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editorial-office@sciformat.ca

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THE ROLE OF MOBILE HEALTH APPLICATIONS IN CHRONIC DISEASE MANAGEMENT: CURRENT EVIDENCE ON DIABETES, HYPERTENSION, OBESITY, AND REMOTE PATIENT MONITORING- NARRATIVE REVIEW

Natalia Wiktorzak *(Corresponding Author, Email: natalia.wiktorzak@onet.pl)*
Cardinal Stefan Wyszyński Voivodeship Hospital, Łomża, Poland
ORCID ID: 0009-0004-8601-3087

Małgorzata Witaszczyk
University Clinical Center of the Medical University of Silesia, Katowice, Poland
ORCID ID: 0009-0004-0197-5480

Alicja Sołtan
Central Clinical Hospital of the Medical University of Warsaw, Poland
ORCID ID: 0009-0006-8750-0797

Jakub Pawlicki
Specialist Hospital St. Wojciech, Gdansk, Poland
ORCID ID: 0009-0007-3888-4672

Julia Lipska
Medical University of Lublin, Poland
ORCID ID: 0009-0009-4093-2543

Jagoda Prządka
Nicolaus Copernicus University in Toruń, Ludwik Rydygier Collegium Medicum in Bydgoszcz, Poland
ORCID ID: 0009-0001-7921-919X

Dominika Kochan-Olszewska
Holycross Cancer Center, Kielce, Poland
ORCID ID: 0009-0002-0001-7809

Longin Rudnicki
Medical University of Gdańsk, Poland
ORCID ID: 0009-0003-8980-8718

Gracjan Koźma
Military Institute of Aviation Medicine, Warsaw, Poland
ORCID ID: 0009-0002-8812-6427

Justyna Laskus
Bielański Hospital, Warsaw, Poland
ORCID ID: 0009-0004-8065-0464

Paweł Klimas
Św. Wincentego a Paulo Hospital, Gdynia, Poland
ORCID ID: 0009-0002-8803-0476

Bartosz Gawior
Mazovian Bródno Hospital, Warsaw, Poland
ORCID ID: 0009-0003-0935-5414

Olga Stasiak
Międzylesie Specialist Hospital, Warsaw, Poland
ORCID ID: 0009-0008-3013-8015

Marta Borkowska
Military Institute of Medicine - National Research Institute ul. Szaserów 128 Warszawa, 04- 141 Poland
ORCID ID: 0009-0002-8105-3384

ABSTRACT

Background Chronic non-communicable diseases (NCDs), including diabetes mellitus, hypertension, and obesity, remain the leading causes of morbidity, mortality, and healthcare expenditure worldwide [1]. Effective management of these conditions requires continuous monitoring, long-term adherence to treatment, and sustained lifestyle modification. The rapid development of mobile health (mHealth) technologies has created new opportunities to support chronic disease management through smartphone applications, wearable devices, remote patient monitoring (RPM), and artificial intelligence (AI) [52-55].
Objective This review aimed to critically evaluate current evidence regarding the effectiveness of mobile health applications in diabetes mellitus, hypertension, and obesity, with particular emphasis on wearable technologies, remote patient monitoring, and artificial intelligence.
Methods A narrative literature review was performed using PubMed/MEDLINE, Scopus, Web of Science, and Google Scholar. Systematic reviews, meta-analyses, randomized controlled trials, observational studies, and international guidelines published between 2018 and 2026 were included.
Results Current evidence indicates that mobile health technologies improve glycaemic control, blood pressure management, body weight reduction, medication adherence, patient engagement, and lifestyle modification [7–18,29–39,46–51].
Conclusions Mobile health technologies represent valuable tools facilitating long-term chronic disease management and preventive healthcare. Upcoming research should focus on implementation strategies, lasting effectiveness, interoperability, and safe embedding of artificial intelligence into routine clinical practice [46–58].

KEYWORDS

Mobile Health (mHealth), Wearable Technologies, Chronic Disease Management, Disease Prevention, Physical Activity, Digital Health, Remote Patient Monitoring, Artificial Intelligence

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1. Introduction

Chronic non-communicable diseases (NCDs), including diabetes mellitus, hypertension, and obesity, are among the leading causes of mortality, disability, and healthcare expenditure worldwide [1]. According to the World Health Organization, NCDs account for approximately 74% of all global deaths, stressing the immediate need for effective prevention and long-term disease management strategies [59].

Standard models of chronic disease management rely primarily on periodic outpatient visits and patient self-reporting, which commonly fail to detect deterioration occurring between clinical consultations. These limitations have accelerated the development and implementation of digital health technologies designed to support continuous monitoring, improve communication between patients and healthcare professionals, and promote personalized models of care [3–8].

Mobile health (mHealth), defined as the use of mobile devices and wireless technologies to deliver healthcare services and health-related information, has become one of the fastest-growing areas of digital medicine [3,6]. Modern mHealth solutions integrate smartphone applications, wearable devices, remote patient monitoring (RPM), cloud-based healthcare platforms, and artificial intelligence (AI), permitting continuous collection and analysis of patient-generated health data [3,7,8].

The clinical application of mHealth has expanded rapidly across several chronic diseases. In diabetes management, smartphone applications integrated with continuous glucose monitoring systems improve glycaemic control and support patient self-management [10–23]. In hypertension, mobile applications combined with home blood pressure monitoring improve treatment compliance and blood pressure control [24–35]. Similarly, obesity management increasingly incorporates digital platforms that support dietary monitoring, physical activity tracking, behavioural coaching, and long-term lifestyle modification [36–45].

Recent advances in wearable technologies and remote patient monitoring have further transformed chronic disease management by permitting continuous assessment of physiological and behavioural parameters under real-life conditions [8,46–51]. Incorporation of these technologies with artificial intelligence allows predictive analytics, clinical decision support, and increasingly personalized clinical treatments [52–58].

Although these advances, important difficulties remain, including limited interoperability, variability in the scientific quality of commercial applications, cybersecurity issues, unequal access to digital technologies, and the need of robust clinical validation before large-scale implementation [3–8,46–58].

