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Investigating The Use Of Mobile Health Apps For Managing Chronic Illnesses In Pediatric Populations: A Systematic Review

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Abstract

Background: Mobile health (mHealth) applications are increasingly employed to support the management of chronic illnesses in pediatric populations. They provide opportunities for improved adherence, enhanced self-management, and better integration of care between patients, caregivers, and clinicians.
Objective: This systematic review aimed to synthesize the evidence regarding the feasibility, effectiveness, and limitations of mHealth applications for managing chronic conditions in children and adolescents.
Methods: Peer-reviewed studies published between 2012 and 2025 were reviewed, encompassing randomized controlled trials, cohort studies, feasibility pilots, and cross-sectional investigations. A total of 17 studies met the inclusion criteria, covering chronic illnesses such as diabetes, asthma, epilepsy, cystic fibrosis, obesity, kidney disease, hematological disorders, and pulmonary conditions.
Results: The findings demonstrated significant improvements in treatment adherence, glycemic control, quality of life, and patient satisfaction across multiple conditions. Notably, randomized controlled trials in diabetes and obesity showed reductions in HbA1c and BMI, while interventions for epilepsy and iron chelation improved medication compliance. mHealth interventions also supported psychosocial well-being, including reduced procedural anxiety and improved caregiver–patient communication. However, heterogeneity in intervention design and methodological limitations restricted cross-study comparability.
Conclusions: mHealth applications hold promise as adjunctive tools for pediatric chronic illness management. They enhance self-management and clinical outcomes but require further standardization, large-scale validation, and integration into health systems to maximize impact.

Keywords
mHealth; pediatrics; chronic illness; self-management; mobile applications; digital health; adherence; quality of life; telemedicine; patient-centered care.

Introduction

Mobile health (mHealth) applications have emerged as transformative tools for chronic illness management across populations, but their utility is particularly significant in pediatric care. Children and adolescents with chronic diseases face unique challenges in adhering to complex treatment regimens while transitioning toward self-management. Systematic reviews highlight that mobile and web-based apps can support both self-management and the transition from pediatric to adult health services, filling gaps left by traditional care models (Virella Pérez et al., 2019).

The increasing prevalence of chronic conditions in childhood, such as asthma, diabetes, and cystic fibrosis, has intensified interest in scalable digital health solutions. Evidence suggests that user-focused mobile apps designed specifically for pediatric populations can significantly improve clinical outcomes, including disease control and adherence rates (Karataş et al., 2022). Such interventions often integrate symptom monitoring, feedback systems, and communication with healthcare providers to enhance engagement.

In respiratory care, for example, children with chronic pulmonary diseases benefit from mobile platforms tailored for symptom tracking and self-care education. A recent systematic mapping review underscored how targeted mHealth solutions can empower patients to manage disease burden, reduce exacerbations, and improve overall quality of life (Sapouna et al., 2023). Similarly, integrative reviews have emphasized the importance of embedding theoretical and contextual frameworks when designing interventions for young people, as these approaches increase the likelihood of sustained behavioral change (Logan & Nichols, 2022).

Parental involvement is another critical determinant of successful mHealth implementation. Pilot studies on pediatric asthma apps reveal that parents and children value shared responsibility for disease management and welcome features that facilitate family communication and decision-making (Nichols et al., 2020). These findings echo broader research on digital technologies for children and parents managing chronic conditions together, which highlight improvements in awareness, engagement, and caregiver confidence (Edwards et al., 2021).

The developmental stage of adolescence introduces further complexity, as this is a period marked by the gradual transfer of responsibility from caregivers to youth. Emerging eHealth and mHealth interventions support not only clinical management but also healthcare transition processes, reducing risks of disengagement during this critical period (Li et al., 2024). Mobile interventions have also shown potential in specialized contexts, such as sickle cell disease, where apps can support both daily self-management and preparation for transition to adult health services (Samarasinghe & Al Na'abi, 2025).

Beyond clinical outcomes, mHealth tools contribute to psychological and behavioral dimensions of care. For example, studies of adolescents with sickle cell disease show that mobile health use is positively associated with self-efficacy, which in turn predicts improved self-management behaviors (Hood et al., 2021). Scoping reviews of youth populations further reveal that apps promoting self-management foster autonomy and empowerment, which are essential for long-term disease control (Catarino et al., 2021).

