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The impact of mobile health interventions on service users' health outcomes and the role of health professions: a systematic review of systematic reviews

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Abstract

Background Mobile health (mHealth) tools have gained prominence in global healthcare in recent years, with demonstrated impacts on managing service users' health. While many systematic reviews have assessed the effectiveness of mHealth on health outcomes, the role of health professions in promoting mHealth adoption and leading to improved outcomes is less clear. This systematic review of systematic reviews (SR of SRs) critically appraises and synthesises evidence to examine both the impact of mHealth interventions on service users' outcomes and the role of health professions in facilitating their adoption.

Methods Five electronic databases—EMBASE, CINAHL Plus, Medline, Web of Science, and the Cochrane Library—were searched for systematic reviews published between 1 January 2015 and 8 June 2024. Reviews focused on the impact of mHealth interventions on service users' outcomes and the role of health professions in promoting adoption were included. Screening, data extraction, and quality assessment were conducted by four independent reviewers.

Results Fourteen systematic reviews, covering 393 primary studies, were included. mHealth interventions showed positive impacts on clinical outcomes, such as reductions in blood pressure, HbA1c, and cholesterol. Behavioural improvements were also reported, including better medication adherence and physical activity. Psychological benefits, such as reduced anxiety and enhanced patient satisfaction, were noted. The involvement of health professions significantly enhanced mHealth outcomes. However, challenges such as sustainability, accessibility, and usability remain.

Discussion This SR of SRs provides critical insights into the effectiveness of mHealth interventions on health outcomes and highlights the important role of health professions in promoting their adoption. While the findings are promising, concerns about training, sustainability, accessibility, and user acceptance need to be addressed to improve

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the broader adoption of mHealth interventions. Further research is recommended to address these challenges and enhance the long-term success of mHealth tools in healthcare.

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Keywords Mobile health, Digital health, Patients' outcomes, Long-term conditions, Health professions

Background

The exponential growth of chronic diseases and the ageing population worldwide pose increasing challenges to adequate healthcare provision [1]. The crisis of the COVID-19 pandemic has highlighted the practical impact of digital technologies to provide health solutions [2]. Various digital technologies are being developed and used to help in the medical field, one of which is mobile health technology, which has been harnessed in healthcare services [3]. Mobile health, also known as mHealth, involves delivering comprehensive medical and health aid to individuals seeking healthcare via mobile phones, laptops, tablets, and wearable devices [4]. Using mobile health technology significantly affects individuals' health-related behaviours, including physical activity, dietary choices, alcohol consumption, sexual conduct, and adherence to medication regimens [5]. There has been significant growth in the body of literature concerning mHealth over the last decade [6], with the United States and the United Kingdom being the most active countries in mHealth research [7]. Mobile health (mHealth) interventions are considered powerful tools that have led to revolutionary changes in digital health, particularly in access, monitoring, education, and intervention [8]. For example, a recent systematic review found that mHealth interventions could monitor patients' conditions remotely, deliver clinical consultation, enhance their engagement, and increase their autonomy in their health management [9]. While there is evidence supporting general effectiveness of mHealth interventions, there is still limited understanding regarding specific service users outcomes.

Furthermore, there is considerable potential for mHealth in various healthcare domains encompassing preventive measures and wellness initiatives, remote and self-diagnostic capabilities, monitoring medication adherence, dissemination of health-related information, and managing chronic diseases [10]. Therefore, mHealth interventions have received recognition and support from global regulatory institutions [11]. For example, the World Health Organisation (WHO) and the National Institute for Health and Care Excellence (NICE) have both acknowledged the potential benefits of mHealth on patient outcomes, disease prevention, and reducing the workload of healthcare providers [12]. The European Commission also described using mHealth as crucial to addressing the healthcare system's challenges in Europe [13]. In the United Kingdom (U.K.), National Health Services (NHS) Digital and other organisations have highlighted the importance of mHealth interventions in managing health problems to meet the high public demand for health services [14].

During the outbreak of COVID-19, mHealth had a significant impact on the management of health issues. In India, patients' engagement and utilisation of mHealth increased dramatically during the lockdown [15]. In Brazil, Randomised Controlled Trial found that using mHealth tools to effectively communicate with the public enhanced people's adherence to preventive measures for COVID-19 [16]. Similarly, in Australia, mHealth interventions were used to provide information about symptoms of COVID-19, prevention, vaccination, and changing behaviour with lifestyle modification for older people [17]. Likewise, other studies worldwide have reported that mHealth technology successfully fought the COVID-19 pandemic [18].

Furthermore, in the U.K., the NHS long-term plan (2019–2024) recommends that health professions be supported to develop digital literacy to use mobile access to digital services. [19]. However, the global literature from high-income countries suggests that there is hesitation among health professions to implement and advocate for the use of digital health technologies in their practice [20–22]. This was echoed by a study conducted in Catalonia, which revealed that only 6.5% of the surveyed nurses consistently advocated for integrating digital technology into their regular provision of patient care [23]. The reluctance of health professions to promote mHealth may reduce their potential in improving service users' outcomes. Understanding the factors contributing to this reluctance as well as the vital role of health professions in promoting mHealth is crucial to maximising the benefits of these interventions for patients. Although there is a growing body of evidence on mHealth, a critical gap remains regarding the comprehensive assessment of mHealth's impact on service users' outcomes and role of health professions in promoting its adoption. Therefore, this review aims to conduct SR of SRs to assess the current state of evidence on the impact of mHealth adoption on service users' outcomes and the influence of health professions in the adoption of mHealth on their service users.

