Review

Implementing Digital Mental Health Interventions for Children and Young People in Emergency Care Settings: Systematic Review

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Abstract

Background: Emergency departments play a central role in crisis management for children and young people's (CYP) mental health. These settings face significant challenges in delivering effective support, such as shortages of mental health specialists, long waiting times, and overcrowding. Digital mental health interventions (DMHIs) may have the potential to expand access to care, bridge service gaps, and alleviate pressure on emergency settings for CYP experiencing mental health crises.

Objective: This review systematically reviews the current evidence for the acceptability, appropriateness, feasibility, and cost-effectiveness of DMHIs for CYP in emergency care settings.

Methods: We conducted database searches using APA PsycInfo, Embase, MEDLINE, and Web of Science from January 2015 to September 2025. We included quantitative, qualitative, and mixed methods studies that related to the acceptability, appropriateness, feasibility, and cost-effectiveness of DMHIs in acute settings. Acceptability, appropriateness, and feasibility were added as post hoc outcomes for this secondary review after implementation-related evidence was identified in the original search. DMHIs included telepsychiatry, phone calls, SMS text messaging, and computerized interventions. In addition to studies reporting data from CYP under the age of 25 years, we included those evaluating data from caregivers and care providers. All selected studies were assessed for quality using the Mixed Methods Appraisal Tool.

Results: Overall, 6778 articles were retrieved from the database searches, of which 13 articles met the inclusion criteria. In total, data from 1495 patients, of whom 1048 received a DMHI, 413 caregivers, and 250 care providers were included across studies, excluding 1 study that did not report the sample size for care providers. Mental health presentations included depressive symptoms, violent behaviors, suicidal ideation and attempts, intoxication, and multiple mental health conditions. DMHIs were broadly acceptable, particularly for interventions such as telepsychiatry and structured follow-up phone calls. Feasibility, appropriateness, and cost-effectiveness outcomes were more varied. These were affected by the specific intervention design, emergency care context, and user characteristics. CYP valued computerized interventions that incorporated age-appropriate design and language; telepsychiatry, phone calls, and automated SMS text messaging interventions that enabled continued support and connectedness with health care professionals; and interventions delivered at appropriate intervals. Conversely, health care providers raised concerns about increasing workloads for interventions that required specialist facilitation. Electronic cognitive behavioral therapy was viewed as more appropriate for CYP with prior therapy experience, and SMS text messaging intervention outcomes were limited in CYP with histories of behavioral violence.

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Conclusions: DMHIs show promise in supporting the mental health care needs of CYP in emergency care settings. CYP, caregivers, and care providers demonstrated a willingness to use these tools, but careful consideration is needed to improve the appropriateness and feasibility of these interventions. More diverse studies are needed to explore these findings in different contexts and to address existing shortcomings to support the implementation of DMHIs.

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KEYWORDS

emergency care; children and adolescents; mental health; digital health; digital mental health

Introduction

Mental health disorders represent a significant global health challenge, affecting approximately 15% of children and young people (CYP) aged 6-18 years [1]. Despite this, up to 80% of CYP in high-income countries do not receive adequate mental health care or any care at all [2]. Left untreated, mental health disorders are associated with substantial morbidity and mortality, including higher risks of educational difficulties, future unemployment, and long-term physical health complications [3-6]. This highlights the critical need for targeted and early intervention.

Pediatric emergency departments (EDs) play an increasingly central role in crisis management for CYP's mental health. In many health care systems, they have become the first point of contact for those seeking mental health care [7]. Between 2011 and 2020, the proportion of mental health-related ED visits nearly doubled in the United States [8], with similar trends observed in other high-income countries [9]. In the United Kingdom, there was a 65% increase in emergency admissions for mental health reasons over the last 10 years [10].

Digital mental health interventions (DMHIs) offer a promising solution to preventing repeat emergency admissions for mental health reasons, especially for lower-acuity cases with avoidable emergencies. DMHIs leverage technological platforms such as smartphones, telemedicine, web-based interventions, and AI-driven tools to deliver digitalized mental health support [11-15]. Early research demonstrated the feasibility of digital approaches within adolescent emergency care, whereby adolescents with self-harm emergencies completed an interactive laptop-based alcohol prevention program in the ED, with 94% reporting that they liked the intervention [16]. Although this work preceded the global expansion of digital mental health platforms [17], with approximately 78% of the global population owning a mobile device and 79% of young people (YP) aged 15-24 using the internet worldwide by 2024 [18], these interventions may have the potential to expand access to care, bridge service gaps, and alleviate pressure on emergency care, providing low-resource solutions.

Among the growing literature on DMHIs, meta-analyses of randomized controlled trials (RCTs) have played a critical role in evaluating the utility of these tools. For example, a meta-analysis of RCTs in adult populations demonstrated that smartphone-based interventions can significantly reduce depressive and anxiety symptoms compared with control and waitlist conditions [19]. Further meta-analyses in adult populations, though largely in high- and middle-income countries, support these positive outcomes and span conditions such as autism spectrum disorder, bipolar disorder, eating disorders, posttraumatic stress disorder, and psychosis-related disorders [20-24], with moderate effectiveness also demonstrated in low- and middle-income countries (LMICs) [25,26]. Despite the success of DMHIs in managing various mental health conditions in adult populations, their application in CYP mental health remains less explored.

Given the high rates of technology engagement among CYP [27,28], DMHIs may represent a viable and scalable solution to improving emergency mental health care. Although DMHIs may demonstrate effectiveness, they are not widely adopted in clinical practice [29], and less is known about their acceptability, appropriateness, feasibility, and cost-effectiveness in emergency care settings, particularly for CYP. This systematic review aims to synthesize the existing literature on DMHIs in emergency care pathways, addressing gaps in knowledge and reviewing the evidence for future implementation.

Methods

Search Strategy

This systematic review was conducted in accordance with the Cochrane Handbook for Systematic Reviews of Interventions [30] and adhered to PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines [31]. A protocol was registered on PROSPERO (CRD42023412329; International Prospective Register of Systematic Reviews), with effectiveness and cost-effectiveness prespecified as primary outcomes. During study screening and data extraction, we identified a substantial body of literature addressing implementation-related outcomes in the delivery of DMHIs for CYP in emergency care settings. We therefore conducted this secondary review to synthesize implementation outcomes using studies identified via the original search strategy. Specifically, this review extended the original PROSPERO registration by exploring acceptability, appropriateness, and feasibility, which were not prespecified as outcomes in the original PROSPERO registration and were added specifically for this secondary analysis. This revision was registered on PROSPERO on August 8, 2025. Cost-effectiveness was prespecified and analyzed in this review. The search strategy was not modified following the addition of acceptability, appropriateness, and feasibility outcomes, as outcomes were not specified in the original strategy. The search was based on 4 search terms: CYP; mental health complaints, symptoms, or disorders; emergency care settings; and DMHIs, and therefore captured studies reporting implementation outcomes irrespective of whether they were prespecified. Eligibility criteria remained unchanged, except

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for the expansion of the outcomes of interest. This protocol deviation is reported in the interest of transparency, with the potential risk of bias arising from post hoc outcome specification, which should be considered when interpreting the findings. See Multimedia Appendix 1 for the completed PRISMA checklist.