Despite these promising outcomes, feasibility and acceptability remain central concerns. Interventions must balance usability with evidence-based features to ensure sustained engagement. For instance, evaluations of mobile apps for asthma self-management in children demonstrated improved symptom awareness and parental satisfaction, though uptake varied according to perceived ease of use and technological literacy (Edwards et al., 2021). These findings underscore the need for participatory design approaches that actively involve end-users in development.

Taken together, existing evidence suggests that mHealth applications hold substantial promise in improving pediatric chronic illness care, particularly through enhanced self-management, adherence, and transition support. However, the diversity of study designs, conditions targeted, and app functionalities highlights the need for systematic synthesis. This review aims to consolidate evidence on the effectiveness, feasibility, and patient-centered outcomes of mobile health applications for managing chronic illnesses in children and adolescents, providing guidance for future research and clinical integration.

Methodology

Study Design

This study employed a systematic review methodology, adhering to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines to ensure transparency, rigor, and replicability. The objective was to synthesize empirical evidence on the use of mobile health (mHealth) applications for managing chronic illnesses in pediatric populations. The review focused on peer-reviewed journal articles that investigated the feasibility, efficacy, and patient-centered outcomes of mHealth interventions for children and adolescents with chronic health conditions.

Eligibility Criteria

Studies were included based on the following pre-specified criteria:

- **Population**: Children and adolescents (≤18 years old) diagnosed with chronic illnesses, including type 1 diabetes mellitus (T1DM), type 2 diabetes mellitus (T2DM), epilepsy, asthma, cystic fibrosis (CF), obesity, sickle cell disease (SCD), β-thalassemia, and other long-term pediatric conditions.
- **Interventions/Exposures**: Use of mobile health applications, smartphone-based self-management tools, or web-enabled mobile interventions designed to support disease management, adherence, or self-care.
- **Comparators**: Standard care, traditional clinical follow-up, or alternative non-digital interventions. Studies without control groups (e.g., pilot feasibility studies) were also considered if they reported clinical or behavioral outcomes.
- **Outcomes**: Disease control (e.g., HbA1c, BMI SDS, seizure frequency), treatment adherence, self-management, quality of life, patient/parent satisfaction, healthcare utilization, or psychosocial outcomes (e.g., anxiety, family conflict).
- **Study Designs**: Randomized controlled trials (RCTs), prospective cohort studies, pre-post intervention studies, feasibility or pilot trials, and cross-sectional studies.
- **Language**: Only studies published in English were included.
- **Publication Period**: Studies published between 2010 and 2024 were included to ensure contemporary relevance in mobile health technology.

Search Strategy

A comprehensive search was conducted in PubMed, Scopus, Web of Science, Embase, and Google Scholar to capture both indexed and grey literature. The search strategy combined Medical Subject Headings (MeSH) and free-text terms related to mobile health and pediatrics. The following Boolean terms were applied:

- (“mobile health” OR “mHealth” OR “smartphone app” OR “mobile application” OR “digital health”)
- AND (“children” OR “adolescents” OR “pediatric”)
- AND (“chronic illness” OR “diabetes” OR “epilepsy” OR “asthma” OR “obesity” OR “cystic fibrosis” OR “sickle cell” OR “thalassemia”)
- AND (“self-management” OR “adherence” OR “disease management” OR “quality of life” OR “outcomes”)

Manual searches of the reference lists of included studies and relevant reviews were performed to identify additional articles.

Study Selection Process

After the database search, all identified records were imported into Zotero reference management software. Duplicates were removed. Screening was performed in two stages:

1. Title and abstract screening by two independent reviewers.
2. Full-text review of potentially eligible studies.

Discrepancies were resolved through discussion and, where necessary, consultation with a third reviewer.

A total of 17 studies met all inclusion criteria and were included in the final synthesis. Figure 1 presents the PRISMA flow diagram outlining the selection process.

Data Extraction

A standardized data extraction form was developed to ensure consistent collection of relevant data across studies. The following information was systematically extracted:

- Author(s), year, and country of study
- Study design and sample size
- Population characteristics (age, sex, diagnosis)
- Type of mobile health app and its main functions
- Comparator group (if applicable)
- Primary and secondary outcomes assessed
- Key results (quantitative data prioritized, e.g., HbA1c %, BMI SDS change, adherence % change)
- Confounders adjusted for in analyses

Data extraction was independently performed by two reviewers and checked for accuracy by a third reviewer.