Methods

SR of SRs synthesizes evidence from multiple systematic reviews to assess the impact of mHealth interventions on service users' health outcomes and to examine the role of health professions in promoting mobile health interventions to improve these outcomes. The methodology for this SR of SRs is described in detail in our published study protocol, which was registered in PROSPERO (CRD42023414435) and published in BMC Systematic Reviews (DOI: https://doi.org/https://doi.org/10.1186/s13643-024-02624-y) [24]. In brief, this SR of SRs aims to provide a comprehensive summary of the current state of research by combining existing knowledge. Various terms in the literature refer to evaluations of systematic reviews, such as umbrella reviews, overviews of reviews, reviews of reviews, summaries of systematic reviews, and synthesis of reviews [25].

Search strategy

An initial scoping search was undertaken to develop the search terms for this review (Table 1). The search strategy was implemented by combining relevant terms across multiple databases, including EMBASE, CINHAL Plus, Medline, Web of Science, and the Cochrane Library. In line with the protocol outlined in our previously published study [24], and following recommendations from The Joanna Briggs Institute (JBI), we limited the literature search to research syntheses from the past 5–10 years to capture original research from 30 + years ago [26]. Moreover, a state-of-science review on mHealth by da Silva et al. [27] and research supporting the European Green Paper on mHealth [28] were considered. Therefore, the search was limited to publications published from January 1, 2015, to June 8, 2024. The detailed search strategy is provided in Supplementary File 1, Table S1.

Study designs

Systematic reviews published in peer-reviewed journals in English, as outlined in the study protocol (Alkhuzaimi et al., 2024), were included in this review.

Identification of search terms

The following four search terms were used: health professions*, digital health, patient care, and systematic review, augmented by MeSH terms. A Boolean combination of search terms can be found in Supplementary File 1, Table S2.

Inclusion and exclusion criteria

Studies were selected based on the PICO framework (Population, Intervention, Comparator, Outcomes). The inclusion and exclusion criteria are summarized as follows:

Population

The review evaluates healthcare service users using mHealth tools and health professionals promoting their adoption. Studies focusing solely on telemedicine or communication tools among health professionals were excluded.

Intervention

This review includes mHealth interventions targeting service users and their health outcomes. Studies not focused on these interventions or outcomes were excluded.

Comparator

mHealth interventions were compared with usual care, which does not involve digital health tools.

Primary outcomes

1. Impact of mHealth on service users' health outcomes (e.g., self-management, disease prevention, medication adherence, hospital admissions).

Table 1 The inclusion and exclusion criteria of this study

Inclusion	Exclusion
Interventions involving mobile health with service users	Interventions involving telehealth; telemedicine, clinical decisions making tools, communication tools between health care providers; digital care delivery
Mobile Health interventions measuring service user outcomes	Non-intervention studies
Engagement of health profession using mobile health to improve service user outcomes	
Published from 2015–2024	Studies concerning mobile health but not focus on patient outcomes
Published in the English language	Reviews not following a systematic search strategy
Systematic reviews	Primary reviews

2. Influence of health professions in promoting mHealth adoption on service users' outcomes (e.g., adoption rates, satisfaction, empowerment, cost-effectiveness).

Additional outcomes

Factors influencing service users' adoption of mHealth and health professionals' roles in promoting it.

The screening and selection process

The study carefully followed the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) checklist as a guide for the search strategy, ensuring that the data were analysed correctly and transparently [29]. The search terms were used to search various databases for relevant studies. Identified studies were imported into EndNote Software Version 21 (Thomson Reuters, New York, USA) for reference management, and duplicates were removed. Four independent reviewers screened the titles and abstracts against the inclusion/exclusion criteria, and the full-text papers were independently reviewed by the same four reviewers. Any discrepancies throughout the screening process were resolved through discussion across the full team. The methodology of this review was based on the study protocol registered in PROSPERO [24].

Data extraction

The data collected from the included reviews were organised into tables to enhance clarity and accessibility for further analysis. The following details were extracted from each study: author names, publication year, journal name, systematic review type (if applicable), country of origin, range of years covered by the included studies, study settings, quality appraisal tool used, number of included studies, types of health conditions investigated, types of mHealth tools used, intervention descriptions, features of the intervention, outcome measures, primary and secondary outcomes, duration of the trial (if applicable), and the relevant role of health professions. This detailed data extraction process was carefully designed to ensure transparency, rigor, and reliability, in alignment with established protocols for systematic reviews [24]. Four independent reviewers were involved in the data extraction process to ensure accuracy and minimise bias. Any discrepancies were discussed and resolved through consensus. Supplementary File 2, Table S1, provides additional details.