The search strategy was adapted from previous studies conducted by this group [32,33], which were developed with support from a librarian at Imperial College London.

The strategy was subsequently adapted to align with the scope of this review and is detailed in Multimedia Appendix 2. It was operationalized using the PICO (Population-Intervention-Comparison-Outcome) framework [30], defined in Table 1.

Table 1. PICO[a] inclusion and exclusion criteria.

Study component	Inclusion	Exclusion
Population	Children and young people up to 25 years of age presenting to, or following presentation to, emergency care settings with mental health-related concerns.	Populations over 25 years of age; children and young people populations that do not include those under 18 years of age; children and young people without mental health-related concerns.
Intervention	Digital mental health interventions delivered or facilitated in emergency care settings.	Interventions that are not digitalized, electronic, or telehealth-related; interventions that are not related to emergency care contexts.
Comparison	With versus without intervention, before-after intervention, or perceptions after intervention usage. For cost-effectiveness outcomes, the comparator was "care as usual" or before intervention.	N/A[b]
Outcome	Acceptability, appropriateness, feasibility, and cost-effectiveness.	Studies that do not provide any qualitative or quantitative data for the defined outcomes.

[a]PICO: Population-Intervention-Comparison-Outcome.

[b]N/A: not applicable.

Searches were conducted using APA PsycInfo, Embase, MEDLINE, and Web of Science on September 29, 2025. A combination of MeSH terms and keywords was used and included the 4 key concepts: emergency care, children and adolescents, mental health, and digital health (see Multimedia Appendix 2 for full search terms). We implemented a date restriction from January 2015 to September 29, 2025, given that mental health emergencies were fewer before this date [10] and 2015 marked a global expansion of digital mental health platforms [17].

Inclusion and Exclusion Criteria

We included quantitative, qualitative, and mixed methods studies in peer-reviewed journals that evaluated the use of DMHIs for CYP presenting to, or following presentation to, emergency care settings.

Eligible studies examined data related to the acceptability, appropriateness, feasibility, and cost-effectiveness of these interventions for CYP presenting to, or following presentation to, acute settings, including pediatric EDs, EDs, emergency admission wards, emergency crisis centers, intensive care units, and emergency referrals from these acute services. Interventions were included if they were delivered during an emergency care encounter or initiated, facilitated, or arranged by EDs. Postdischarge interventions were included if delivery formed part of the care pathway. Interventions were excluded if they were delivered independently of emergency care.

DMHIs were defined as any digital tool providing diagnostic, psychological, monitoring, or other forms of virtualized intervention, such as telepsychiatry and messaging [14,15]. Implementation outcomes, defined by Proctor et al [34], included acceptability, defined here as the extent to which DMHIs were perceived as satisfactory; appropriateness, defined as the perceived fit, relevance, and suitability of an intervention's design, content, delivery mode, and therapeutic components for the target population, their needs, and the emergency care context; feasibility, defined as the practicality of implementing DMHIs in emergency care pathways, including indicators such as recruitment, attrition, adherence, retention, and qualitative feedback; and cost-effectiveness, or implementation cost, defined as the economic value of an intervention relative to standard care [34].

In addition to studies incorporating CYP perspectives, we included those evaluating the perspectives of caregivers and care providers. We included CYP study samples up to the age of 25 years, which is described as a critical developmental period [35] and aligns with the World Health Organization's (WHO) definition of "youth" [36], provided that the sample also included CYP aged under 18 years; only 2 studies [37,38] encompassed YP over the age of 18 years. Mental health-related emergencies were defined as mental health symptoms or disorders, encompassing both diagnosed mental health conditions (eg, anxiety, depression, eating disorders, mood disorders, neurodevelopmental disorders) and mental health-related presentations (eg, self-harm, suicidal thoughts, or overdose) [33,39].

We excluded presentations of CYP without symptoms indicating mental illness, as well as cases that were found not to need

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treatment after the assessment. We excluded articles published before January 1, 2015.

Selection Process

The search results extracted from electronic database searches and hand searches were uploaded to and deduplicated in Covidence software for systematic reviews [40].

Screening was conducted in 2 stages: 4 reviewers (MO, NCJ, VR, and YZ) independently screened the retrieved titles and abstracts against the inclusion criteria and selected reasons for exclusion. Next, 3 authors (NCJ, VR, and YZ) independently assessed the full texts of the studies that passed the title and abstract screening, selecting reasons for exclusion. Discrepancies were resolved through discussion and consensus among the 3 authors (NCJ, VR, and YZ), with further consultation with a fourth reviewer when necessary (MO).

Data Extraction

A data extraction tool was developed using Microsoft Excel (version 16.8) to systematically record study characteristics, which included author names, year of publication, country of study, study population age, type of mental health presentations included, study sample size, study design, type of data (qualitative, quantitative, or mixed methods), type of DMHI evaluated, and qualitative and quantitative outcomes related to the acceptability, appropriateness, feasibility, and cost-effectiveness of DMHIs.

Quality Assessment

To assess study quality, 3 authors (NCJ, VR, and YZ) independently evaluated the included studies using the Mixed Methods Appraisal Tool (MMAT), version 2018. The MMAT is a validated tool for assessing the quality of RCTs, nonrandomized trials, qualitative research, quantitative descriptive studies, and mixed methods studies [41]. The MMAT first evaluates whether studies have clear research questions and corresponding data. It then applies 5 methodological quality criteria specific to each study design. Each criterion is rated as "yes," "no," or "cannot tell" (see Multimedia Appendix 3 for the completed MMAT tool and definitions). "Not applicable" was applied in cases where a criterion was not required for the study design. Studies were not excluded based on quality ratings; a descriptive summary of methodological strengths and limitations was provided to assist readers in interpreting the findings.