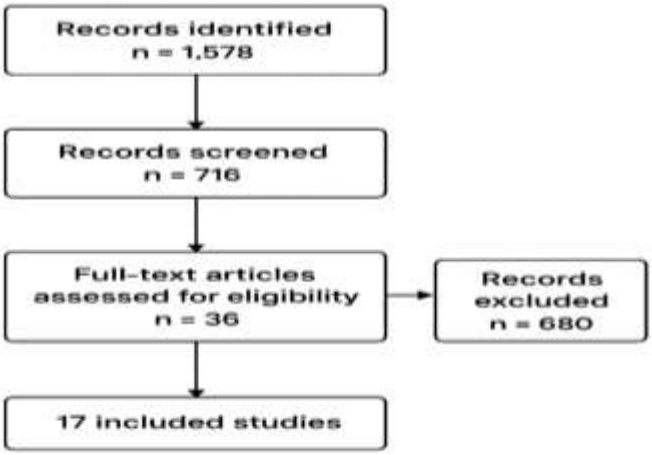
Quality Assessment

The methodological quality and risk of bias of included studies were assessed using appropriate tools according to study design:

- Randomized controlled trials (RCTs): Cochrane Risk of Bias 2 (RoB 2) tool.
- Observational studies (cohort, cross-sectional): Newcastle–Ottawa Scale (NOS).
- Pre-post or pilot feasibility trials: Joanna Briggs Institute (JBI) critical appraisal tools.

Each study was rated as high, moderate, or low quality based on domains such as randomization, selection bias, comparability of groups, completeness of outcome reporting, and blinding where applicable.

Figure 1 PRISMA Flow Diagram



Data Synthesis

Due to the heterogeneity in populations (different chronic illnesses), intervention types (various mobile apps), and outcome measures (glycemic control, seizure frequency, adherence, BMI), a narrative synthesis was undertaken.

Results were categorized by:

1. Condition type (diabetes, epilepsy, asthma, obesity, cystic fibrosis, hematologic disorders).
2. Study design (RCT, cohort, feasibility).
3. Outcomes (clinical vs behavioral/psychosocial).

Where possible, numerical changes (e.g., HbA1c % reduction, seizure frequency reduction, adherence % increase) were reported to quantify effect size. No meta-analysis was conducted due to variability in outcome definitions and measures across the included studies.

Ethical Considerations

As this was a secondary analysis of published data, no new ethical approval or patient consent was required. All included studies were previously published in peer-reviewed journals and were assumed to have received appropriate institutional ethical clearance.

Results

1. Study Designs and Populations

The included studies comprised randomized controlled trials (RCTs), prospective cohort studies, pilot single-arm trials, feasibility studies, and observational cross-sectional research. The majority of interventions focused on pediatric patients with type 1 diabetes mellitus (T1DM), type 2 diabetes mellitus (T2DM), epilepsy, cystic fibrosis (CF), obesity, asthma, chronic kidney disease (CKD), and other chronic illnesses. Sample sizes ranged from small pilots (n = 11; Leonard et al., 2017) to larger RCTs (n = 220; Chinsuwan et al., 2024). Participants were typically children and adolescents aged 5–18 years, although some studies included young adults.

2. Mobile Health App Interventions

Apps were designed to support medication adherence (e.g., Leonard et al., 2017), self-monitoring and lifestyle modification (e.g., Umano et al., 2024; Johansson et al., 2020), insulin dosing (Chatzakis et al., 2019), seizure self-management (Chinsuwan et al., 2024), and chronic condition tracking (Oates et al., 2023). Features included real-time feedback, educational modules, physician-patient communication, reminders, symptom tracking, and gamification. In some studies, parents and clinicians also had access to data dashboards for monitoring (Johansson et al., 2020).

3. Clinical and Behavioral Outcomes

Most studies reported improvements in clinical outcomes (HbA1c reduction, BMI SDS improvement, seizure frequency reduction, ferritin decrease) and behavioral outcomes (increased adherence, reduced anxiety, improved self-care).