Data synthesis

This review applied thematic analysis to identify main themes and subthemes emerging from the findings based on the similarities and differences of mHealth interventions on service users' outcomes, types of interventions, types of mHealth tools, types of outcomes, the impact of health professions on service users' outcomes, and factors affecting service users in adopting mobile health and health professions in promoting mobile health to their service users. A coding technique was employed to classify and code the identified themes and subthemes. The primary research questions and topics of focus guided the creation of this framework, consistent with established protocols for thematic analysis in systematic reviews [24]. Four independent reviewers applied the coding framework to ensure consistency and accuracy. Any discrepancies were resolved through team discussion, and the coding framework was refined accordingly. The coding process was progressive, with code reviews occurring at various stages. Existing themes from the reviews were discussed with supporting evidence from systematic reviews, and comparisons and contrasts were highlighted. These findings were critically analysed, considering the strengths and limitations of the included reviews. The synthesis of the findings provides recommendations for clinical practice, policy, and future research.

Data quality assessment

The quality of the included reviews was assessed using the A Measurement Tool to Assess Systematic Reviews (AMSTAR 2), a critical appraisal instrument designed for systematic reviews of randomised and non-randomised trials [30]. Developed based on the Cochrane Handbook for systematic reviews of interventions [31], AMSTAR 2 consists of 16 items categorised into seven critical domains and nine non-critical domains. The tool employs a binary assessment ("yes" or "no") for each item, with partial compliance allowed for critical domains. AMSTAR 2 is an Open Access tool, distributed in accordance with the terms of the Creative Commons Attribution (CC BY 4.0) license, which permits others to distribute, remix, adapt, and build upon this work, for commercial use, provided the original work is properly cited. See: http://creativecommons.org/licenses/by/4.0/. Four independent reviewers assessed the data and resolved discrepancies through team discussion. Confidence rankings were assigned to the reviews based on the presence or absence of weaknesses in critical and non-critical domains.

Results

Review characteristics

In the initial database search, 109 systematic reviews were identified and imported into the reference management software, with five duplicates removed. Following initial screening, 81 references were excluded, leaving 18 for full paper review. Four studies were excluded because their mHealth interventions did not measure service users' outcomes, leaving 14 systematic reviews that met the eligible criteria for inclusion in the study. The PRISMA flow diagram (Fig. 1) provides a comprehensive description of the selection process. Additionally, the characteristics of excluded reviews and reasons for exclusion from full-text screening are presented in Supplementary File 1, Table S3.

Target population

All 14 systematic reviews explicitly outlined the health conditions investigated within their participant cohorts. Several reviews focused on specific health conditions such as diabetes (DM) and hypertension (HTN) [32], human immunodeficiency virus (HIV) [33], chronic obstructive pulmonary disease (COPD) [34], leukaemia [35], individuals at an elevated risk of cardiovascular disease (CVD) [36], and heart failure [37]. Additionally, one review [38] focused on individuals suffering from CVD. In contrast, the remaining seven reviews [39–45] adopted a more comprehensive approach, addressing a spectrum of chronic health conditions alongside those mentioned above. These include end-stage renal disease, multiple sclerosis, respiratory failure, cystic fibrosis, dementia, motor neurone disease, cerebral vascular disease, chronic kidney disease, mental disorders, Parkinson's disease, smoking, alcoholism, asthma, malaria, skin diseases, epilepsy, and various forms of cancer (e.g. prostate, lung, and breast cancer). Furthermore, 13 of the 14 included systematic reviews provided information on the number of participants included in the primary studies, ranging from four to 925 [39] and 171 participants respectively [36]. However, one study did not report on the overall sample size of the primary studies [33]. Additionally, among the 13 reviews that involved health professions, only two specified the number of health professions included: Qudah and Luetsch [40] reported 322, and Disalvo et al. [41] reported 812. Two studies involved both patients and their family caregivers [41, 42].