Data Synthesis and Analysis

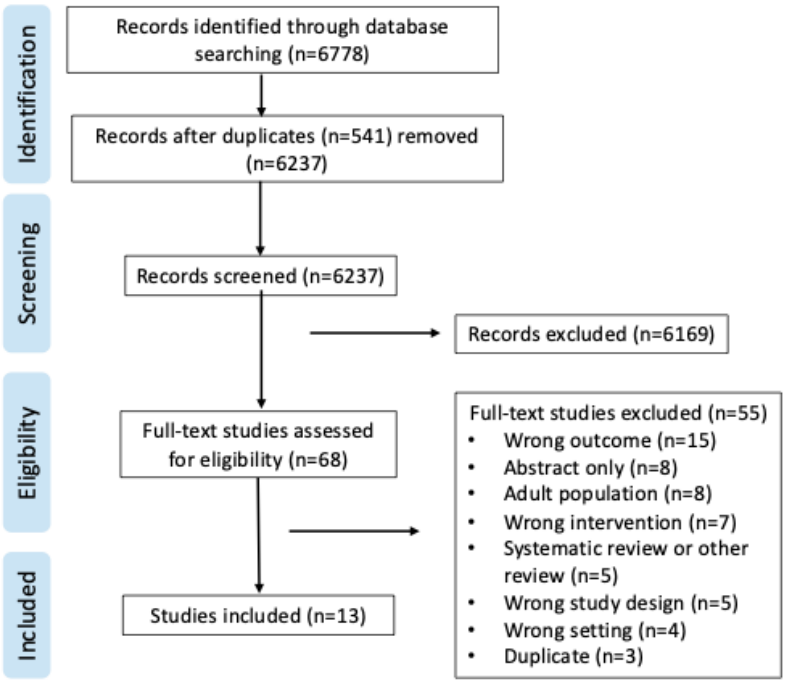
Given the considerable heterogeneity in study designs, methodologies, and outcome measures, a meta-analysis was not possible; narrative synthesis of the included studies was therefore conducted. Studies were categorized based on the type of DMHI evaluated. The synthesis focused on the acceptability, appropriateness, feasibility, and cost-effectiveness of DMHIs in emergency care settings. Findings were summarized thematically by each DMHI to synthesize current evidence to promote uptake in acute care and highlight key gaps in the literature.

Results

Study Selection

The initial search yielded 6778 articles from 4 electronic databases, of which 541 were removed as duplicates. After title and abstract screening of the remaining 6237 articles, 68 relevant articles were identified for full-text screening. Thirteen articles met the inclusion criteria for the study [37,38,42-52]. No further studies were identified through manual searches of reference lists. Figure 1 shows the PRISMA flowchart.

Figure 1. PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) flowchart.



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Study Characteristics

All studies were from high-income countries, with 7 from the United States [42,43,46,49-52], 3 from Canada [44,45,47], and 1 each from the United Kingdom [48], France [37], and Australia [38]. Seven study designs were quantitative [38,43-45,48,49,51], 3 were qualitative [37,50,52], and 3 employed a mixed methods design [42,46,47]. In total, 1495 patients were included across studies reporting individual participant samples; this encompassed 1048 CYP who received a DMHI and 447 CYP who received usual care. In addition, 413 caregivers and a minimum of 250 service providers were included. One study reported a sample size of 241 patient-caregiver dyads, which were counted separately within the aforementioned patient and caregiver totals, as both contributed to the DMHI screening tool evaluation [51]. One study did not report statistics for participating care providers [51]; therefore, the care provider total represents a minimum. One study assessed cost-effectiveness via population-level modeling and therefore did not report an extractable sample size [38]. Mental health-related emergency presentations included depressive symptoms, violence, suicide, intoxication, and multiple mental health conditions. The age of CYP at presentation was up to 25 years, with the youngest reported age category being 1-6 years [49], which included 5 patients aged 1-6 years who received telepsychiatry.

Of the studies included in this review, 6 reported on suicidal symptoms [37,38,43,46,51,52], 3 addressed multiple mental health conditions or symptom profiles [45,47,49], 2 focused on depression [42,50], and 2 investigated intoxication or alcohol-related presentations [44,48]. The DMHIs evaluated comprised 5 computerized interventions [44,46,48,51,52], 3 telepsychiatry approaches [45,47,49], 3 automated SMS text messaging services [42,43,50], and 2 phone call-based interventions [37,38]. No results were retrieved for telepsychology or e-therapies, telediagnoses, mobile apps, digital assistants, or social media interventions. See Table 2 for study characteristics.

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Table 2. Summary of characteristics of included studies.

Author (year)	Study design	Country	Age range	Sample size	Digital mental health intervention	Mental health condition	Key themes and findings
Roberts et al [45]	Quantitative	Canada	Under 18 years	60 patients	Telepsychiatry	Multiple	• High satisfaction with telepsychiatry among service users; pooled mean (SD) 4.34 (0.79) out of 5.
Stuart et al [47]	Mixed methods	Canada	N/A[a]	25 care providers	Telepsychiatry	Multiple	• Moderate to high appropriateness ratings among pediatric ED[b] practitioners, with 63%-67% agreeing on the benefits and safety of telepsychiatry. Low to moderate satisfaction. • Qualitative themes were as follows: (1) Time Constraints for Assessments; (2) Limited Support From Specialist Mental Health Clinicians; and (3) Concerns About the Appropriateness of Pediatric ED Clinicians Conducting Assessments
Thomas et al [49]	Quantitative	United States	Under 18 years of age	226 DMHI[c] patients; 268 usual care patients; 156 caregivers; and 208 care providers	Telepsychiatry	Multiple	• Moderate to high acceptability among caregivers and providers; pooled mean (SD) 4.12 (0.86) out of 5. • Telepsychiatry consultations were lower cost than usual care (median cost per patient: US $3493 vs US $8611), although cost savings were limited to the initial consultation appointment.
Ranney et al [42]	Mixed methods	United States	13-17 years of age	16 patients	Automated SMS text messaging	Depression and violent behaviors	• High acceptability reported (average rating of 80% satisfaction on a Modified Client Satisfaction Questionnaire; 87% of CYP[d] rated SMS text messaging as excellent or good). • Qualitative themes were as follows: (1) The iDOVE Intervention Was Seen as Helpful and Reassuring; (2) The Daily Mood Check-In Was Highly Valued (Frequency and Format of Quantifying Emotions); and (3) Automation Reduced Relatability
Thorsen et al [50]	Qualitative	United States	13-17 years of age	41 patients	Automated SMS text messaging	Depression and violent behaviors	• The appropriateness of SMS text messaging content varied. • Qualitative themes were as follows: (1) Behavioral Modification Messages Were Less Suitable for CYP With Higher Violence Risk and (2) CBT[e] Content Was More Suited to Those With Prior Counseling Experience
Ryan et al [43]	Quantitative	United States	12-17 years of age	27 patients	Automated SMS text messaging	Suicide risk	• High satisfaction reported (93%). • Feasibility was mixed, with 30%-37% of participants suggesting the need for timeline adjustments, including changes to the intervention's start time and duration.
Normand et al [37]	Qualitative	France	15-21 years of age	173 patients	Telephone calls	Suicide risk	• Moderate feasibility observed, with only 53.8% of participants reachable at 1 year. • High acceptability among CYP and parents; the intervention was perceived as supportive and as helping maintain a connection with health care professionals.
Crosland et al [38]	Quantitative	Australia	15-25 years of age	N/A	Telephone calls	Suicide risk	• The emergency department-based suicide prevention was not cost-effective, with an incremental cost of Aus $4,100,000[f] and a negative incremental net monetary benefit of Aus –$1,000,000.