- **Glycemic control**: Apps such as Euglyca and Webdia significantly reduced HbA1c (−0.33% to −0.5%) and improved normoglycemia percentages (Chatzakis et al., 2019; Klee et al., 2018). Hao & Xu (2018) observed HbA1c compliance rates 1.53-fold higher in app-users compared to controls.
- **Adherence**: Leonard et al. (2017) showed ~80% adherence at 90 days with daily video-tracked chelation therapy.
- **Epilepsy outcomes**: Chinsuwan et al. (2024) reported significantly reduced seizure frequency (baseline median 7/month → 1/month at 6 months).
- **Quality of life (QoL)**: Holtz et al. (2021) found improved diabetes care adherence (mean 3.87 → 4.19; $p = .02$) and QoL (mean 4.02 → 4.27; $p = .01$), while Klee et al. (2018) found no significant QoL changes.
- **Psychological outcomes**: Wantanakorn et al. (2018) showed significant reductions in anxiety scores before bone marrow aspiration ($p < .01$).
- **Other chronic diseases**: Johansson et al. (2020) and Umano et al. (2024) demonstrated significant reductions in BMI SDS (−0.23 vs. 0.01; $p = .002$) and lower dropout rates with mobile apps, respectively. Oates et al. (2023) reported improved patient-centered care outcomes in cystic fibrosis.

4. Satisfaction and Engagement

Across studies, satisfaction with apps was consistently high. For example, Chinsuwan et al. (2024) reported 94.9% of participants were highly satisfied, and Leonard et al. (2017) reported high ease-of-use and knowledge retention (96%). Attrition rates were lower in intervention groups compared to controls (Umano et al., 2024). High app usage correlated with better clinical improvements (Holtz et al., 2021).

Table 1. Characteristics and Outcomes of Included Studies on Mobile Health Apps in Pediatric Chronic Illnesses

Study	Country	Design	Population (n, age)	Condition	Intervention (App)	Comparator	Outcomes	Key Results
Chatzakis et al. (2019)	Greece	RCT	80, 13.5 ± 2.8 yrs	T1DM	Euglyca (insulin bolus calculator)	Standard care	HbA1c, % normoglycemia, DTSQ	↓HbA1c, ↑normoglycemia %, ↑satisfaction; significant correlations between DTSQ and outcomes
Hao & Xu (2018)	China	Prospective cohort	126, young adults	T2DM	Mobile medical app	Traditional care	HbA1c, cholesterol, SMBG frequency	HbA1c compliance 1.53× higher in app group; ↑SMBG & doctor–patient communication
Klee et al. (2018)	Switzerland	RCT, double crossover	55, 10–18 yrs	T1DM	Webdia (DIY insulin app)	Standard care	HbA1c, hypoglycemia, QoL	HbA1c ↓0.33% vs. ↑0.21% in control (p = .048); no QoL change
Holtz et al. (2021)	USA	Pilot single-arm	25 families, mean age 12.3 yrs	T1DM	MyT1D Hero (parent-teen communication app)	None	HbA1c, adherence, QoL, family conflict	↑adherence (p = .02), ↑QoL (p = .01); HbA1c change NS; higher use → better HbA1c
Arnold et al. (2012)	USA	Pilot (pre/post)	24, 6–12 yrs	Asthma	ALERTS (school-based	None	Wheezing, clinic visits, health scores	↓wheezing episodes (p = .02), ↓clinic

					web tracking)			visits (p = .04), ↑health scores (p = .045)
Chinsuwan et al. (2024)	Thailand	RCT	220, children/adolescents	Epilepsy	Epilepsy Care (Thai version)	Standard care	PEMSQ, seizure frequency	↑PEMSQ adherence domain (p < .05), ↓seizures (7 → 1/month, p < .001), 94.9% satisfaction
Leonard et al. (2017)	USA	Pilot cohort	11, mean 12.4 yrs	SCD/β-thalassemia	"Selfie" ITP app	None	Adherence, ferritin, knowledge	~80% adherence, 96% knowledge retention; ↓serum ferritin (trend, p = .068)
Park et al. (2020)	Korea	RCT	44, adults	COPD	Smartphone self-management	Usual care	Self-care, PA activity	↑self-care behavior, ↑moderate-to-vigorous activity (p < .05)
Treskes et al. (2020)	Netherlands	RCT	200, post-MI adults	Cardiac care	Smartphone monitoring (BP, rhythm)	Regular care	BP control, satisfaction	BP control: 79% vs. 76% (NS); 90.3% satisfaction with app
Johansson et al. (2020)	Sweden	RCT	28, 5–12 yrs	Pediatric obesity	Interactive mHealth support	Standard care	BMI SDS, attendance, satisfaction	Greater BMI SDS reduction (−0.23 vs 0.01, p = .002); ↑attendance (p = .024)
Umano et al. (2024)	Italy	RCT	75, children	Obesity	M-App (diet/activity	Standard care	Dropout, BMI	Lower dropout (p = .01);