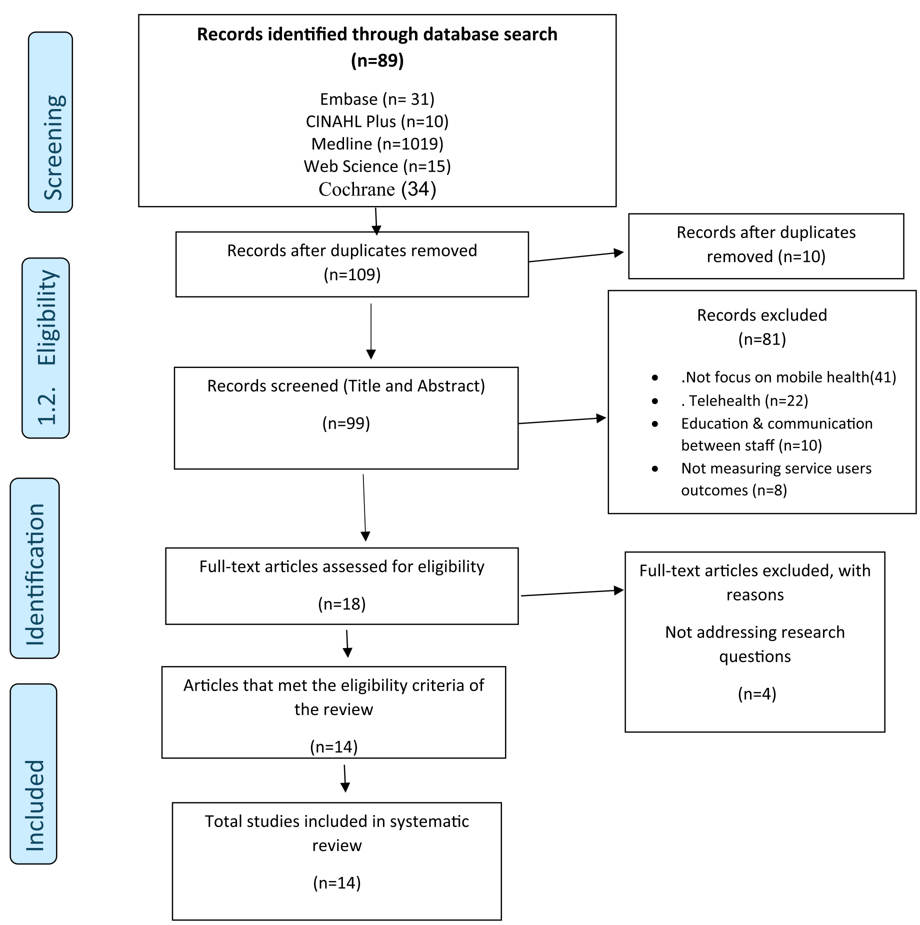

Fig. 1 Presents the study's PRISMA flow diagram

Study designs

Across the 14 systematic reviews, the number of primary studies included ranged from 3 [34] to 107 [39], collectively covering 393 primary studies. Nine of the 14 reviews were meta-analyses [32, 34, 36–39, 41–43]. Eleven systematic reviews included randomised controlled trials (RCTs) [32–39, 42, 43, 45]. Two reviews were narrative and mixed-method studies, respectively [40, 44]. The systematic reviews identified the countries where the primary studies were conducted, with the United States, Australia, China, and the United Kingdom being the most common. Eleven reviews mentioned the study settings, which mainly included combinations of community [33, 34, 36, 37, 41–44], hospital [33, 38, 40, 41, 43–45], primary care [33, 34, 36, 37, 41, 43, 44], sheltered housing, and outpatient clinics [33, 34, 36–38, 40–45]. A detailed list of the countries and study settings is available in Supplementary File 2, Table S1.

Quality of included reviews

The methodological quality of the included systematic reviews was assessed using the AMSTAR2 tool. Six reviews were rated as high-quality [36–38, 41, 43, 45] as they addressed all critical and non-critical domains. Five reviews received critically low ratings [32, 33, 35, 39, 40] due to methodological issues such as the lack of a registered protocol and insufficient bias consideration. Three reviews were identified as low-quality [32, 42, 44] because they did not address specific domains essential for high-quality reviews. The quality assessment of the included reviews using AMSTAR2 is presented in Supplementary File 3, Table S1.

Quality of studies in included systematic reviews

The quality of studies within the systematic reviews was evaluated using risk of bias assessment tools. Thirteen of the 14 systematic reviews explicitly reported the results of bias assessments. Two systematic reviews [42, 43] utilised the Cochrane Collaboration's tool, categorising the studies from low to high risk. Five systematic reviews employed the GRADE methodology, primarily from the Cochrane Database of Systematic Reviews [32, 34, 36–38].

Three systematic reviews used the mixed-method appraisal tool but did not provide explicit details about the quality of the assessed papers [35, 40, 44]. The Critical Appraisal Skills Programme (CASP) tool was applied in two reviews, with results ranging from high to serious risk of bias [33, 46]. Another systematic review, which used the Joanna Briggs Institute tool, reported most studies as low risk, with a few classified as high risks [41]. Detailed information can be found in Supplementary File 2, Table S1.

Objectives

The systematic reviews included in this SR of SRs investigate a range of objectives. Nine reviews assess the impact of mHealth interventions on health outcomes, focusing on conditions such as DM, HTN, CVD, heart failure, COPD, palliative care, and cancer [32, 34, 36–39, 42, 44, 46]. Three reviews explore the role of health professions in promoting and supporting the adoption of mHealth tools [33, 35, 41]. Two reviews examine both the effectiveness of mHealth interventions across diverse populations and the role of health professions in advocating for their adoption [42, 43].

Theory to underpin the mHealth interventions

The examination of mHealth interventions across 14 systematic reviews reveals varying degrees of reliance on theoretical frameworks. Six reviews specifically mentioned the use of theory, primarily to guide behavioural change interventions. The most frequently applied theories were the Social Cognitive Theory and the Stages of Change Model, guiding interventions in four reviews [33, 35, 36, 38]. Additionally, the Integrative Model of Behavioural Prediction and the Relational Frame Theory were used to assess behavioural changes in two reviews [44, 45].

Evaluation of mHealth interventions

Primary and secondary outcomes

The SR of SRs examined various clinical outcomes resulting from mHealth interventions, with some reviews specifying both primary and secondary outcomes. Seven systematic reviews explicitly distinguished between primary and secondary outcomes [32, 34, 36–38, 43, 45], while the remaining reviews did not provide such a clear distinction [33, 35, 39–42, 44]. The primary outcomes reported across the reviews varied considerably. For instance, Liu, Xie, and Or [32] and Fernando et al. [43] concentrated on clinical outcomes, specifically reductions in physiological parameters such as systolic and diastolic blood pressure. In contrast, Van Driel et al. [36] emphasised behavioural outcomes, such as patients' adherence to treatment regimens. Moreover, other reviews examined a range of outcomes, encompassing clinical, behavioural, knowledge, and psychosocial aspects [34, 37, 38, 45].