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Author (year)	Study design	Country	Age range	Sample size	Digital mental health intervention	Mental health condition	Key themes and findings
Newton et al [44]	Quantitative	Canada	12-17 years of age	80 patients	Computerized interventions	Alcohol-related complaint	• Acceptability ratings varied: 55.6% of CYP were satisfied with the intervention, while only 44.4% found the feedback credible. • Feasibility was low to moderate, with an initial recruitment rate of 37.6% and subsequent retention rates of 47.7% at 1 month and 40.9% at 3 months.
Cafferty et al [52]	Qualitative	United States	13-17 years of age	8 patients and 9 caregivers	Computerized interventions	Suicide risk	• The intervention was generally seen as acceptable by both patients and caregivers; digitalized screening was perceived as promoting greater honesty because it was more private than traditional paper screening, although concerns were raised about electronic data security. • Feasibility concerns included younger users navigating digitalized screening tools alone.
Deluca et al [48]	Quantitative	United Kingdom	14-18 years of age	160 DMHI patients and 179 usual care patients	Computerized interventions	Alcohol-related complaint	• The electronic brief intervention was more costly than screening alone (approximately £400[g] more per person), with a 28%-30% likelihood of being cost-effective.
Leyenaar et al [46]	Mixed methods	United States	12-17 years of age	16 patients, 7 caregivers, and 17 providers	Computerized interventions	Suicide risk	• I-CARE[h] was generally well accepted across CYP, caregivers, and care providers, with a median of 4.0 (IQR 3.0-4.0); generally considered appropriate, with a median of 3.7 (IQR 3.0-4.2); and demonstrated moderate to good feasibility, with a median of 4.0 (IQR 3.8-4.5). • Qualitative themes were as follows: (1) Perceived Appropriateness Was Higher Among Participants Familiar With the Curriculum Content (eg, CBT); (2) Appropriateness Was Questioned for Diverse Adolescent Needs, Including Age Appropriateness; (3) Feasibility Concerns Included Challenges Surrounding the Acute Care Hospital Environment, Such as Noise; and (4) Feasibility Concerns Included Increased Workload Demands and Low Availability of Specialist Staff to Facilitate the Intervention
Seag et al [51]	Quantitative	United States	7-17 years of age	241 patient-caregiver dyads: 241 patients and 241 caregivers; unreported sample size for care providers	Computerized interventions	Suicide risk	• Dyads reported low to moderate perceived appropriateness; 41.5% experienced at least one implementation barrier, with language/comprehension issues being the most common (28%). • ED staff reported feasibility concerns, with 48.2% of barriers related to workload burden.

[a]N/A: not applicable.

[b]ED: emergency department.

[c]DMHI: digital mental health intervention.

[d]CYP: children and young people.

[e]CBT: cognitive behavioral therapy.

[f]Aus $1=US $0.70.

[g]£1=US $1.33.

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[h]I-CARE: Improving Care, Accelerating Recovery and Education.

Quality Assessment

Most MMAT criteria were met across the included studies, although some methodological concerns were identified (see Multimedia Appendix 3 for individual study MMAT item-level ratings). Among the quantitative studies, 1 study [51] raised concerns regarding potential nonresponse bias, while another quantitative nonrandomized study [49] did not clearly report whether confounding factors were appropriately controlled in its design and analysis. Among the qualitative studies, 1 study [52] sufficiently derived and interpreted data, although it also included quotes that did not clearly support the themes identified, which suggested incoherence between the qualitative quotes and the findings reported in the study. Regarding the mixed methods studies, 1 study [46] was deemed to have a risk of nonresponse bias. Furthermore, across all 3 mixed methods studies [42,46,47], all were rated as "cannot tell" regarding whether divergences and inconsistencies between quantitative and qualitative findings were adequately addressed, indicating limited clarity in this area.

Telepsychiatry

Telepsychiatry, which involves the use of videoconferencing platforms for psychiatric consultations, was evaluated in 3 studies that each addressed a range of mental health conditions [45,47,49]. A total of 554 patients under 18 years of age, of whom 286 received telepsychiatry care, 156 caregivers, and 233 care providers were included across these studies.

Acceptability was consistently high among patients, caregivers, and providers. When used to support the delivery of urgent mental health care for a range of mental health complaints in CYP [45], most patients reported high agreement with emergency telepsychiatry (mean 4.38 out of 5), were comfortable using it (mean 4.17), and would use it again (mean 4.54). Similarly, another study evaluated telepsychiatry in geographically dispersed ED sites in the United States and reported strong acceptability among providers and caregivers, with mean ratings between 3.92 and 4.47 out of 5 [49]. Collectively, these findings demonstrate convergence across perspectives, with no acceptability concerns reported [47].

In terms of delivery, telepsychiatry was generally perceived as an appropriate intervention by care providers and caregivers. Telepsychiatry was considered comparable to emergency in-person consultations (mean 3.88), albeit preferences for telepsychiatry versus in-person appointments had high variability (mean 4.00, SD 1.22) [45]. When using ED-adapted virtual care for patients presenting with urgent mental health needs, a study found that 64%-67% of ED clinicians reported benefits of telepsychiatry and supported that it was safe for their patients [47], while caregivers also expressed confidence in a telepsychiatry platform meeting their child's needs (mean 4.29) [49]. Although telepsychiatry was perceived as an appropriate intervention, preferences for virtual or face-to-face care varied among service users.