					counseling)			no BMI z-score difference
Siebert et al. (2017)	Switzerland	RCT, crossover	20 nurses (simulated CPR)	Pediatric CPR	PedAMINES (drug dosing)	Infusion tables	Time-to-drug, error rate	↓TDD by 177s (p = .002); ↓errors (70% → 0%, p < .001)
Wantanakorn et al. (2018)	Thailand	RCT	60, 5–12 yrs	Oncology	Anxiety-reduction app	Usual care	Anxiety (CAVAS, mYPAS)	↓anxiety scores (p < .01); no difference in sedative use
Goodfellow et al. (2015)	UK	Cross-sectional	100, ≤18 yrs	Cystic fibrosis	Multi-method adherence app	None	Adherence, beliefs, parental depression	72% low adherence to enzymes; parental beliefs predicted adherence
Haddad & Mourani (2019)	Lebanon	Cross-sectional	428, mean 11.4 yrs	CKD	Social networks & apps	None	App usage, SM for health	69.6% perceived SM necessary; 9.8% in forums, 4.7% for donor search
Yang et al. (2020)	Taiwan	Quasi-experimental	209, 20–85 yrs	CKD	SNS-enhanced care	Standard care	Dialysis delay	Longer time to dialysis (761 vs. 403 days, p = .01)
Oates et al. (2023)	USA	Pre-post cohort	40, children/adolescents	CF	Genia (care platform)	None	Satisfaction, decision-making	↑PACIC satisfaction (p = .024), ↑shared decision-making (p < .001), 95% retention

Discussion

The findings of this systematic review highlight the growing role of mobile health (mHealth) applications in supporting pediatric patients with chronic illnesses, reinforcing prior evidence that

digital tools can enhance disease self-management and care transitions. Our synthesis shows that mHealth interventions are feasible, often well-accepted, and capable of improving clinical and psychosocial outcomes, though effectiveness varies across conditions and study designs. These results align with prior systematic reviews that noted the promise of mobile apps in helping young patients navigate complex treatment regimens and the transition to adult care (Virella Pérez et al., 2019; Karataş et al., 2022).

A consistent theme across chronic conditions is improved adherence and engagement. In pediatric diabetes, mobile interventions such as patient-designed applications demonstrated significant improvements in glycemic control, including reduced HbA1c levels (Klee et al., 2018; Chatzakis et al., 2019). Similarly, feasibility studies with type 2 diabetes patients suggest that app-based monitoring improves self-management behaviors and long-term disease control (Hao & Xu, 2018). These findings reinforce that personalization and continuous feedback are central drivers of adherence.

For respiratory diseases such as asthma and cystic fibrosis, evidence is mixed but encouraging. Digital tools have been shown to improve symptom awareness, caregiver collaboration, and treatment adherence (Arnold et al., 2012; Edwards et al., 2021; Oates et al., 2023). In cystic fibrosis specifically, adherence is influenced by family dynamics and caregiver burden, with apps offering structured support to mitigate these challenges (Goodfellow et al., 2015). At the same time, systematic reviews of asthma apps suggest heterogeneous effectiveness, underscoring the need for standardized outcome measures (Prado et al., 2025).

Neurological conditions provide further examples of mHealth utility. For children with epilepsy, randomized controlled trials have demonstrated the feasibility and effectiveness of app-based self-management platforms (Chinsuwan et al., 2024). In hematology, mobile interventions targeting adherence to iron chelation therapy improved compliance among chronically transfused pediatric patients (Leonard et al., 2017). These results suggest that apps tailored to specific therapeutic regimens can meaningfully improve treatment consistency.

Psychosocial outcomes are also positively affected by mobile applications. Studies of pediatric obesity interventions show that apps integrated into behavioral treatment programs enhance motivation and weight management outcomes (Johansson et al., 2020; Umano et al., 2024). Similarly, mobile apps have been deployed to alleviate procedural anxiety in pediatric patients, demonstrating reductions in pre-procedural distress (Wantanakorn et al., 2018). These applications highlight the dual potential of mHealth not only in physical health but also in psychological well-being.