Secondary outcomes were also varied, with seven systematic reviews assessing factors such as fasting blood sugar levels, weight reduction, patient satisfaction, medication adherence, and knowledge acquisition [32, 34, 36–38, 43, 45]. These outcomes demonstrate the broad impact of mHealth interventions on both physiological and psychosocial health indicators.

Outcomes measure

The included systematic reviews demonstrated variation in their selected outcome measures, which could be grouped into three distinct categories. First, some reviews employed validated instruments, such as questionnaires and scales. For instance, Van Driel et al. [36] and McCabe, McCann, and Brady [34] measured outcomes using tools like the Medication Adherence Report Scale (MARS) and the St. George's Respiratory Questionnaire (SGRQ). Second, nine reviews measured outcomes by directly assessing the impact of mHealth interventions on various clinical, behavioural, psychosocial, and lifestyle factors [32, 35–37, 39–41, 43, 44]. Third, three systematic reviews [35, 37, 38] combined both validated scales and direct impact measures to assess outcomes.

Duration of mHealth intervention trial

The duration of mHealth intervention trials was specified in ten systematic reviews. Interventions varied in length depending on the desired outcomes, ranging from a few hours to up to 60 months [32, 33, 35–37, 39–41, 43, 44]. The average duration of interventions was approximately 6 months. Additionally, some reviews mentioned follow-up periods ranging from weeks to months [34, 37, 38, 42, 43]. Further details on trial duration can be found in Supplementary File 2, Table S1.

Types of mHealth interventions

mHealth interventions in the included reviews varied according to the specific objectives of each study. The interventions can be categorised into three main types: self-management, communication, and health promotion and prevention. Seven reviews addressed self-management interventions, delivered through education, direct support, and monitoring [32–37, 42]. These interventions focused on patients with chronic diseases and substance use disorders. In six of these reviews, self-management was monitored by health professions, while one review discussed self-management without health professions involvement [34].

Additionally, seven reviews examined the effectiveness of mHealth interventions in enhancing communication. These reviews highlighted a wide range of communication methods, including patient support groups, direct patient-to-patient communication, and communication between patients and health professions [32, 33, 35, 40, 41, 44, 45].

Four reviews explored health promotion and prevention interventions, focusing on promoting adherence to chronic disease management, medication regimens, and follow-up procedures. These reviews also emphasised the monitoring of risk factors and support for lifestyle changes and behaviour modification [36, 38, 39, 43].

Characteristics of mHealth intervention

mHealth interventions play a crucial role in transforming healthcare delivery and improving individual well-being. Insights from 14 systematic reviews reveal a diverse range of mHealth tools, each offering unique attributes. Some interventions frequently integrated personalised goal setting, reminders, and automated feedback mechanisms to enhance adherence to health-related activities, allowing users to tailor their health objectives [32, 36, 43]. Self-monitoring features were also prominent in some studies, enabling individuals to track health parameters such as blood glucose levels, blood pressure, body weight, physical activity, and mood [35, 42].

Other notable features included monitoring logs, motivational messages, medication adjustment aids, and diagnostic support to enhance self-management [34, 40, 44]. Several reviews consistently highlighted virtual consultations, educational resources, automated symptom management, direct contact with health professions, and coaching services as key components of mHealth interventions [32–37, 39, 42, 43]. These features collectively aimed to monitor and improve clinical, behavioural, psychosocial, lifestyle, and educational outcomes.

Types of mHealth tools

A range of tools was used to deliver mHealth interventions across the systematic reviews. These tools included mobile applications (apps), video calls, telephone calls, voice messages, text messages, short message service (SMS), social media platforms, video consultations, emails, video conferences, Android tablets, iPads, and web-based platforms.

Eight out of the 14 systematic reviews incorporated mobile apps alongside other tools, while the remaining six did not consider apps [35, 36, 38, 42, 44, 45]. Moreover, eight reviews included SMS as part of their toolset, with two highlighting SMS as the most widely used and favourable tool due to its accessibility, simplicity, and cost-effectiveness [39, 44]. Additionally, a systematic review [41] emphasised the effectiveness and accessibility of video conferencing compared to other tools like SMS, mobile apps, and telephone calls.

Impact of mHealth Interventions on the outcomes

Impact of mHealth on clinical outcomes

The systematic reviews conducted by Liu, Xie, and Or [32], Fernando et al. [43], Hamine et al. [39], Van Driel et al. [36], and McCabe, McCann, and Brady [34] collectively demonstrate that mHealth interventions positively impact clinical outcomes. Liu, Xie, and Or's [32] systematic review and meta-analysis of RCTs highlighted self-care interventions, particularly those involving medication monitoring for patients with DM and HTN. These interventions significantly reduced HbA1c levels, systolic blood pressure (SBP), diastolic blood pressure (DBP), fasting blood glucose, and waist circumference. The positive results were further enhanced by effective communication between patients and health professions. However, the same meta-analysis [32] did not find notable changes in body weight, low-density lipoprotein (LDL), or high-density lipoprotein (HDL).

McCabe, McCann, and Brady [34] found that mHealth interventions were more effective than face-to-face interactions in reducing hospital admissions for COPD related symptoms and anxiety. However, the study noted that these benefits diminished over time, particularly after a 12-month period.