Therefore, the aim of the present narrative review was to critically evaluate current evidence regarding the function of mobile health applications in the management of diabetes mellitus, hypertension, and obesity, while highlighting the contribution of wearable technologies, remote patient monitoring, and artificial intelligence to contemporary customized healthcare.

2. Methods

2.1. Study Design

This study was conducted as a narrative literature review to evaluate the current position of mobile health (mHealth) technologies in chronic disease management. The review focused on three highly prevalent non-communicable diseases—diabetes mellitus, hypertension, and obesity—while also examining the contribution of wearable technologies, remote patient monitoring (RPM), and artificial intelligence (AI) to contemporary healthcare [52-55]. A narrative review methodology was selected because it allows the combination of evidence originating from clinical medicine, digital health, public health, biomedical engineering, and behavioral sciences, supplying a comprehensive overview of this quickly developing field.

2.2. Literature Search Strategy

A comprehensive literature search was conducted using PubMed/MEDLINE, Scopus, Web of Science, and Google Scholar. International guidelines and policy documents published by the World Health Organization (WHO), the American Diabetes Association (ADA), the European Society of Cardiology (ESC), and the International Society of Hypertension (ISH) were also reviewed to ensure inclusion of current clinical recommendations [1,2,24–27].

The search covered publications issued between January 2018 and March 2026. Medical Subject Headings (MeSH) and free-text keywords included combinations of:

- mobile health
- mHealth
- digital health
- remote patient monitoring
- wearable devices
- artificial intelligence
- diabetes mellitus
- hypertension
- obesity

Reference lists of eligible systematic reviews and meta-analyses were manually screened to identify further pertinent studies [3–8].

2.3. Eligibility Criteria

Peer-reviewed publications written in English were included if they investigated the application of mobile health technologies in chronic disease prevention or management. Eligible study designs comprised systematic reviews, meta-analyses, randomized controlled trials, observational studies, and international clinical guidelines [3–58].

Studies were excluded if they:

- focused exclusively on acute diseases,
- evaluated non-mobile digital technologies without an mHealth component,
- were conference abstracts lacking full-text publication,
- or did not report clinically relevant outcomes.

Priority was given to high-quality evidence, particularly systematic reviews, meta-analyses, randomized controlled trials, and evidence-based clinical guidelines.

2.4. Data Extraction and Evidence Synthesis

The selected publications were analyzed qualitatively. Data extraction focused on:

- characteristics of mobile health interventions,
- wearable technologies,
- remote patient monitoring systems,
- artificial intelligence applications,
- clinical outcomes,
- patient engagement,
- medication adherence,
- lifestyle modification,
- and healthcare provision.

Evidence was synthesized according to the principal clinical domains examined in this review: diabetes mellitus, hypertension, obesity, wearable technologies, remote patient monitoring, and upcoming developments in AI-supported healthcare. Owing to methodological heterogeneity among the included studies, no quantitative meta-analysis was performed.

The classification of mobile health technologies used throughout this review is presented in Table 1.

Table 1. Classification of Mobile Health Applications Used in

Category	Primary Function	Examples of Clinical Applications
Disease monitoring	Continuous monitoring of physiological parameters	Diabetes, hypertension, obesity
Medication support	Medication reminders and adherence monitoring	Chronic pharmacotherapy
Lifestyle management	Diet, physical activity and behavioural coaching	Obesity and cardiovascular prevention
Patient education	Health education and self-management	Chronic disease prevention
Remote patient monitoring	Transmission of patient-generated health data	Telemonitoring and continuity of care
AI-supported systems	Predictive analytics and clinical decision support	Personalized digital medicine

3. Evidence of Mobile Health Applications in Diabetes Management

Diabetes mellitus is one of the chronic diseases in which mobile health (mHealth) technologies have demonstrated the strongest evidence of clinical effectiveness. Successful diabetes management requires continuous monitoring of glycaemic status, adherence to pharmacological therapy, healthy dietary habits, regular physical activity, and active patient participation in self- management [10–12]. Because these activities must be maintained throughout life, digital technologies have become increasingly important in supporting both patients and medical professionals. Recent advances in smartphone applications and wearable technologies have transformed diabetes care from episodic clinical assessment to continuous monitoring. Modern mHealth platforms integrate glucose monitoring, insulin dose recording, dietary assessment, physical activity tracking,medication reminders, educational resources, and safe communication with medical professionals [10–13]. Integration with continuous glucose monitoring (CGM) systems allows real- time visualization of glucose trends and supports timely therapeutic adjustments [14,15].

Systematic reviews and meta-analyses consistently prove that mHealth interventions improve glycaemic control, particularly among individuals with type 2 diabetes mellitus. Significant reductions in glycated haemoglobin (HbA1c), improved medication adherence, and higher patient engagement have been reported across multiple randomized controlled trials [10–12,16]. Digital interventions incorporating behavioral coaching and bespoke feedback generally achieve greater clinical benefits than applications limited to data recording alone [11,18].

Beyond glycaemic control, mobile health applications support comprehensive diabetes self-management by supporting healthier lifestyle behaviors. Features such as dietary monitoring, individualized goal setting, exercise tracking, and educational modules support long-term compliance with treatment recommendations and empower patients to actively participate in disease management [12,18–20].

Wearable technologies additionally enhance diabetes care through continuous collection of physiological data. Continuous glucose monitoring systems provide detailed information on glucose variability and Time in Range (TIR), enabling earlier detection of hypo- and hyperglycaemia compared with conventional self-monitoring [14,15]. When combined with smartwatches and activity trackers, these technologies additionally monitor physical activity, heart rate, sleep quality, and energy expenditure, delivering a more comprehensive assessment of overall health status [17].

Artificial intelligence has recently been incorporated into digital diabetes platforms to improve clinical decision-making. Machine learning algorithms can analyse longitudinal glucose measurements together with behavioral and physiological data to predict glycaemic excursions, identify patients at increased risk of complications, and generate customized therapeutic recommendations [10,18]. Although these technologies remain under continuous development, they illustrate the transition toward personalized digital medicine.

Despite encouraging evidence, several problems remain. Commercial applications vary considerably in usability, interoperability, and scientific validation. Long-term adherence to mobile applications often declines after several months of use, demonstrating the need for better user- centred design and stronger integration with standard healthcare services [19–23].