Feasibility of telepsychiatry yielded mixed results across studies. Telepsychiatry was reported as feasible and clinically equivalent to face-to-face consultation outcomes [45]. However, 2 studies reported that providers raised concerns about insufficient appointment times and limited specialist mental health staff availability due to dual responsibilities, including standard in-person ED duties [47,49]. In contrast to the moderate to high acceptability and appropriateness perceptions of telepsychiatry, these variable feasibility findings raise questions regarding the successful implementation of telepsychiatry where contextual factors, such as workload and staffing, are limiting.

One study demonstrated that telepsychiatry consultations were associated with significantly lower health care charges than "usual care," which involved ambulance transport to hospitals for emergency in-person consultations before either admission to an inpatient facility or discharge, with a median cost per individual of US $3493 for telepsychiatry compared with US $8611 for usual in-person consultations [49]. However, there was no evidence for subsequent cost benefits when comparing the downstream admission pathways, except in the case of discharge, with median costs of US $2399 for telepsychiatry versus US $4633 for usual care. These findings reflect differences in health care charges rather than a formal cost-effectiveness analysis.

Phone Call Services

Two studies evaluated follow-up phone calls to YP aged 15-25 years for suicide risk [37,38]. The first evaluated follow-up phone calls upon discharge from the ED after suicide attempts [37]. The calls aimed to monitor repeat suicide attempts and psychological well-being, as well as serving as a reminder to CYP of access to mental health services; feasibility was moderate, with 53.8% of the 173 participants contactable at 1 year. By contrast, acceptability was high, with CYP described as feeling "looked after" and connected to health care professionals—"There is a link being built...I know you are there if there's a problem." Others said it encouraged future help-seeking—"We won't hesitate to contact you if there is a problem," while only 2 participants expressed undecided views about acceptability. Caregivers also generally reported feeling supported by the ongoing contact.

The second study evaluated the cost-effectiveness of an ED-based suicide prevention intervention for YP aged 15-25 years, which consisted of 3 in-person components and follow-up phone calls postdischarge from the ED [38]. This study implemented a population-level modeling approach and did not report sample sizes. Using incremental cost-effectiveness ratio analyses, the overall intervention was deemed not cost-effective, with an incremental cost of Aus $4,100,000 [95% uncertainty interval Aus $1,200,000 to Aus $8,200,000] (Aus $1=US $0.70) and a negative incremental net monetary benefit of Aus –$1,000,000 [95% uncertainty interval Aus –$8,000,000 to Aus $2,000,000].

SMS Text Messaging Services

Three studies evaluated the use of automated SMS text messaging for the prevention of depressive symptoms and violent behaviors delivered postdischarge from EDs [42,50], and as a tool provided upon discharge from emergency

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hospitalization for suicidal presentations [43]. The total sample size across these studies was 84 CYP between the ages of 12 and 17 years.

Acceptability of SMS text messaging tools was generally high across studies, although satisfaction was assessed using different measures [42,43,50], with reported satisfaction indicators ranging from 78% to 93%. In an intervention where CYP received a brief in-person session followed by an 8-week SMS text messaging program informed by cognitive behavioral therapy (CBT) and motivational interviewing, participants received daily mood check-ins and corresponding intervention messages [42]. They could also initiate support by texting keywords, such as "stressed," "angry," or "sad." Overall, satisfaction was high, with a mean score of 80% on the Modified Client Satisfaction Survey, and 87% of CYP rated the intervention as excellent or good. Many CYP valued the daily frequency of SMS text messages, reporting that the prompts encouraged them to reflect on their emotional state: "it helps me reflect and see how I actually feel other than just [saying that I am fine]." Others, however, found the numeric response format restrictive: "Instead of using numbers, [we would prefer to] say how we're feeling," and 20% of participants expressed a preference for human interaction over automated SMS text messages, particularly during the emotionally complex postemergency period. Similarly, 93% of participants endorsed being satisfied with a supportive SMS text message intervention [43], which delivered SMS text messages on days 1, 7, 14, and 30 following ED discharge. Each message included a brief expression of care and a prompt to contact a mental health provider or crisis hotline if needed. The use of SMS text messaging was reported as broadly acceptable for conveying CBT concepts to CYP with depressive symptoms and violent behaviors, particularly for CYP who found texting easier than speaking: "It's easier when you just text" [50]. Taken together, SMS text messaging interventions were perceived as acceptable by CYP, although preferences for the type of interaction vary, with some favoring human support over automated SMS text messages.

Appropriateness of SMS text messaging interventions varied depending on personalization, CYP's prior experiences, and the care context. Adolescents with a history of counseling or therapy generally found CBT-based content more relatable than those without [50]. The 8-week texting program targeting depressive and violent behaviors raised questions regarding the appropriateness of automation. This was influenced by the extent to which CYP perceived the content as relevant to their individual needs. While some CYP still found automated messages useful—"...even if [there's] just a machine texting me, [they're still supporting me]"—others criticized the intervention—"...it would send me a message about something that did not really have to do with the situation" [42]. A comparable study suggested that individuals with higher exposure to violence engaged less with the content of the DMHI—"when you're my age, fighting is the best way to get respect" [50]. Despite the high overall acceptability, perceived appropriateness was contingent on how well the intervention's content reflected CYP's experiences and needs.

Feasibility of delivering SMS text messaging interventions in emergency care settings was limited due to a lack of engagement and timelines not meeting the emergency care pathway. Both the 8-week SMS text messaging [42] and supportive SMS text messaging [43] programs reported limitations in duration of engagement and user expectations. Additionally, 30%-37% of participants reported issues with the timing of the SMS text messages, stating they would have preferred to receive support sooner after discharge and for a longer duration [43]. Together with the findings related to automation and personalization, these results underscore the need for flexibility in the timing, duration, and mode of automated support to successfully implement SMS text messaging DMHIs following emergency mental health care.

Computerized Interventions

Computerized interventions were assessed across 5 studies targeting CYP aged 7-17 years, in the contexts of alcohol misuse [44], suicide screening [48,51,52], and suicidal ideation or attempts [46]. A total of 441 CYP, of whom 262 received a DMHI, 241 caregiver-patient dyads, 16 caregivers, and at least 17 care providers were included across the studies, although 1 study [51] did not report figures for care providers.