Van Driel et al. [36] focused on lipid-lowering therapy adherence and found that intensified patient care interventions significantly improved adherence, with positive effects on physiological indicators like LDL cholesterol and overall health outcomes. Evidence from this review also suggested that these interventions enhanced short-term medication adherence and contributed to better quality of life, reduced morbidity, and lower mortality.

Fernando et al. [43] examined DM-related risk factor management, highlighting the effectiveness of remote interventions in lowering HbA1c, total cholesterol, LDL, and blood pressure. However, unequal access to mobile devices posed a barrier to the broader implementation of these interventions.

Hamine et al. [39] demonstrated the usability and acceptance of adherence tools, reporting significant improvements in clinical outcomes for chronic diseases, including blood pressure, weight, lipid profiles, and blood glucose levels.

Impact of mHealth interventions on Health-related behaviour outcomes

Lifestyle changes The evaluation of mHealth interventions across 14 systematic reviews reveals a complex and, in some cases, limited impact on health-related behaviour changes. Van Driel et al. [36] found that mHealth interventions positively influenced physical activity, dietary habits, and smoking cessation. Similarly, McCabe, McCann, and Brady [34] reported that mHealth interventions were more effective than traditional face-to-face methods in improving quality of life, physical activity, and smoking cessation for COPD patients over a four-month period. However, the long-term sustainability of these benefits remains uncertain. Conversely, Liu, Xie, and Or [32] suggested that mHealth interventions had a limited impact on diet and physical activity.

Adherence to treatment regimens mHealth interventions significantly improved patient adherence across several studies. Liu, Xie, and Or's [32] systematic review found that self-care interventions with medication monitoring features resulted in a substantial reduction in HbA1c levels due to increased adherence. Similarly, Van Driel et al. [36] demonstrated that intensified patient care interventions, such as telephone reminders and educational activities, improved adherence to lipid-lowering therapy. Fernando et al. [43] supported this, showing that remotely managed modifiable risk factors led to significant reductions in HbA1c, cholesterol levels, and blood pressure (BP) in patients with DM. Furthermore, Hamine et al. [39] presented a broader view, asserting that adherence tools were both feasible and beneficial, contributing to improved disease management and enhanced patient confidence. Disalvo et al. [41] also found that mHealth interventions in palliative care improved adherence to care plans and enhanced clinical health outcomes at home.

Impact of mHealth interventions on psychological and psychosocial outcomes

The findings from four systematic reviews highlight the diverse psychological and psychosocial impacts of mHealth interventions across different health domains. Hamine et al. [39] examined the role of adherence tools, noting a significant increase in patient confidence for monitoring chronic diseases. This psychosocial improvement was marked by reduced anxiety and greater feelings of reassurance and control, which strengthened patients' coping mechanisms. In palliative care, Disalvo et al. [41] observed a decrease in depression and anxiety levels, alongside increased patient satisfaction and acceptance of treatment. Similarly, Mwase, Nkhoma, and Allsop [44] found that mHealth interventions positively affected psychological outcomes, improving patient satisfaction and support for palliative care. McCabe, McCann, and Brady [34] reported that mHealth interventions were more effective than traditional methods in reducing anxiety and depression among COPD patients. However, Irani, Niyomyart, and Hickman [42] observed that while patient satisfaction increased, there was limited evidence of improved psychological outcomes in their review. Taylor et al. [35] also found that mHealth interventions did not significantly enhance patient confidence.

The synthesis of findings from five out of the 14 systematic reviews highlights the influence of mHealth interventions on patient self-efficacy [35, 39, 40, 42, 45].

Three reviews found that mHealth apps and smartphones improved patients' self-efficacy by encouraging access to healthcare services, active involvement in self-management, and fostering collaborative relationships with health professions [35, 40, 45]. Hamine et al. [39] found that patients' self-efficacy and social support positively influenced adherence to mHealth interventions. Irani, Niyomyart, and Hickman [42] reported that self-efficacy, social support, and perceived control improved self-management among heart failure patients using mHealth tools. However, Allida et al. [37] highlighted uncertainty regarding the effect of mHealth interventions on self-efficacy when compared to usual care.

Involvement of health professions in mHealth interventions

Seven out of 14 systematic reviews specifically examined the involvement of health professions in delivering mHealth interventions. Liu, Xie, and Or [32] highlighted that feedback, communication, and monitoring by health professions improved outcomes such as adherence to self-management, reductions in fasting blood sugar, and increased disease knowledge. Godinho et al. [33] found that communication, coordination, and counselling from health professions enhanced patients' self-management and adoption of mHealth interventions. Additionally, two reviews [40, 45] emphasised that the active involvement of health professions improved communication and relationships between health professions and patients, promoting relationship-centred care.

Hamine et al. [39] found that mHealth tools led by health professions were widely accepted by patients with chronic conditions, though health professions expressed concerns about workload, technological dependency, and implementation costs. Mwase, Nkhoma, and Allsop [44] identified that active involvement in coordinating patient care, especially decision support, reduced outpatient services and improved both diagnosis and psychosocial outcomes. Redfern et al. [38] underscored the critical role of health professions in developing and delivering mHealth interventions, particularly in improving medication adherence for cardiovascular disease management.