Overall, current evidence supports the integration of mobile health technologies into diabetes management. Their greatest clinical value is observed when smartphone applications are combined with wearable devices, behavioral interventions, and regular supervision by healthcare professionals, resulting in better metabolic control and greater patient engagement [10–18].

Table 2. Applications of Mobile Health Technologies in Diabetes Management

Technology	Primary Function	Principal Clinical Benefit	References
Smartphone applications	Self-management and glucose recording	Improved HbA1c and patient engagement	[10–12]
Continuous glucose monitoring	Continuous glucose assessment	Early detection of hypo- and hyperglycaemia	[14,15]
Medication reminder systems	Treatment adherence	Improved pharmacological compliance	[11,16]
Lifestyle applications	Diet and physical activity monitoring	Improved self-management	[12,18]
Remote patient monitoring	Data transmission to healthcare professionals	Earlier treatment optimization	[13,17]

Table 3. Representative Clinical Evidence on mHealth in

Study	Design	Main Findings	References
Tarricone et al.	Systematic review and meta-analysis	Behavioral coaching significantly improved diabetes self-management	[11]
Jahan et al.	Systematic review	Smartphone applications reduced diabetes risk and improved lifestyle behaviours	[12]
Liu et al.	Meta-analysis	Telemedicine improved diabetes self-management	[13]
Jancev et al.	Systematic review	Continuous glucose monitoring improved glycaemic outcomes	[14]
Richardson et al.	Meta-analysis	CGM promoted behavioral change and better metabolic control	[15]
Tang et al.	Meta-analysis	Interactive applications improved patient engagement	[18]

4. Evidence of Mobile Health Applications in Hypertension Management

Hypertension remains the leading modifiable risk factor for cardiovascular disease, stroke, chronic kidney disease, and premature mortality worldwide [24–28]. Despite the availability of effective antihypertensive medications and evidence-based clinical guidelines, global rates of blood pressure control remain suboptimal because of poor medication compliance, insufficient lifestyle modification, and inadequate long-term monitoring [24–27]. These limitations have stimulated the development of mobile health (mHealth) technologies that support continuous monitoring, patient education, and remote management of hypertension.

Contemporary mHealth applications integrate home blood pressure monitoring, medication reminders, educational resources, behavioral counselling, and teleconsultation into a single digital platform [29–32]. When connected to Bluetooth-enabled blood pressure monitors, these applications automatically synchronize blood pressure measurements, generate longitudinal reports, and facilitate secure transmission of patient-generated health data to healthcare professionals. Such functionality allows more timely therapeutic adjustments and promotes individualized hypertension management [27,32].

Evidence from systematic reviews and randomized controlled trials regularly demonstrates that digital health interventions improve blood pressure control. Recent meta-analyses have reported significant reductions in both systolic and diastolic blood pressure among patients using smartphone-supported monitoring compared with usual care [29–31]. The greatest improvements are observed when digital monitoring is combined with behavioral interventions and regular interaction with healthcare professionals, pointing out that technology should complement rather than replace clinical care [30,31].

Medication adherence is another important determinant of successful hypertension management. Mobile applications incorporating automatic reminders, individualized treatment schedules, and feedback systems improve adherence to antihypertensive therapy and reduce treatment discontinuation [29,30]. Educational modules integrated into mobile applications further improve patients' understanding of hypertension and promote active participation in long-term disease management [31].

Lifestyle modification remains fundamental to hypertension treatment and cardiovascular risk reduction. Current international guidelines recommend frequent physical exercise, weight management, dietary modification, sodium restriction, smoking cessation, and moderation of alcohol consumption [2,24–26]. Mobile applications facilitate these interventions by monitoring daily physical activity, recording exercise sessions, tracking body weight, and providing personalized behavioral coaching. Integration with wearable devices enables objective assessment of activity levels and promotes long-term adherence to healthy lifestyle recommendations [31–33]. Remote patient monitoring has additionally expanded the role of mHealth in hypertension care.

Continuous transmission of home blood pressure measurements enables healthcare professionals to detect uncontrolled hypertension earlier, evaluate treatment response more accurately, and optimize pharmacotherapy without requiring frequent outpatient visits [27,32–34]. This strategy improves continuity of care and may reduce unnecessary hospital visits while maintaining high-quality follow-up. Artificial intelligence is expected to further improve digital hypertension management through predictive analytics and clinical decision support. Machine learning algorithms can analyse longitudinal blood pressure measurements together with behavioral and demographic data to identify patients at increased cardiovascular risk and predict poor treatment compliance [35,56].

Although these technologies remain under active evaluation, they represent an important step toward precision cardiovascular medicine.

Despite encouraging evidence, several implementation difficulties remain. Commercial applications differ considerably in quality, usability, and clinical validation. Limited interoperability between digital applications and electronic health record systems, together with cybersecurity issues and variations in digital literacy, continue to restrict greater implementation [3–8,31]. Future studies should therefore evaluate long-term clinical effectiveness, cost-effectiveness, and implementation strategies within standard healthcare systems.

Overall, current evidence supports the assimilation of mobile health technologies into hypertension management. Smartphone applications combined with validated home blood pressure monitoring devices, wearable technologies, behavioral interventions, and healthcare professional supervision improve blood pressure control while supporting healthier lifestyles and strengthening preventive cardiovascular care [29–35].

Table 4. Applications of Mobile Health Technologies in Hypertension Management

Technology	Primary Function	Clinical Benefit	References
Smartphone applications	Home blood pressure monitoring	Improved blood pressure control	[29–31]
Bluetooth blood pressure monitors	Automatic synchronization of measurements	Continuous remote monitoring	[27,32]
Medication reminder systems	Treatment adherence	Improved compliance	[29,30]
Lifestyle management applications	Physical activity, diet and body weight monitoring	Cardiovascular risk reduction	[2,24–26,31]
Telemonitoring platforms	Remote consultation and treatment optimization	Improved continuity of care	[32–34]

Table 5. Representative Clinical Evidence on mHealth in Hypertension

Study	Design	Main Findings	Reference
Abe et al.	Systematic review and meta-analysis	Significant reductions in systolic and diastolic blood pressure	[29]
Zhou et al.	Systematic review and meta-analysis	Improved medication adherence and blood pressure control	[30]
Siopis et al.	Systematic review and meta-analysis	Digital interventions improved hypertension management	[31]
Pletcher et al.	Randomized clinical trial	Smartphone-supported monitoring improved home blood pressure management	[32]
Zietzer et al. (HELP Trial)	Randomized controlled trial	Better blood pressure control compared with standard care	[33]
Kappes et al.	Systematic review	Telehealth interventions improved hypertension outcomes	[34]

5. Evidence of Mobile Health Applications in Obesity Management

Obesity is a chronic, relapsing disease characterized by excessive adipose tissue accumulation and represents one of the most important modifiable risk factors for cardiovascular disease, type 2 diabetes mellitus, hypertension, musculoskeletal disorders, and several types of cancer [1,2,36].