Acceptability varied between studies. An RCT evaluated a computerized screening, brief intervention, and referral to treatment tool for adolescents presenting to the ED with an alcohol complaint and found that 55.6% of YP valued the personalized feedback intervention as informative, but only 44.4% found the feedback credible [44]. For the I-CARE (Improving Care, Accelerating Recovery and Education) intervention, which takes a modular approach to teaching CYP evidence-based psychosocial skills with the support of clinical staff, clinicians and caregivers rated acceptability as high, but YP gave moderate scores (mean 3.6 out of 5), citing content as overly simplistic or burdensome: "[it felt like doing homework]" [46]. In a computerized suicide screening intervention [52], CYP expressed favorability toward traditional paper or verbal screenings, citing that the intervention promoted privacy and encouraged them to answer questions honestly: "when I go to my normal doctor, [questionnaires are completed on paper in front of a parent]. I don't really like doing that because I'm pressured into answering some of those questions [in] a certain way." This view was echoed by caregivers: "I know when [he] does it digitally, he's a lot more likely to tell the truth." Views on privacy, however, varied, with some CYP raising concerns about data security and potential breaches [52]. Overall, acceptability of computerized interventions varied according to the content and intervention type.

Appropriateness concerns centered on age relevance and content. I-CARE received a low mean suitability score of 2.8 out of 5 from CYP, with only 50% rating it "appropriate" [46]. Feedback included that "most teenagers won't want to follow a video that looks like it's for a younger audience," highlighting issues with the perceived maturity of the content. However, I-CARE appeared suitable for those with prior therapy experience, as one participant shared, "The book was a very good way of putting it, as someone who's done dialectical behavior therapies (DBTs) and CBTs before." Another study noted that the lack

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of available age-specific normative drinking behavior data for younger adolescents reduced the perceived relevance and appropriateness of the personalized feedback tool for the target population [44]. Similar concerns related to age were reported elsewhere, with 41.5% of YP-caregiver dyads describing barriers to using the K-CAT suicide screening tool, particularly regarding developmentally appropriate language for the younger users, with these CYP struggling with the concept of "suicide" [51]. Across interventions, these findings indicate that developmental content design considerations may be particularly important for computerized interventions with broad target population age ranges.

Feasibility of online interventions varied across studies. The personalized screening and feedback tool had a moderate recruitment rate, with 37.6% of eligible patients enrolled, and moderate retention rates, with 47.7% and 40.9% of enrolled participants retained at 1 and 3 months, respectively [44]. In another suicide screening tool, parents noted that younger adolescents required assistance when using the tool, highlighting feasibility challenges regarding independent use. However, this intervention was more easily used by individuals who had used electronic screening in other settings [52]. By contrast, I-CARE, which was delivered in-hospital with staff support, was given moderate to high feasibility ratings of 4 out of 5 across CYP, caregivers, and clinicians [46]. However, environmental factors, including hospital noise, affected intervention delivery [46], while clinicians and hospital staff raised concerns about the additional workload associated with implementation [46,51], raising questions about the practicality of implementing these types of DMHIs in ED environments.

One study conducted a cost-utility analysis of a personalized feedback tool combined with an electronic brief intervention (eBI) for alcohol-related ED presentations using incremental cost-effectiveness ratios based on incremental cost per quality-adjusted life year and willingness-to-pay thresholds [48]. The eBI was found to be costlier, at approximately £400 (US $529) more per person, and slightly less effective than screening alone, with a 28%-30% probability of cost-effectiveness. Although limited to one intervention, this finding raises questions regarding scalability and broader implementation.

Across implementation outcomes, developmental tailoring emerged as a recurring consideration, influencing the acceptability, appropriateness, and feasibility of some computerized interventions. While these interventions offered potential advantages, successful implementation appeared contingent on age appropriateness, user characteristics, staff support, and comparability within emergency care environments.

Cross-Intervention Synthesis of Implementation Outcomes

Across interventions, acceptability was generally favorable, although the factors underlying acceptability differed according to modality. In our results, telepsychiatry demonstrated consistently high acceptability across CYP, caregivers, and care providers [45,49], while automated SMS text messaging interventions [42,43,50] and follow-up phone calls [37] were also well accepted. However, qualitative findings from automated and computerized interventions identified greater variation in appropriateness, particularly where content personalization and developmental relevance were highlighted as barriers [42,44,46,50,51]. Across these interventions, high acceptability therefore did not necessarily translate to perceived appropriateness.

Feasibility was more varied across intervention types and appeared particularly sensitive to contextual and organizational factors. Both telepsychiatry and computerized interventions were constrained by organizational demands such as staffing availability, staff workload, and competing clinical responsibilities [46,47,49,51], whereas automated SMS text messaging interventions were influenced by intervention timing, duration, and individuals' engagement [42,43]. Consistent with the SMS text messaging interventions, follow-up phone calls also demonstrated high acceptability but challenges to sustained engagement [37]. Other feasibility considerations concerned developmental needs and the feasibility of implementation in the ED environment [46,52].

Evidence regarding cost was limited and inconsistent across intervention types. Telepsychiatry was associated with lower health care charges than usual care, although this was based on cost comparison rather than a full economic evaluation [49]. By contrast, the 2 studies conducting full economic evaluations found limited evidence of cost-effectiveness for the eBI [48] and no evidence of cost-effectiveness for the multimodal suicide prevention intervention that encompassed postdischarge follow-up calls [38]. Given the small number of studies and heterogeneity in economic evaluation methods, conclusions regarding this remain limited.

Discussion

Principal Findings

This systematic review aimed to appraise and synthesize the available evidence for the acceptability, appropriateness, feasibility, and cost-effectiveness of DMHIs for CYP in emergency care pathways. Thirteen studies spanning various digital formats such as telepsychiatry, phone calls, automated SMS text messaging, and computerized tools were evaluated [37,38,42-52]. Overall, DMHIs were found to be broadly acceptable across CYP, caregivers, and care providers, particularly for interventions such as telepsychiatry and structured follow-up phone calls. These were often seen as comparable to in-person care and appeared to encourage continued help-seeking.

Feasibility and perceived appropriateness outcomes were more varied. Feasibility was often hindered by challenges such as low recruitment and retention rates and an additional workload burden reported by staff, which was a common finding in interventions that required specialist facilitation, such as telepsychiatry or supervised computerized interventions. Appropriateness was often influenced by the specific intervention design and user characteristics, with developmental relevance, prior help-seeking, and previous experience with digitalized interventions contributing to differences in perceived fit or relevance across users. Cost-effectiveness findings were

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mixed but limited, with only 3 studies [38,48,49] evaluating cost-related outcomes.

These findings should be interpreted in the context of the methodological quality of the contributing evidence, with concerns concentrated in studies of computerized interventions for CYP presenting with suicide risk [46,51,52] and in some telepsychiatry interventions [47,49].