Although some reviews did not explicitly focus on the role of health professions, they still recognised their significant impact. For instance, Allida et al. [37] found that interactions between patients and health professions led to enhanced behaviour changes, self-management, and motivation. Van Driel et al. [36] showed that coaching, advising, and counselling by health professions improved adherence to lipid-lowering medications, reducing cardiovascular disease risks. Other reviews [41, 43] indicated that follow-up calls post-discharge were effective in palliative care, improving patient outcomes. McCabe, McCann, and Brady [34] noted that the sustainability of mHealth interventions was dependent on the continued involvement of health professions, particularly for periods exceeding six months. Irani, Niyomyart, and Hickman [42] found that health professions' facilitation of mHealth interventions significantly enhanced patient-provider relationships.

Factors affecting service users in adopting mobile health and health professions in promoting mobile health to their service users

Barriers to adopting mHealth interventions

The findings from the included reviews indicate that the barriers to widespread adoption of mHealth interventions are varied. Unequal access to mobile devices among patients remains a significant challenge, hindering the universal use of these interventions [43]. Additionally, the reluctance of health professions to fully integrate mobile applications into clinical practice represents a major obstacle [40, 41]. Another notable barrier is the lack of continued monitoring by health professions, which is essential for maintaining the long-term impact of these interventions, particularly beyond 12 months [34, 38].

Concerns have also been raised about the limitations of one-way communication tools, which may lead to misunderstandings [35]. Furthermore, reviews identified issues such as a lack of digital literacy and skills among service users, as well as limited access to internet services, both of which pose significant challenges to mHealth adoption [38, 39, 41]. Technological dependency, implementation costs, and concerns about usability have also been cited as complexities in implementing adherence tools [38, 39].

Training of health professions has been highlighted as a critical factor influencing the successful adoption of mHealth interventions [33, 44]. Additionally, user acceptance of mHealth, influenced by their digital literacy, was found to impact adoption rates significantly [32, 39–41, 44].

Facilitators to adopting mHealth interventions

The findings from the systematic reviews identified several facilitators that enhance the adoption of mHealth interventions. Firstly, mHealth tools with features such as phone reminders, continuous monitoring, goal setting, motivational support, education, and feedback were reported as influential factors driving patients' adoption [34, 36, 38, 42, 43, 45].

Additionally, the active involvement of health professions in delivering mHealth interventions was associated with improved patient outcomes in clinical, behavioural, and psychosocial domains [32, 33, 35, 38–40, 44]. Other key facilitators included patients' self-efficacy, the accessibility of healthcare services, and the digital literacy of both patients and health professions. These factors were consistently reported as crucial in fostering the adoption of mHealth interventions across multiple reviews.

Discussion

The present SR of SRs synthesises 14 systematic reviews from 393 primary studies to explain the impact of mHealth interventions on the health outcomes of service users. It concurrently examines the role of health professions in promoting these interventions. Covering a wide range of chronic diseases and substance abuse, managed through mHealth tools, the findings of this SR of SRs reflect the current evidence on the impact of mHealth interventions across different healthcare settings. Despite the mixed results, many reviews reported in the findings of this paper highlight the effectiveness of mHealth in delivering care at primary, secondary, and palliative levels, with a particular focus on prevention, self-management, and lifestyle improvements in primary care.

The current SR of SRs underscores the wide-ranging benefits of mHealth interventions in improving clinical, behavioural, psychological, and psychosocial outcomes. Clinically, mHealth interventions have demonstrated the ability to reduce glucose levels, HbA1c, blood pressure, and lipid profiles, thereby slowing the progression of chronic diseases. These clinical improvements contribute to a decrease in patient admissions and hospitalisation costs. Consistent with these findings, a previous meta-analysis on the comparative effectiveness of mobile phone interventions also found that mHealth significantly improves health outcomes [46].

Although mHealth has successfully promoted lifestyle changes such as increased physical activity, improved diet, weight management, treatment adherence, smoking cessation, and reduced alcohol use the long-term sustainability of these behavioural changes remains underexplored, as supported by prior evidence [47]. Consequently, investing in mHealth interventions as a complement to existing health services could yield substantial benefits [48].

Furthermore, this review highlights the positive psychological and psychosocial impacts of mHealth interventions. The findings indicate increased self-efficacy, better adoption of mHealth tools, and active engagement in behavioural changes, aligning with existing evidence [32, 49]. Increased self-efficacy has facilitated better collaboration with health professions and improved self-management in conditions such as heart failure, DM, and HTN.

Several reviews included in this SR of SRs reported reductions in depression and anxiety, as well as improvements in patient satisfaction, assurance, and treatment acceptance, all of which strengthened coping mechanisms. These findings align with previous RCTs. For example, Bendtsen et al. [50] demonstrated significant mental health improvements among university students using a mobile health intervention, while Serrano-Ripoll et al. [51] conducted a systematic review and meta-analysis showing that smartphone app–based psychological interventions significantly reduced depressive symptoms in people with depression. However, Tan et al. [52] found that these psychological benefits were limited in breast cancer patients, suggesting that while mHealth shows promise, its psychological effects remain inconsistent across different populations and require further research.

This review found that users preferred SMS, smartphone apps, and video conferencing for mHealth interventions. While SMS is widely recognised as a commonly used tool in other studies [53–57], this review highlighted that the combination of these tools promotes mHealth adoption and enhances the management of health conditions [33, 37, 39, 41, 42]. This supports the channel complementarity theory, which posits that individuals use multiple sources to gather health information [58]. However, the effectiveness of these tools is contingent upon factors such as digital literacy, the specific features of the mHealth tools, and the involvement of health professions [36, 43–45].