The increasing prevalence of obesity has exposed the need for effective long-term interventions that promote sustainable behavioural change. While pharmacological and surgical treatments are appropriate for selected patients, lifestyle modification—including dietary improvement, increased physical activity, and behavioural support—remains the foundation of obesity management [2,36,39].

Mobile health (mHealth) technologies have appeared as valuable tools for supporting weight management by facilitating continuous self-monitoring and supporting healthier behaviours. Contemporary smartphone applications combine dietary assessment, physical activity tracking, body weight monitoring, behavioural coaching, goal setting, and bespoke feedback within integrated digital platforms [36–41]. These interventions enable patients to participate actively in self-management while providing healthcare professionals with objective data that can support individualized treatment planning.

Evidence from systematic reviews and meta-analyses indicates that mobile health interventions produce modest but clinically meaningful reductions in body weight, body mass index (BMI), and waist circumference [36–40]. Although digital interventions alone generally achieve smaller effects than intensive multidisciplinary lifestyle programmes, they substantially improve accessibility, facilitate long-term follow-up, and enhance patient engagement. Applications integrating behavioral counselling and individualized feedback consistently demonstrate greater effectiveness than those focused solely on recording body weight or caloric intake [37,38].

Dietary self-monitoring remains one of the strongest predictors of successful weight reduction. Mobile applications simplify nutritional assessment through food databases, barcode scanners, meal planning tools, and automated nutrient analysis [41]. More recently, artificial intelligence has been incorporated into dietary applications to analyse food photographs, estimate portion size, and generate individualized nutritional recommendations. Although these technologies continue to evolve, they may reduce the burden of manual data entry while increasing adherence to dietary interventions [52,53].

Regular physical activity is equally essential for successful obesity management and long-term weight maintenance. International guidelines recommend combining aerobic exercise with resistance training to improve body composition, cardiometabolic health, and functional capacity [2]. Mobile applications support these recommendations by monitoring daily step counts, exercise duration, heart rate, and energy expenditure through integration with smartwatches and wearable activity trackers [42–45]. Real-time feedback, motivational notifications, and individualized exercise goals encourage sustained participation in physical activity programmes, making digital interventions particularly valuable within preventive medicine and health promotion.

Behavioral change techniques embedded within mobile applications further strengthen treatment effectiveness. Goal setting, self-monitoring, motivational messaging, adaptive coaching, and personalized feedback promote long-term adherence to lifestyle recommendations [38,42]. Current evidence suggests that these interventions are most successful when combined with regular supervision by healthcare professionals, emphasizing that digital technologies should complement rather than replace multidisciplinary obesity care [37,39].

Despite promising findings, several barriers continue to limit widespread implementation. Long- term user engagement frequently declines after the initial months of application use, and many commercially available applications have not undergone rigorous clinical evaluation [40,41].

Additional challenges include limited interoperability with healthcare information systems, variability in application quality, concerns regarding data privacy, and disparities in digital literacy and access to mobile technologies [3–8].

Overall, current evidence supports the integration of mobile health technologies into comprehensive obesity management programmes. Smartphone applications combined with wearable technologies, behavioural interventions, and healthcare professional supervision promote healthier dietary habits, increase physical activity, improve treatment adherence, and contribute to sustainable weight management. These findings highlight the important role of digital health technologies in lifestyle medicine, disease prevention, and long-term management of obesity [36–45].

Table 6. Applications of Mobile Health Technologies in Obesity Management

Technology	Primary Function	Clinical Benefit	References
Dietary monitoring applications	Food intake recording and nutritional analysis	Improved dietary habits	[36,41]
Physical activity applications	Exercise and activity tracking	Increased physical activity	[42–45]
Smart scales	Body weight monitoring	Improved long-term weight control	[36,40]
Behavioural coaching applications	Goal setting and personalized feedback	Better adherence to lifestyle interventions	[37,38]
AI-assisted nutrition applications	Automated dietary analysis and recommendations	Personalized nutritional support	[52-55]

Table 7. Representative Clinical Evidence on mHealth in Obesity Management

Study	Design	Main Findings	Reference
Li et al.	Systematic review and meta-analysis	Significant reductions in body weight and BMI	[36]
Pujia et al.	Systematic review and meta-analysis	Improved long-term weight management	[37]
Li et al.	Systematic review	Behavioural interventions enhanced weight loss	[38]
Metzendor f et al.	Cochrane systematic review	Moderate-quality evidence supporting mHealth interventions	[39]
Protano et al.	Systematic review	Digital technologies improved obesity management	[40]
Nishi et al.	Systematic review and meta-analysis	Digital interventions increased physical activity and improved cardiometabolic health	[42]

Remote Patient Monitoring and Wearable Technologies in Chronic Disease Management

The rapid evolution of digital health technologies has transformed chronic disease management from episodic, clinic-based care into continuous, patient-centred healthcare supported by real-time monitoring. Remote patient monitoring (RPM) has emerged as one of the most promising components of mobile health (mHealth), enabling continuous collection, transmission, and interpretation of patient-generated health data outside traditional healthcare settings [46–50].

Through the integration of wearable devices, smartphone applications, cloud-based platforms, and artificial intelligence (AI), RPM facilitates earlier detection of clinical deterioration, improves treatment adherence, and supports personalized therapeutic decision-making.