Comparison With Prior Work

Consistent with previous systematic reviews and meta-analyses [53-60], our findings highlight broad acceptability of DMHIs for CYP, but mixed outcomes in terms of appropriateness, feasibility, and cost-effectiveness across platforms such as telepsychiatry, phone calls, SMS text messaging interventions, and other computerized tools. This aligns with the wider literature suggesting CYP are generally open to engaging with digital tools when these are familiar and relevant to their needs, but challenges such as uptake and sustained engagement remain prevalent [61].

Overall, DMHIs were demonstrated to be acceptable across CYP, caregivers, and providers. This was most apparent for telepsychiatry [45,47,49] and structured follow-up calls [37,38], echoing large-scale evaluations during the COVID-19 pandemic, which also found video-based services equivalent or superior to face-to-face care [62], with equivalent findings in resource-constrained or high-burden emergency settings [63]. Our findings also agree with the growing body of evidence demonstrating good overall acceptability of DMHIs among CYP and caregivers [53]. A recent meta-analysis by Abuyadek et al [54] reported an average general population (including CYP, adults, and elderly patients) acceptability rate of 71% across remote services, including texting and other telehealth platforms in both high- and low-income settings. While our review was limited to studies in high-income countries, the high acceptability of telepsychiatry and SMS text messaging tools for CYP aligns with these wider trends.

Appropriateness outcomes were highlighted as context- and age-dependent in this review. Younger users sometimes found concepts too abstract or difficult to understand [51], for example, suicide-related language, while older users criticized certain tools as overly simplistic or lacking relevance [46]. Personalized interventions were more favorably received, yet even these faced limitations such as feedback tools using normative data that were inapplicable to younger adolescents [44]. CBT-informed DMHIs showed particular benefit for CYP with prior therapy-based experience [46,50], suggesting that individual readiness and familiarity with therapeutic content may influence suitability and effectiveness. [52]. These findings warrant some caution, as methodological concerns were concentrated among studies evaluating the appropriateness of computerized interventions for CYP presenting with suicide risk [46,51]. The MMAT identified potential nonresponse bias in 2 of these studies [46,51] and limited clarity regarding the integration of qualitative and quantitative findings in a mixed methods study [51]. Although these studies suggest that age and previous therapeutic experience may influence intervention suitability, confidence in these associations is somewhat limited. These nuances emphasize the need to consider user characteristics and service context when designing and implementing DMHIs for CYP in emergency care settings. These findings reflect broader concerns about generic or "one-size-fits-all" approaches to digital care [64,65], and the need for tailored interventions that meet the developmental and emotional needs of CYP [66]. The literature increasingly recognizes the value of implementation characteristics valued by CYP, including credibility of design and information, relatable situations, and incorporating local and cultural differences [66,67]. Hybrid models, such as the Digital Mental Health Practice Model of Care [68], have been proposed to address these limitations by blending tools with human interaction and in-person care as appropriate for an individual's needs.

Where reported, low recruitment and adherence posed issues, implying limited feasibility [37,43,44]. A recent systematic review identified high rates of dropout and low adherence in DMHI studies involving marginalized YP aged 15-25 years, despite high initial engagement rates [56], reflecting widespread challenges in the continued use and engagement with DMHIs in this population. However, evidence suggests that co-designing these tools with the target populations may be a viable solution to ensure higher engagement and retention rates [57,69,70].

Feasibility concerns identified in this review also included increasing workloads for clinicians and ED staff for tools that required professional facilitation or input, which was a consistent finding [46,47,51] in all but 1 quantitative study [49] that did not evaluate feasibility as an outcome. In these studies, interventions were allocated in addition to existing responsibilities, raising practical concerns about integration into real-world clinical settings. Furthermore, 1 study [52] evaluated ease of use, reporting that patients who had prior experience using digitalized screening were most suited and found the tool easy to use, while younger patients required extra supervision. These findings are not without methodological concerns; 2 of the studies reporting increasing workloads [46,51] were identified as being at risk of nonresponse bias, which may have affected the representativeness of stakeholder experiences; it was unclear whether divergences between qualitative and quantitative findings were accurately addressed in the mixed methods studies [46,47], and the relationship between some supporting qualitative quotations and the themes reported was unclear in another study [52]. Thus, although workload burden concerns emerged consistently as a barrier to implementation, the magnitude and generalizability of this finding remain uncertain. Feasibility concerns were also influenced by setting and mode of delivery, as also reflected in the wider literature [14,71]. Further, despite our generally positive findings for telepsychiatry's acceptability, appropriateness, and cost-efficiency, telepsychiatry as a mode of delivery was not exempt from these operational challenges. This highlights the need for careful consideration of how different modalities of DMHIs are implemented effectively within ED settings to ensure their feasibility in acute mental health care. Furthermore, research suggests that the feasibility of DMHI efforts may be higher in school-based or less time-pressured environments [72,73], underscoring the unique operational and contextual challenges faced by emergency care settings. While DMHIs are

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often considered feasible in these alternative settings, these challenges must be carefully considered when evaluating the implementation of various DMHIs in EDs.

Three studies assessed cost-related outcomes [38,48,49]; evidence was limited and inconsistent. Despite telepsychiatry demonstrating a cost advantage over usual care [49], the MMAT appraisal identified uncertainty regarding whether potential confounding factors were appropriately accounted for, thereby reducing confidence in the observed economic benefit. This study evaluated costs and time comparisons rather than undertaking a full economic evaluation. The eBI for alcohol screening was not found to be cost-effective [48], nor was a 3-stage intervention that incorporated follow-up calls [38]. These 3 studies were heterogeneous in intervention type, clinical population, and health economic measures, further limiting comparability and conclusions on scalability. Despite this, these mixed results add to the existing literature; DMHIs may offer cost savings, particularly in reducing unnecessary service use and associated costs, but more evidence is needed across various clinical cohorts and interventions [58-60].

Strengths and Limitations

To our knowledge, this is the first systematic review exploring the acceptability, appropriateness, feasibility, and cost-effectiveness of DMHIs for CYP in emergency care settings. Our use of the PICO framework ensured rigorous selection criteria, promoting transparency and reproducibility. This mixed methods review not only synthesized both qualitative and quantitative evidence, but also included data from service users, caregivers, and care providers, therefore offering unique insights from different perspectives.