In this SR of SRs, human-led mHealth interventions led to significant improvements in clinical outcomes, including HbA1c, SBP, DBP, FBG, and LDL levels. Studies that involved health professions reported higher adherence to medication, diet, and exercise, particularly in the DM, CVD, and COPD. These findings are consistent with previous studies that underscore the importance of human support in improving outcomes related to weight, exercise, and diet [59–61].

The role of health professions through communication, feedback, coaching, and counselling was critical in fostering behavioural changes and promoting self-management. This finding is supported by other reviews [62–64]. Furthermore, the present review emphasises that two-way communication and social support are more effective than one-way tools in engaging patients and improving outcomes, aligning with the findings of previous studies [65–67]. Similarly, a prior review on COPD demonstrated that frequent feedback from health professions significantly improved adherence to physical activity and exercise [68].

Additionally, this review emphasises the essential role of health professions in enhancing user engagement with mHealth interventions. Nevertheless, challenges such as access, sustainability, workload, cost, and the need for training for both patients and professions persist. These factors are critical in influencing the adoption of mHealth interventions, as confirmed by other reviews [18, 69, 70]. Addressing these challenges is essential for advancing mHealth innovations and improving service delivery.

While the results of this SR of SRs support the effectiveness of mHealth interventions, it is important to consider the impact of study quality on these findings. High-quality reviews in this paper [36–38, 41, 43, 45] provide robust evidence, particularly regarding improvements in clinical outcomes, patient adherence, and the role of health professions. These high-quality studies employed more rigorous methodologies, contributing to the reliability of the outcomes. However, lower-quality reviews reported in this paper [32, 33, 35, 39, 40] often presented mixed results, particularly around long-term sustainability and the comprehensive impact of mHealth interventions. This variability suggests that conclusions drawn from lower-quality studies should be interpreted cautiously, underscoring the need for more rigorous future research to solidify the evidence base for mHealth interventions.

Strengths and limitation

The strength of this review lies in its comprehensive synthesis of recent evidence on the effects of mHealth interventions across diverse health outcomes. It systematically examines the role of health professions in promoting mHealth, offering valuable insights into their influence on service user engagement and clinical outcomes. Several steps were taken to reduce variability in data interpretation. EndNote version 21 software was used to manage references and remove duplicates during the screening process. Additionally, four reviewers independently conducted data extraction and synthesis, with cross-validation of the findings through team discussions and coding refinements, ensuring a more rigorous analysis. Furthermore, this review followed a pre-published protocol, enhancing the transparency and methodological rigor of the study. Despite these measures, the review has certain limitations. The search and inclusion criteria were limited to reviews published in English, potentially excluding relevant studies in other languages. Moreover, the findings of this SR of SRs are dependent on the analyses conducted by the authors of the included reviews, which may still lead to variability in the interpretation of results.

Conclusion

This SR of SRs provides strong evidence on the impact of mHealth interventions on user outcomes across various health conditions, emphasising the crucial role of health professions in promoting mHealth. The review highlights the benefits of mHealth interventions on clinical, psychological, behavioural, and psychosocial outcomes. The evidence supports the effectiveness of mHealth interventions in disease management, health promotion, and prevention through a variety of mHealth tools. The involvement of health professions significantly improves user adoption and communication. However, key factors such as digital literacy, the design of mHealth tools, and professions engagement must be considered when implementing mHealth services. Further experimental and longitudinal studies are needed to evaluate the long-term sustainability of mHealth adoption. Future research should also investigate the factors influencing health professions' active involvement in promoting mHealth interventions.

Abbreviations

AMSTAR 2	Assessing the Methodological Quality of Systemaic Reviews
JBI	The Joanna Briggs Institute
CINAHL	Cumulative Index to Nursing and Allied Health Literature
MEDLINE	Medical Literature Analysis and Retrieval System Online
MeSH	Medical Subject Headings
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
EMBASE	Excerpta Medica database
PROSPERO	International prospective register of systematic reviews
NICE	The National Institute for Health and Care Excellence
WHO	World Health Organisation
NHS	National Health Service
DM	Diabetes mellitus
HTN	Hypertension
CVD	Cardiovascular disease
LDL	Low-density lipoprotein
HDL	High-density lipoprotein
SR of SRs	Systematic review of systematic reviews
RCT	Randomised control study
CASP	The Critical Appraisal Skills Programme

Supplementary Information

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Supplementary Material 1.

Supplementary Material 2.

Supplementary Material 3.

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Authors' contributions

FA assisted in conceiving the study, carried out search strategies, participated in the design and coordination of the study, and drafted the study manuscript. CBW helped conceive the study, participated in the design and coordination of the study, and revised the manuscript critically. DR participated in the design and was involved in revising the manuscript. JB participated in critical appraisal of the reviews and in revising the manuscript.All authors reviewed the manuscript.

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Data availability

All data generated or analyzed during this study are included in this published article and its supplementary information files. The data supporting the findings of this study are available within the manuscript and the supplementary files attached to it.

Declarations

Ethics approval and consent to participate
Not applicable.

Consent for publication
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Competing interests
The authors declare no competing interests.

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