Unlike conventional follow-up based on scheduled outpatient visits, RPM provides continuous access to physiological and behavioural data collected during everyday life. This approach allows healthcare professionals to identify clinically significant changes before symptoms become apparent and to intervene at an earlier stage of disease progression [46,48]. Such continuous monitoring is particularly valuable in diabetes mellitus, hypertension, and obesity, where long-term disease control depends on timely therapeutic adjustments and sustained lifestyle modification.

Wearable technologies constitute the technological foundation of remote patient monitoring. Current devices include continuous glucose monitoring (CGM) systems, Bluetooth-enabled blood pressure monitors, smartwatches, activity trackers, smart scales, pulse oximeters, and wearable electrocardiographic sensors [8,47,48,51]. These devices continuously measure glucose concentration, blood pressure, heart rate, cardiac rhythm, physical activity, sleep quality, body weight, and energy expenditure, providing comprehensive information on patient health in real- world settings.

Automatic synchronization between wearable devices and smartphone applications enables secure transmission of patient-generated health data to cloud-based healthcare platforms, where information can be analysed and reviewed by healthcare professionals. Such integration improves continuity of care, facilitates multidisciplinary collaboration, and enables remote optimization of pharmacological and lifestyle interventions [46,49,50].

Artificial intelligence further enhances RPM by converting continuously collected health data into clinically meaningful information. Machine learning algorithms are capable of analysing longitudinal datasets, identifying physiological trends, estimating disease progression, and generating automated alerts when predefined risk thresholds are exceeded [52–55]. Potential applications include prediction of hypoglycaemic episodes in diabetes, identification of uncontrolled hypertension, detection of reduced physical activity, and early recognition of cardiovascular deterioration. Importantly, AI should function as a clinical decision-support tool rather than an autonomous decision-maker, with all recommendations interpreted within the broader clinical context [52–55].

Remote patient monitoring also supports preventive healthcare by promoting healthier lifestyle behaviours. Integration of wearable activity trackers with mobile applications enables objective monitoring of daily physical activity, exercise intensity, sedentary behaviour, and sleep quality. These functions provide patients with immediate feedback, encourage achievement of individualized health goals, and strengthen motivation to maintain long-term behavioural change [42–45,51]. Consequently, RPM not only facilitates disease management but also contributes to primary and secondary prevention of chronic diseases.

Despite these advantages, several challenges continue to limit large-scale implementation. Interoperability between digital health systems remains inconsistent, and integration of patient- generated health data into electronic health records is still incomplete in many healthcare settings [3,46,50]. Additional barriers include concerns regarding cybersecurity, data privacy, reimbursement models, digital literacy, and long-term patient engagement. Addressing these issues will require standardized regulatory frameworks, robust clinical validation of digital technologies, and stronger collaboration between clinicians, engineers, policymakers, and healthcare organizations.

Overall, current evidence indicates that remote patient monitoring represents one of the most significant advances in digital healthcare. By combining wearable technologies, mobile applications, cloud computing, and artificial intelligence, RPM enables continuous assessment of patient health, supports personalized treatment, promotes healthier lifestyle behaviours, and strengthens preventive medicine. As healthcare systems increasingly adopt hybrid models of care, remote patient monitoring is expected to become an integral component of chronic disease management [46–58].

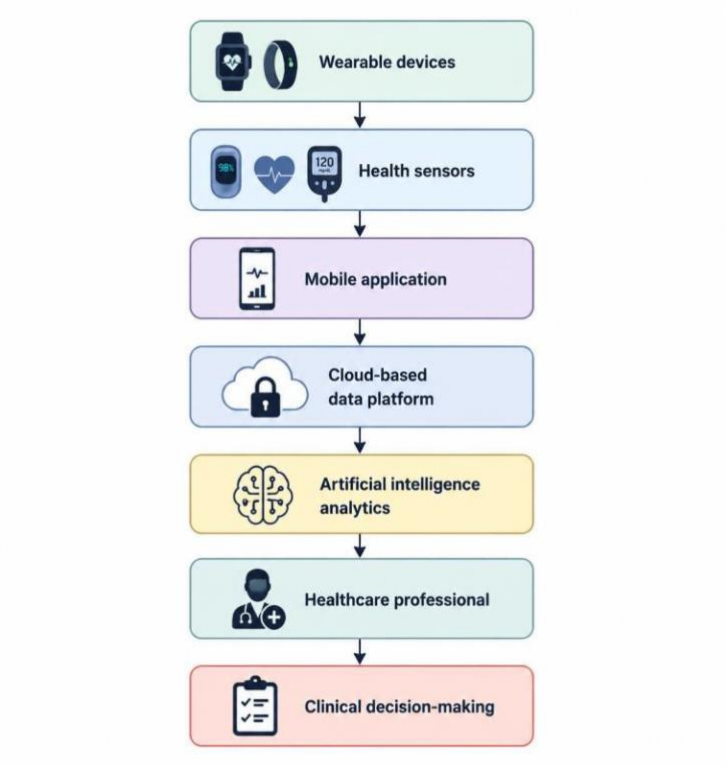

Fig. 1. *Integration of Mobile Health Technologies with Remote Patient Monitoring*

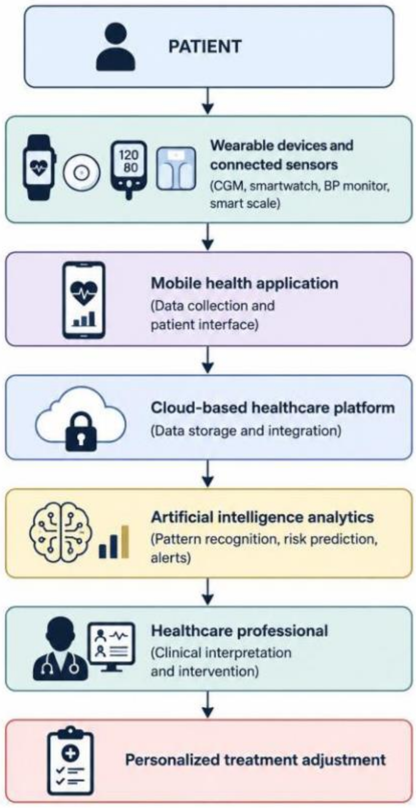

Fig. 2. Data Flow Model in AI-Supported Remote Patient Monitoring

Table 8. Remote Patient Monitoring Technologies Used in Chronic Disease Management

