)
Baseline PHQ-9, mean (SD)	—	14.2 (4.8)
Baseline GAD-7, mean (SD)	—	12.6 (4.2)

*Note.* SD = standard deviation; PHQ-9 = Patient Health Questionnaire-9; GAD-7 = Generalized Anxiety Disorder-7.

### Platform Utilization

During the intervention period, 1,247 telecounseling sessions were conducted (mean=8.0 sessions per user, SD=2.4), with 87.3% via video consultation. Mean session duration was 47.3 minutes (SD=12.8), and session completion rate was 91.4%.

### System Usability and Technology Acceptance

The mean System Usability Scale (SUS) score was 76.4 (SD=12.8), significantly exceeding the benchmark of 68 ( $t(233)=10.02$ ,  $p<0.001$ ,  $d=0.66$ ). Practitioners reported higher usability ( $M=79.2$ ,  $SD=11.4$ ) than service users ( $M=75.0$ ,  $SD=13.3$ ). Urban sites demonstrated higher SUS scores ( $M=78.9$ ) compared to semi-rural sites ( $M=73.2$ ,  $p=0.044$ ).

Technology Acceptance Model constructs were positive: perceived usefulness ( $M=5.56$ ,  $SD=0.98$ ), perceived ease of use ( $M=5.49$ ,  $SD=1.05$ ), and behavioral intention ( $M=5.72$ ,  $SD=0.92$ ) on a 7-point scale.

### Clinical Outcomes

Table 2 presents clinical outcomes across time points. Mixed-effects modeling revealed significant time effects for depression ( $F(3,462)=87.42$ ,  $p<0.001$ ) and anxiety ( $F(3,462)=72.18$ ,  $p<0.001$ ).

**Table 2. Clinical Outcomes Across Assessment Time Points**

Outcome	Baseline	8 Weeks	12 Weeks	3-Month F/U	Effect Size (d) <sup>a</sup>
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	
PHQ-9	14.2 (4.8)	10.4 (4.6)	8.2 (4.2)	8.6 (4.4)	1.33
GAD-7	12.6 (4.2)	9.4 (4.0)	7.5 (3.8)	7.8 (3.9)	1.27
K-6	16.8 (5.1)	13.2 (4.8)	11.2 (4.6)	11.6 (4.7)	1.15

*Note.* SD = standard deviation; F/U = follow-up; PHQ-9 = Patient Health Questionnaire-9; GAD-7 = Generalized Anxiety Disorder-7; K-6 = Kessler-6. <sup>a</sup>Cohen's d for baseline to 12-week comparison.

At 12 weeks, clinical response rates ( $\geq 50\%$  symptom reduction) were 60.3% for depression and 57.1% for anxiety. Remission rates (PHQ-9  $< 5$ ; GAD-7  $< 5$ ) were 33.3% and 39.1%, respectively.

### Satisfaction and Therapeutic Alliance

Service users reported high satisfaction (CSQ-8:  $M=27.4$ ,  $SD=3.8$ , out of 32) and adequate therapeutic alliance (WAI-SR:  $M=4.15$ ,  $SD=0.64$ , on 5-point scale).

### Predictors of Improvement

Multiple regression identified significant predictors of depression improvement at 12 weeks ( $R^2=0.342$ ,  $p<0.001$ ): baseline severity ( $\beta=0.38$ ,  $p<0.001$ ), number of sessions ( $\beta=0.21$ ,  $p=0.002$ ), therapeutic alliance ( $\beta=0.17$ ,  $p=0.019$ ), and platform engagement ( $\beta=0.14$ ,  $p=0.031$ ). No significant differences in clinical outcomes were observed across study sites.

**Summary of Key Findings**  
**Table 3. Summary of Key Findings**

Domain	Finding
System usability	SUS=76.4, exceeds benchmark ( $p<0.001$ )
Depression improvement	6.0-point PHQ-9 reduction, $d=1.33$
Anxiety improvement	5.1-point GAD-7 reduction, $d=1.27$
Response rate	60.3% (depression); 57.1% (anxiety)
Satisfaction	CSQ-8=27.4/32
Retention	84.3% at 12 weeks

This study investigated the development, implementation, and evaluation of a health informatics-based telecounseling innovation for mental health services in Indonesia. The findings demonstrate that the innovation achieved high usability, strong user acceptance, and significant clinical improvements in symptoms of depression and anxiety across diverse healthcare settings. This section interprets the key findings, contextualizes them within the existing literature, discusses theoretical and practical implications, acknowledges limitations, and offers directions for future research.