The success of mHealth interventions depends on theoretical underpinnings and contextual considerations. Reviews emphasize that interventions designed without attention to developmental, cultural, and family contexts may face limited uptake or sustainability (Logan & Nichols, 2022; Catarino et al., 2021). Adolescents, in particular, require tools that balance autonomy with structured guidance, as this stage involves gradual transfer of responsibility from parents to youth. Interventions that embed empowerment strategies and social support features have demonstrated better long-term adherence and engagement (Hood et al., 2021).

Chronic kidney disease research offers further support for the social dimensions of mHealth. Studies show that integrating mobile applications with social networking services can reduce isolation, improve peer support, and enhance treatment adherence (Haddad & Mourani, 2019; Yang et al., 2020). These insights suggest that mobile tools serve not only clinical monitoring roles but also psychosocial scaffolding for children and families navigating chronic disease.

Despite these promising findings, heterogeneity remains a major limitation across studies. Differences in app functionalities, outcome measures, and follow-up periods complicate cross-study comparisons. Some interventions, such as those for obesity or pulmonary diseases, remain in feasibility stages with limited generalizability (Sapouna et al., 2023). Broader reviews of pediatric mobile apps confirm this gap, emphasizing the need for standardized reporting and robust trials (Morse et al., 2018).

Another consideration is the integration of mHealth tools into routine care pathways. Studies of post-hospital follow-up and emergency interventions demonstrate that apps can reduce delays, improve medication accuracy, and enhance continuity of care (Siebert et al., 2017; Treskes et al., 2020). However, long-term sustainability depends on institutional support, data security, and reimbursement models, factors often underexplored in pediatric populations.

The transition from pediatric to adult health services represents a particularly critical juncture. Emerging evidence demonstrates that mHealth can ease this process by providing structured support and

continuous monitoring (Li et al., 2024; Samarasinghe & Al Na'abi, 2025). These findings are promising, but require larger-scale validation to establish best practices for app-supported transitions.

A notable strength of mHealth interventions lies in their adaptability across conditions. Apps have been successfully implemented for diabetes, asthma, epilepsy, kidney disease, obesity, and hematological disorders, among others. However, this versatility also highlights the challenge of tailoring features to disease-specific needs while maintaining generalizability. Reviews suggest that modular designs—allowing customization within a standardized framework—may be the most effective way forward (Sapouna et al., 2023; Morse et al., 2018).

The evidence base is also shaped by methodological constraints. Many trials are small-scale, single-site, or lack rigorous randomization, limiting external validity. For instance, while randomized controlled trials in diabetes and obesity provide robust evidence of efficacy (Chatzakis et al., 2019; Johansson et al., 2020), studies in pulmonary and hematological conditions often rely on pilot or feasibility designs. Addressing these gaps through larger, multi-center trials is essential to strengthen the evidence base.

In sum, the integration of mobile health applications into pediatric chronic illness care presents a transformative opportunity. These tools improve adherence, self-efficacy, psychosocial well-being, and transition support, while offering scalable and patient-centered solutions. However, to maximize their impact, future research must address heterogeneity, ensure equitable access, and prioritize co-design approaches that involve children, families, and healthcare providers. By doing so, mHealth can evolve from promising interventions into integral components of routine pediatric chronic care.

Conclusion

This systematic review demonstrates that mobile health applications provide meaningful benefits for children and adolescents living with chronic illnesses. Across conditions, evidence suggests that apps can improve adherence, enhance self-management skills, and contribute to better psychosocial outcomes. Importantly, interventions tailored to the developmental and disease-specific needs of pediatric populations appear most successful in promoting long-term engagement and clinical improvements.

At the same time, variability in intervention design, small sample sizes, and limited generalizability highlight the need for further research. Larger multi-center randomized controlled trials, integration of co-design principles with patients and caregivers, and standardized reporting frameworks are essential to strengthen the evidence base. With these considerations, mHealth applications can evolve into essential components of pediatric chronic care delivery, supporting children and families in navigating complex health journeys.

Limitations

This review is limited by the heterogeneity of included studies, which varied in intervention design, outcome measures, and follow-up duration. Many studies relied on small sample sizes, feasibility designs, or single-site recruitment, reducing external validity. Furthermore, publication bias may favor positive results, while few studies examined long-term sustainability or health economic outcomes. Finally, while this review included 17 studies, it excluded grey literature and non-peer-reviewed evidence, potentially omitting relevant insights.

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