Disease	Technology	Clinical Benefit	References
Diabetes mellitus	Continuous glucose monitoring (CGM)	Improved glycaemic control	[14,46]
Hypertension	Bluetooth blood pressure monitor	Better blood pressure management	[27,29,32]
Obesity	Smart scales and activity trackers	Improved weight management	[36,42]
Cardiovascular diseases	Smartwatch and wearable ECG	Early detection of cardiovascular abnormalities	[47,48,51]
Multimorbidity	Integrated RPM platform	Continuous multidisciplinary care	[46,49,50]

Table 9. Wearable Devices Supporting Remote Patient Monitoring

Device	Measured Parameters	Clinical Application	References
Continuous Glucose Monitor	Glucose concentration, Time in Range	Diabetes management	[14,15]
Smartwatch	Heart rate, ECG, physical activity, sleep	Cardiovascular prevention	[17,47,48]
Bluetooth Blood Pressure Monitor	Blood pressure	Hypertension management	[27,32]
Smart Scale	Body weight, BMI	Obesity management	[36,40]
Activity Tracker	Daily steps, energy expenditure	Lifestyle modification	[42–45]

Table 10. Representative Studies Evaluating Remote Patient Monitoring

Study	Study Design	Main Findings	References
Tan et al.	Systematic review	RPM improved clinical outcomes and continuity of care	[46]
Tegegne et al.	Systematic review	Wearable devices improved chronic disease monitoring	[47]
Jafleh et al.	Narrative review	Wearables supported long-term patient management	[48]
Sumner et al.	Systematic review	Co-designed RPM systems increased patient acceptance	[49]
Pannunzio et al.	Systematic review	Standardized evaluation improved implementation of RPM	[50]

6. Benefits and Challenges of Mobile Health Technologies in Chronic Disease Management

Mobile health (mHealth) technologies have fundamentally changed the delivery of healthcare by enabling continuous monitoring, personalized interventions, and improved communication between patients and healthcare professionals. Evidence presented throughout this review indicates that smartphone applications, wearable devices, and remote patient monitoring (RPM) systems can significantly improve chronic disease management when implemented as part of integrated healthcare pathways [3–8,46–50]. Their greatest value lies not only in improving disease control but also in promoting patient engagement, supporting healthy lifestyle behaviors, and strengthening preventive healthcare.

One of the principal advantages of mHealth is its ability to facilitate patient self-management. Interactive mobile applications encourage patients to monitor physiological parameters, record medication use, track dietary habits, and maintain regular physical activity [10–18,36–45]. These functions improve treatment adherence while increasing patients' understanding of their own health conditions. Behavioral interventions integrated into mobile applications—including goal setting, motivational messaging, personalized feedback, and educational resources—have consistently been associated with greater patient engagement and more sustainable lifestyle modification than passive monitoring alone [5,11,18,38,42].

Another important benefit of mHealth is the expansion of remote patient monitoring. Continuous transmission of patient-generated health data enables healthcare professionals to identify clinically significant changes at an earlier stage, optimize treatment, and reduce unnecessary outpatient visits [46–50]. This model of care supports continuity of healthcare while improving accessibility for patients living in rural areas, individuals with limited mobility, and those requiring long-term follow-up. Integration of wearable technologies with cloud-based platforms further enhances communication within multidisciplinary healthcare teams and facilitates more personalized clinical decision-making [8,47–50].

Mobile health technologies also contribute to disease prevention and health promotion. Smartphone applications and wearable devices encourage regular physical activity, healthier dietary habits, weight management, and adherence to preventive recommendations [2,36–45]. Continuous monitoring combined with real-time feedback may strengthen motivation and facilitate sustained behavioural change, particularly when digital interventions are supported by healthcare professionals. Consequently, mHealth has considerable potential not only in disease treatment but also in reducing the future burden of non-communicable diseases through earlier intervention and healthier lifestyles.

Despite these advantages, important challenges continue to limit widespread implementation of digital health technologies. Considerable variation exists in the quality, usability, and scientific validation of commercially available mobile applications [3–7]. Many applications available to consumers have not been evaluated in randomized clinical trials, making it difficult for healthcare professionals to recommend evidence-based solutions. In addition, interoperability between mobile applications, wearable devices, electronic health records, and hospital information systems remains insufficient in many healthcare settings, limiting the practical use of patient-generated health data [46,50].

Data privacy and cybersecurity represent additional implementation challenges. Mobile health platforms continuously collect large volumes of sensitive personal health information, requiring secure cloud infrastructure, transparent governance frameworks, and compliance with national and international data protection regulations. Maintaining patient trust will depend on ensuring confidentiality, secure data transmission, and responsible management of digital health information [46,49,50,52].

Digital inequalities must also be considered. Older adults, individuals with limited digital literacy, and socioeconomically disadvantaged populations may experience difficulties in using mobile health technologies, potentially widening existing health disparities [4,6]. Future implementation strategies should therefore include patient education, user-centred application design, and equitable access to validated digital health solutions.

Overall, current evidence suggests that the benefits of mobile health technologies outweigh their limitations when these interventions are integrated into evidence-based clinical care. Continued technological development, standardized regulatory frameworks, robust clinical validation, and interdisciplinary collaboration will be essential for maximizing the clinical value of mHealth while ensuring patient safety, equitable access, and sustainable implementation within modern healthcare systems [3,7,46–58].