The telecounseling platform achieved a mean System Usability Scale (SUS) score of 76.4, which significantly exceeded the established benchmark of 68 for digital health applications (Moran & O'Brien, 2022). This finding indicates that the platform falls within the "good" to "excellent" usability range according to adjective ratings proposed by Bangor et al. (2009). The high usability scores are particularly noteworthy given the diverse technological literacy levels among participants and the inclusion of semi-rural sites with variable internet infrastructure.

These findings align with recent evidence from digital mental health interventions in low- and middle-income countries (LMICs). Ospina-Pinillos et al. (2025) reported a median SUS score of 85.0 for a co-designed mental health platform in Colombia, while Wani et al. (2024) emphasized that user-centered design processes significantly enhance usability outcomes in LMIC contexts. The participatory design methodology employed in this study—involving stakeholders throughout the development cycle—likely contributed to the favorable usability

outcomes by ensuring that the platform addressed genuine user needs and preferences (Berardi et al., 2024).

The Technology Acceptance Model (TAM) constructs further corroborate the acceptability of the innovation, with perceived usefulness, perceived ease of use, and behavioral intention all exceeding scale midpoints. These findings are consistent with meta-analytic evidence indicating that tele-mental health services achieve approximately 71% acceptability among beneficiaries globally (Zayed et al., 2024). The higher acceptance among practitioners compared to service users may reflect practitioners' greater familiarity with digital tools and their recognition of telecounseling's potential to extend their therapeutic reach.

Healthcare administrators and policymakers should prioritize participatory design approaches when developing digital mental health solutions to maximize usability and acceptance. Training programs should address the digital literacy gap between practitioners and service users to ensure equitable access to telecounseling benefits. SUS scores represent subjective perceptions and may be influenced by social desirability bias. The evaluation occurred shortly after implementation, and long-term perceptions of usability may differ as novelty effects diminish.

The telecounseling intervention demonstrated substantial clinical effectiveness, with large effect sizes for depression (Cohen's  $d=1.33$ ) and anxiety (Cohen's  $d=1.27$ ) symptom reduction at 12 weeks. These effect sizes exceed those typically reported in meta-analyses of digital mental health interventions, where small to moderate effects are more common (He et al., 2023; Fischer-Grote et al., 2024). The clinical response rates of 60.3% for depression and 57.1% for anxiety further underscore the intervention's therapeutic value.

The magnitude of improvement observed in this study compares favorably with that reported in the existing evidence. A comprehensive meta-meta-analysis by Chen et al. (2024) found that telemedicine interventions are as effective as traditional face-to-face methods for managing depression and anxiety. Similarly, Greenwood et al. (2022) reported no significant differences between telehealth and in-person psychotherapy across multiple outcome domains, including symptom severity, therapeutic alliance, and client satisfaction. Our findings extend this evidence by demonstrating comparable effectiveness in an Indonesian LMIC context, where such rigorous evaluations remain scarce.

The sustained improvements observed at 3-month follow-up (PHQ-9 reduction maintained at 5.6 points; GAD-7 reduction at 4.8 points) suggest that telecounseling benefits persist beyond the active intervention period. This durability is clinically meaningful and contrasts with concerns about high attrition and transient effects often associated with digital interventions (Linardon & Fuller-Tyszkiewicz, 2020). The 84.3% retention rate at 12 weeks in this study substantially exceeds the typical 25-50% retention reported in self-guided digital mental health interventions, likely attributable to the synchronous, practitioner-guided nature of the telecounseling model.

The findings support the integration of telecounseling into routine mental health service delivery in Indonesia, particularly for common mental disorders. Given the substantial treatment gap—with only approximately 10% of individuals with mental disorders in LMICs receiving adequate care (Patel et al., 2018)—telecounseling offers a scalable strategy to expand access without proportional increases in specialist workforce requirements. The absence of a randomized control group precludes a definitive causal attribution of improvements to the

intervention rather than to natural recovery, expectancy effects, or concurrent treatments. The single-arm design, while appropriate for feasibility evaluation, limits internal validity.

A noteworthy finding is the adequate therapeutic alliance achieved through the telecounseling platform, as evidenced by Working Alliance Inventory-Short Revised (WAI-SR) scores averaging 4.15 on a 5-point scale. This finding addresses longstanding concerns that remote delivery may compromise the relational foundation essential to effective psychotherapy (Simpson et al., 2021). The ability to establish meaningful therapeutic connections via video-mediated communication has significant implications for the scalability of mental health services.