However, our review is limited in generalizability, given that all included studies were from high-income countries and included a small range of mental health conditions and presentations. This is likely due to limitations of our PICO criteria and health care structures, given that mental health care may not be delivered in emergency care in LMICs. Furthermore, quality appraisal using the MMAT does not produce an overall quality score; although most included studies were methodologically robust, gaps were observed in the overall quality of included studies, particularly in the integration of qualitative and quantitative findings within mixed-methods study designs. Addressing this limitation in future research would strengthen the coherence and interpretability of results. Additionally, efforts to minimize the risk of nonresponse bias are essential for the accuracy and generalizability of findings. Further, the heterogeneity in intervention type, purpose, and mental health conditions limits potential comparisons and conclusions. Finally, acceptability, appropriateness, and feasibility were not prespecified as outcomes in the original PROSPERO registration, but were identified as relevant when conducting the primary systematic review and amended as a revision. While the same search strategy was applied, this may still introduce a risk of selective outcome reporting and should be considered when interpreting our findings.

Clinical and Policy Implications

The findings of this review suggest that the successful implementation of DMHIs in emergency care settings requires consideration of wider individual-, intervention-level, and organizational factors. Although acceptability was generally favorable across interventions, appropriateness and feasibility outcomes were influenced by developmental relevance and needs, personalization, timing and duration of delivery, automation or preference for human contact, workload and staffing requirements, and compatibility with existing workflows. Thus, for clinical practice, DMHIs may provide opportunities to complement existing emergency health care and extend support beyond an initial encounter, rather than replace human-delivered care. Developmentally appropriate and personalized content should also be considered, particularly for automated interventions. Co-design with CYP and health care professionals may also improve contextual suitability and promote sustained engagement [57,69,70].

At the service level, implementation should consider workforce and organizational capacity and constraints. Staffing availability, competing clinical responsibilities, and workload affected the feasibility of some interventions, suggesting that digital delivery may not always reduce pressure on emergency care services. Appropriate staffing, training, and structured integration within existing workflows could support successful implementation.

DMHIs may present a promising opportunity to address long-standing gaps in service delivery. However, the generalizability of these implications is limited by the geographically limited evidence base. All studies included in this review were conducted in high-income countries, predominantly in the United States. Consequently, implementation findings may not necessarily apply to broader health care systems or LMICs. Whether DMHIs can provide acceptable, appropriate, feasible, and cost-effective approaches to emergency health care in LMICs or other contexts, therefore, warrants further evaluation. Although DMHIs may have the potential to support more efficient allocation of resources, the limited and methodologically heterogeneous economic evidence identified in this review cannot support conclusions regarding their cost-effectiveness. Economic evaluations should be standardized to enable robust cost-benefit comparisons and support decision-making across settings. Future research should broaden its focus to include a wider range of mental health conditions and intervention types when evaluating the implementation of DMHIs.

Recent OECD (Organisation for Economic Co-operation and Development) and WHO strategies and international policy initiatives underscore a shift from analog to digital models of care, providing a policy context for the evaluation of DMHIs [74,75]. Similar priorities are also evident at the national level. For example, an independent investigation of the National Health Service (NHS) in England [76] highlighted a missed opportunity to transition from a “diagnose and treat” approach to one centered on “predict and prevent” through technological advancement. In response, the “10 Year Health Plan for England” [77] outlined government commitments to embed modern technology within the NHS to increase efficiency and

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personalize services and care. These international and national policy developments demonstrate increasing policy emphasis on digital health care, providing a broader strategic context in which the potential role of DMHIs within health care systems warrants further evaluation for effective integration.

Given the increasing recognition of the prioritization of CYP mental health and the management of acute crises within national policy planning [78-82], DMHIs for CYP in emergency settings hold a relevant, timely, and strategic appeal. However, realizing this potential requires a clear economic case and evidence-based implementation frameworks to ensure that technological interventions translate into real-world improvements.

Conclusions

This systematic review highlights the promise of DMHIs for CYP in emergency care settings, particularly in terms of acceptability. However, feasibility and appropriateness varied across intervention types and user groups. Evidence regarding cost-effectiveness was limited and methodologically heterogeneous, precluding conclusions regarding the cost-effectiveness of DMHIs. Limited evidence on feasibility and cost-effectiveness highlights an important gap in the literature and the need for future research examining the real-world implementation and economic viability of digital interventions. While tools such as telepsychiatry showed encouraging outcomes, others, particularly app- or SMS text messaging-based interventions, faced challenges in engagement and contextual fit. CYP valued credibility, personalization, and age-appropriate design, underscoring the need for co-designed and contextually adapted interventions. The use of DMHIs for CYP in emergency settings aligns closely with current health care policy relating to the use of technology in improving efficiency and accessibility of care. However, more research is needed to better explore integration into existing health systems and the impact on clinical outcomes.

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Data Availability

Data sharing does not apply to this article as no datasets were generated during this study.

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Authors' Contributions

Conceptualization: MO, VR
Data curation: NCJ, VR, YZ, SR
Formal analysis: NCJ, MO, SR, VR, YZ (equal)
Funding acquisition: BH
Investigation: NCJ, YZ, VR, SR, BH, SB, MO
Methodology: MO, VR, SR, YZ, NCJ, BH
Project administration: NCJ, MO, VR
Resources: MO, BH, SB
Supervision: MO, BH
Visualization: NCJ, MO, VR, SR, YZ
Writing – original draft: NCJ (lead), YZ (supporting)
Writing – review and editing: NCJ, YZ (equal, main), MO, BH, SB, SR, VR

Conflicts of Interest

None declared.

Multimedia Appendix 1

Completed PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) checklist.
[DOCX File , 22 KB-Multimedia Appendix 1]

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Multimedia Appendix 2

Search strategy.
[DOCX File , 20 KB-Multimedia Appendix 2]

Multimedia Appendix 3

Mixed Methods Appraisal Tool quality assessment.
[DOCX File , 23 KB-Multimedia Appendix 3]

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Abbreviations

CBT: cognitive behavioral therapy
CYP: children and young people
DMHI: digital mental health intervention
eBI: electronic brief intervention
ED: emergency department
GAIDeT: Generative AI Delegation Taxonomy
I-CARE: Improving Care, Accelerating Recovery and Education
LMIC: low- and middle-income country
MMAT: Mixed Methods Appraisal Tool
NHS: National Health Service
OECD: Organisation for Economic Co-operation and Development
PICO: Population-Intervention-Comparison-Outcome
PRISMA: Preferred Reporting Items for Systematic Reviews and Meta-Analyses
PROSPERO: International Prospective Register of Systematic Reviews
RCT: randomized controlled trial
WHO: World Health Organization
YP: young people

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