Table 11. Advantages and Limitations of Mobile Health Technologies

Advantages	Supporting References	Limitations	Supporting References
Continuous health monitoring	[46–50]	Limited interoperability	[46,50]
Improved patient engagement	[4,5,11,18]	Variable scientific validation	[3–7]
Better medication adherence	[7,18,29,30]	Cybersecurity and privacy concerns	[46,49,50,52]
Promotion of physical activity and healthy lifestyles	[2,36–45]	Digital literacy barriers	[4,6]
Earlier clinical intervention	[46–50]	Limited reimbursement policies	[3,46]
Personalized treatment support	[52–55]	Regulatory and ethical challenges	[52–55]

Table 12. Current Challenges and Future Priorities for mHealth Implementation

Challenge	Future Priority	References
Interoperability	Wider implementation of HL7 FHIR standards	[46,50]
Clinical validation	More multicentre randomized controlled trials	[3–7]
Data privacy	Stronger cybersecurity and governance frameworks	[46,49,52]
Digital literacy	Education of patients and healthcare professionals	[4,6]
Healthcare integration	Better integration with electronic health records	[46–50]
Accessibility	Equitable access to validated digital health technologies	[2–8]

7. Future Perspectives: Artificial Intelligence, Personalized Digital Medicine, and Healthcare Transformation

The rapid advancement of digital health technologies is reshaping the future of chronic disease prevention and management. Mobile health (mHealth), wearable technologies, remote patient monitoring (RPM), cloud computing, and artificial intelligence (AI) are increasingly integrated into healthcare systems, enabling a transition from reactive disease treatment toward predictive, preventive, and personalized healthcare [3,46–58]. This transformation has the potential to improve clinical outcomes while supporting sustainable healthcare delivery in ageing populations with an increasing burden of chronic diseases.

Artificial intelligence is expected to become a key component of future digital healthcare. Machine learning algorithms can analyse large volumes of patient-generated health data obtained from mobile applications, wearable devices, and electronic health records, allowing early identification of clinically relevant patterns that may not be apparent during routine clinical assessment [52–55].

These technologies may support prediction of disease progression, assessment of treatment adherence, individualized lifestyle recommendations, and optimization of therapeutic decisions. Nevertheless, AI should complement rather than replace healthcare professionals, whose clinical judgement remains essential for interpreting algorithm-generated recommendations and ensuring patient-centred care [52–55].

The continued development of wearable technologies is expected to further strengthen preventive medicine and health promotion. Modern wearable devices enable continuous assessment of glucose levels, blood pressure, heart rhythm, physical activity, sleep quality, and body composition, generating comprehensive health profiles under real-world conditions [47,48,51]. Combined with mobile applications, these technologies encourage regular physical activity, facilitate behavioral change, and promote long-term adherence to healthy lifestyle recommendations. Such capabilities are particularly important for preventing complications associated with obesity, hypertension, and diabetes mellitus [2,42–45].

An important future direction is the implementation of personalized digital medicine. Instead of applying standardized interventions, digital platforms increasingly support individualized therapeutic strategies based on continuous analysis of behavioral, physiological, and clinical data. Personalized exercise programes, adaptive nutritional recommendations, medication reminders, and behavioral coaching may improve patient engagement and enhance long-term treatment effectiveness [11,38,42,52]. Integration of these functions into multidisciplinary care pathways may further strengthen disease prevention and facilitate individualized chronic disease management. Despite these promising developments, successful implementation will require addressing several organizational and ethical challenges. Greater interoperability between digital platforms, standardized data exchange protocols, and secure integration with electronic health records remain essential for effective use of patient-generated health data in routine clinical practice [46,49,50]. At the same time, healthcare systems must ensure robust cybersecurity, transparent governance of artificial intelligence, and equitable access to validated digital health technologies to prevent widening health inequalities [4,6,52–55].

Future research should prioritize multicentre randomized controlled trials evaluating long-term clinical effectiveness, cost-effectiveness, and implementation outcomes of integrated digital health ecosystems. Additional evidence is also needed to determine how AI-supported interventions can be safely incorporated into routine healthcare while maintaining transparency, accountability, and patient trust [46–58].

Overall, the future of chronic disease management will increasingly depend on connected digital ecosystems integrating mobile applications, wearable technologies, remote patient monitoring, and artificial intelligence. These innovations have the potential to improve disease prevention, support healthy lifestyles, facilitate personalized healthcare, and enhance the efficiency and sustainability of healthcare systems.

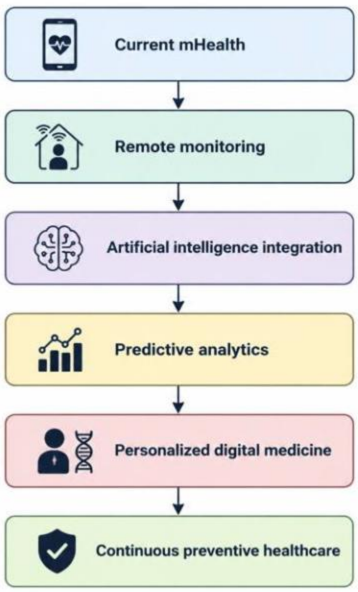

Fig. 3. *Future Directions of mHealth Development*

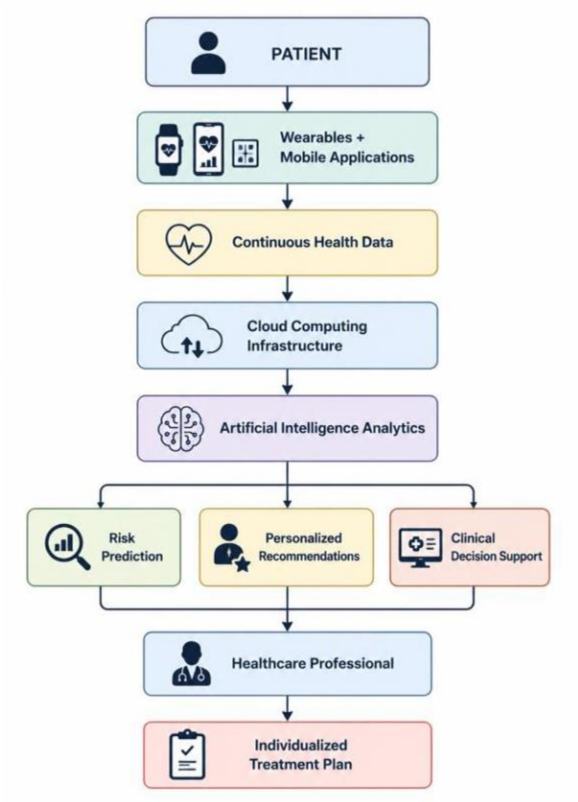

Fig. 4. *Future Model of AI-Driven Personalized Digital Healthcare*

8. Discussion

This narrative review synthesizes current evidence demonstrating that mobile health (mHealth) technologies have become valuable components of chronic disease management, particularly in diabetes mellitus, hypertension, and obesity. Across the studies analyzed, smartphone applications, wearable devices, remote patient monitoring (RPM), and artificial intelligence (AI) consistently improved patient engagement, treatment adherence, and selected clinical outcomes when implemented as part of structured healthcare programes [7–18,29–42,46–55]. Rather than replacing conventional healthcare, these technologies extend clinical care beyond hospital settings by enabling continuous monitoring and supporting individualized therapeutic decision-making.