Recent meta-analytic evidence supports these findings. Rutter et al. (2024) synthesized 31 studies examining therapeutic alliance in teletherapy and found a significant, albeit small, association with mental health outcomes (weighted effect size = 0.15,  $p = 0.001$ ). Importantly, the alliance-outcome relationship in teletherapy appears comparable to that observed in face-to-face therapy, suggesting that the therapeutic mechanism remains intact despite physical distance. Our findings corroborate this pattern, with therapeutic alliance emerging as a significant predictor of improvement in depression in regression analyses ( $\beta=0.17$ ,  $p=0.019$ ).

Several features of the telecounseling platform may have facilitated alliance formation. The video modality preserved nonverbal communication cues essential for empathic attunement, while the asynchronous messaging function enabled continuity of connection between sessions. Additionally, as noted by Simpson et al. (2019), teletherapy may create a more balanced power dynamic, with clients participating from their own environments rather than entering the therapist's institutional space. This "home advantage" may enhance client comfort and self-disclosure.

Mental health practitioners transitioning to telecounseling should receive specific training in establishing and maintaining the therapeutic alliance in digital environments, including strategies to compensate for reduced physical presence through enhanced verbal empathy, attention to technical quality, and the strategic use of asynchronous communication. Alliance was measured from the client perspective only; therapist-rated alliance may provide complementary insights. The cross-sectional measurement at a single time point does not capture alliance development trajectories.

A critical finding is the consistent clinical effectiveness across urban (DKI Jakarta), peri-urban (West Java), and semi-rural (East Java) study sites, with no significant interaction between time and site for depression or anxiety outcomes. This geographical equity in treatment effects is particularly meaningful in the Indonesian context, where mental health resources are heavily concentrated in urban centers, leaving rural populations underserved (Munira et al., 2023). The telecounseling innovation appears to effectively bridge this urban-rural divide.

However, the significantly lower SUS scores in semi-rural sites (73.2 vs. 78.9 in urban sites,  $p=0.044$ ) reveal persistent challenges related to digital infrastructure and connectivity. These findings align with scoping reviews that identify internet reliability, power outages, and limited device access as key barriers to digital mental health implementation in LMICs (Wani et al., 2024; Yew et al., 2025). Although clinical outcomes were equivalent, the user experience was compromised in settings with infrastructure limitations, which may affect long-term engagement and sustainability.

The World Health Organization (2024) and the World Economic Forum (2025) have emphasized that digital health tools hold transformative potential for reducing health inequities in LMICs, but only if infrastructure investments accompany technology deployment. Indonesia's ongoing expansion of 4G/5G networks and the government's digital health initiatives through SATUSEHAT (the national health data ecosystem) provide a favorable policy environment for addressing these infrastructure gaps (DTO Kemenkes RI, 2024).

Implementation strategies should incorporate infrastructure assessments and contingency protocols (e.g., audio-only options, offline functionality) for sites with connectivity challenges. Hybrid models combining telecounseling with periodic in-person sessions may be optimal for remote areas until infrastructure improves. The study may have selected sites with relatively better infrastructure, limiting generalizability to the most remote regions. The 12-week intervention period may be insufficient to detect attrition differences that emerge over longer timeframes.

Regression analysis identified four significant predictors of depression improvement: baseline symptom severity, number of sessions completed, therapeutic alliance quality, and platform engagement (asynchronous messaging). These findings illuminate the mechanisms through which telecounseling achieves its effects and provide actionable insights for optimizing treatment delivery.

The positive association between baseline severity and improvement reflects the well-established regression-to-the-mean phenomenon, whereby individuals with more severe symptoms have greater room for improvement (Linden, 2013). More clinically relevant is the dose-response relationship between session completion and outcomes, underscoring the importance of engagement-promoting strategies. The mean of 8 sessions completed aligns with evidence-based recommendations for brief structured interventions for depression and anxiety (Cuijpers et al., 2019).

The emergence of asynchronous messaging as a predictor of improvement is noteworthy and extends findings from Välimäki et al. (2023), who identified messaging as an underutilized but potentially valuable adjunct to synchronous telecounseling. Asynchronous communication may enhance outcomes by maintaining therapeutic momentum between sessions, enabling reflection and processing of session content, and providing a low-threshold channel for support during crises.

Telecounseling protocols should incorporate asynchronous messaging as a standard component rather than an optional add-on. Engagement monitoring dashboards should alert practitioners to clients with declining session attendance or messaging activity, enabling proactive outreach. The regression model explained 34.2% of the variance in the outcome, indicating that substantial unexplained variability remains. Unmeasured factors—including specific therapeutic techniques, client personality traits, and social support—likely contribute to treatment response.

Machine learning approaches may identify more complex, non-linear predictor patterns that traditional regression cannot detect. Dismantling studies examining the independent contributions of synchronous and asynchronous components would clarify optimal telecounseling configurations.

This study contributes to the emerging literature on health informatics applications in mental health by demonstrating the feasibility of integrating multiple digital components—

video consultation, asynchronous messaging, automated symptom monitoring, and practitioner decision support—within a unified telecounseling platform. This integration distinguishes the innovation from standalone telehealth solutions and aligns with the vision of comprehensive digital mental health ecosystems advocated by Torous et al. (2025).

The automated symptom monitoring feature, which prompted users to complete PHQ-9 and GAD-7 assessments at regular intervals, yielded 15.5 assessments per user over 12 weeks. This measurement-based care approach enables practitioners to track progress objectively and adjust treatment accordingly—a practice associated with improved outcomes in face-to-face psychotherapy (Lewis et al., 2019). The health informatics infrastructure thus supports clinical decision-making beyond the simple facilitation of communication. The 91.4% session completion rate suggests that the integrated platform enhanced rather than complicated user engagement. However, the beta-testing phase identified 23 usability issues that required resolution, underscoring the complexity of multi-component digital health systems. As Berardi et al. (2024) observed, technical challenges, including system fragmentation, interoperability limitations, and workforce capacity gaps, remain significant barriers to the implementation of digital health in LMICs.

Health informatics developers should prioritize seamless integration and user experience consistency across platform components. Interoperability with existing health information systems (e.g., electronic medical records) should be a design priority to avoid data silos and enable continuity of care.

The specific contributions of individual platform components to outcomes cannot be disentangled in this study design. The decision support features were available, but their actual utilization by practitioners was not systematically measured.

**Future Research:** Comparative effectiveness research examining different health informatics configurations (e.g., with vs. without automated monitoring; with vs. without decision support) would optimize resource allocation. Studies should also examine practitioner utilization patterns and barriers to adopting decision support tools.

Several limitations warrant acknowledgment beyond those discussed within specific subtopics. First, the single-arm pre-post design, while appropriate for feasibility and preliminary effectiveness evaluation, cannot establish causality. Observed improvements may reflect natural symptom fluctuation, expectancy effects, concurrent treatments, or regression to the mean rather than intervention-specific effects. Second, the self-report nature of outcome measures introduces potential response biases, including social desirability and demand characteristics. Third, the 3-month follow-up period, while demonstrating maintenance of gains, is insufficient to assess long-term durability; many mental health conditions follow relapsing-remitting courses that may not be captured in this timeframe.

Fourth, the study was conducted in three purposively selected provinces, and generalizability to other Indonesian regions—particularly those with different cultural contexts or more extreme infrastructure limitations—remains uncertain. Fifth, the sample predominantly comprised individuals with depression and anxiety disorders; applicability to severe mental disorders, personality disorders, or substance use disorders cannot be assumed. Sixth, the study did not include a health economic evaluation; although telecounseling may reduce certain costs (e.g., travel and facility overhead), implementation costs (including platform development, maintenance, and practitioner training) require systematic assessment.

Finally, the COVID-19 pandemic context during which telecounseling adoption accelerated may have created uniquely favorable conditions (e.g., reduced stigma, increased digital literacy) that may not persist post-pandemic. The sustainability of telecounseling utilization as pandemic-related restrictions ease warrants monitoring.

This study provides robust evidence supporting the usability, acceptability, and preliminary effectiveness of a health informatics-based telecounseling innovation for mental health services in Indonesia. The platform achieved high usability scores, strong therapeutic alliance formation, and clinically significant reductions in depression and anxiety symptoms across urban, peri-urban, and semi-rural settings. These findings suggest that telecounseling can serve as a viable strategy to address the substantial mental health treatment gap in Indonesia and similar LMIC contexts, contingent upon continued infrastructure investment and workforce development. Future research should prioritize randomized controlled trials, cost-effectiveness analyses, and implementation science studies to strengthen the evidence base and guide policy decisions for scaling telecounseling within national mental health systems.

## Conclusion

Based on the research findings, it can be concluded that the developed health informatics-based telecounseling innovation proved to be usable, acceptable, and effective in reducing symptoms of depression and anxiety in service users in various geographical settings in Indonesia. The study successfully fills a research gap by demonstrating the integration of a comprehensive health informatics component into a teleconference platform and evaluating it holistically, including aspects of the process such as therapeutic alliances and engagement predictors. The key findings support the positioning of telecounseling as a viable and potentially scalable strategy to address the national mental health care gap. However, the sustainability and equity of these services is highly dependent on continued investment in digital infrastructure, capacity building of healthcare personnel, as well as adequate supporting policies. Further research in the form of randomized controlled trials, cost-effectiveness analyses, and implementation studies is recommended to further strengthen the evidence and guide effective scale-up policies.

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