One of the most consistent findings of this review is that the effectiveness of mHealth depends on combining technological innovation with behavioral interventions. Digital applications that incorporated goal setting, personalized feedback, educational content, medication reminders, and regular communication with healthcare professionals produced better clinical outcomes than applications limited to passive data collection [5,11,18,30,38,42]. These findings are consistent with contemporary models of lifestyle medicine, in which long-term behavioral change remains the cornerstone of preventing and managing chronic diseases. Consequently, mHealth should be viewed not only as a technological innovation but also as a practical instrument for supporting patient empowerment and sustained self-management.

The review also highlights the growing importance of wearable technologies and remote patient monitoring. Continuous assessment of glucose levels, blood pressure, physical activity, sleep quality, and body weight enables earlier identification of disease deterioration and facilitates timely therapeutic intervention [14,27,46–51]. Beyond improving disease control, wearable technologies encourage regular physical activity and increase awareness of health behaviors, supporting primary and secondary prevention of chronic diseases. These findings are particularly relevant for healthcare systems seeking cost-effective strategies to reduce the long-term burden of non- communicable diseases.

Artificial intelligence represents another promising direction for the development of digital healthcare. AI-based clinical decision support systems can analyse large volumes of patient- generated health data, identify clinically relevant patterns, estimate disease risk, and generate personalized recommendations [52–55]. However, current evidence indicates that AI should complement rather than replace clinical expertise. Safe implementation requires transparent algorithms, external validation, continuous clinical oversight, and compliance with ethical and legal standards governing the use of health data. Future research should therefore evaluate not only the diagnostic performance of AI systems but also their clinical utility, safety, and impact on patient-centred outcomes.

Despite encouraging evidence, several implementation challenges remain. Considerable heterogeneity exists among commercially available mobile applications regarding functionality, usability, and scientific validation [3–8]. Furthermore, limited interoperability between digital platforms and electronic health records continues to restrict the integration of patient-generated health data into routine clinical practice [46,49,50]. Differences in digital literacy, socioeconomic status, and access to technology may also contribute to inequalities in healthcare delivery, emphasizing the importance of inclusive implementation strategies and user-centred application design [4,6].

This review has several strengths. It integrates evidence from three major chronic diseases within a single conceptual framework while highlighting the complementary roles of mobile applications, wearable technologies, remote patient monitoring, and artificial intelligence. The inclusion of recent systematic reviews, meta-analyses, randomized controlled trials, and international clinical guidelines enhances the clinical relevance of the findings and provides an up-to-date overview of current developments in digital health [1–58]. Another strength of this review is the inclusion of recently published systematic reviews and clinical guidelines from 2024–2026, providing an updated overview of current developments in digital health.

Several limitations should also be acknowledged. As a narrative review, this study did not perform a formal risk-of-bias assessment or quantitative synthesis of outcomes. The included studies differed substantially with respect to intervention characteristics, follow-up duration, and outcome measures, limiting direct comparison between investigations. In addition, digital health technologies evolve rapidly, and some emerging applications may not yet be supported by long-term clinical evidence.

Future research should prioritize multicentre randomized controlled trials with standardized outcome measures, longer follow-up periods, and comprehensive health-economic analyses. Greater attention should also be given to implementation science, interoperability standards, patient-centred design, and evaluation of integrated digital health ecosystems supporting physical activity, lifestyle modification, and multidisciplinary chronic disease management. Such evidence will be essential for translating technological innovation into sustainable improvements in clinical practice and public health.

9. Conclusions

Mobile health (mHealth) technologies have emerged as important components of contemporary chronic disease management by supporting continuous monitoring, patient engagement, and personalized healthcare delivery. The evidence reviewed in this study demonstrates that smartphone applications, wearable technologies, remote patient monitoring (RPM), and artificial intelligence (AI) can improve self-management, medication adherence, lifestyle modification, and selected clinical outcomes in patients with diabetes mellitus, hypertension, and obesity [7–18,29–42,46–55]. The greatest clinical benefits are achieved when digital technologies are integrated into multidisciplinary models of care that combine continuous physiological monitoring with behavioral support and regular interaction between patients and healthcare professionals [5,11,18,30,38,46–50]. Such integrated approaches not only improve disease control but also promote healthy lifestyle behaviors, increase physical activity, strengthen patient empowerment, and support preventive healthcare. Consequently, mHealth should be regarded as a complementary component of evidence-based clinical practice rather than a substitute for conventional medical care.

The integration of wearable devices with cloud-based platforms and AI-supported clinical decision systems represents an important step toward personalized digital medicine. Continuous analysis of patient-generated health data enables earlier identification of clinical deterioration, facilitates individualized therapeutic adjustments, and supports more proactive disease management [47–55]. However, successful implementation requires robust clinical validation, interoperability between digital health systems, effective cybersecurity measures, transparent governance of artificial intelligence, and equitable access to validated digital technologies [3–8,46–55].

Although current evidence is encouraging, additional high-quality multicentre randomized controlled trials are needed to evaluate the long-term clinical effectiveness, cost-effectiveness, and implementation outcomes of integrated digital health interventions. Future research should also investigate how digital ecosystems can be optimally integrated into routine healthcare while supporting physical activity, healthy nutrition, behavioural change, and patient-centred chronic disease management [2,42–58].

In conclusion, mobile health technologies have the potential to transform chronic disease management by enabling more connected, preventive, and individualized healthcare. Continued collaboration among clinicians, researchers, engineers, and policymakers will be essential to ensure that technological innovation translates into measurable improvements in population health, quality of care, and the long-term sustainability of healthcare systems.

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