NICOLAUS COPERNICUS UNIVERSITY IN TORUŃ

Quality in Sport. eISSN 2450-3118.

Journal Home Page https://apcz.umk.pl/QS/index

CHEN, Kai, GOU, Cuiping and GUO, Liya. Leveraging mHealth to Support Physical Exercise in Hematologic Malignancies: A Narrative Review. Quality in Sport. 2026;52:69788. eISSN 2450-3118. https://doi.org/10.12775/QS.2026.52.69788

The journal has been awarded 20 points in the parametric evaluation by the Ministry of Higher Education and Science of Poland. This is according to the Annex to the announcement of the Minister of Higher Education and Science dated 05.01.2024, No. 32553. The journal has a Unique Identifier: 201398. Scientific disciplines assigned: Economics and Finance (Field of Social Sciences); Management and Quality Sciences (Field of Social Sciences).
Punkty Ministerialne z 2019 - aktualny rok 20 punktów. Załącznik do komunikatu Ministra Szkolnictwa Wyższego i Nauki z dnia 05.01.2024 Lp. 32553. Posiada Unikatowy Identyfikator Czasopisma: 201398. Przypisane dyscypliny naukowe: Ekonomia i finanse (Dziedzina nauk społecznych); Nauki o zarządzaniu i jakości (Dziedzina nauk społecznych).
The authors declare that there is no conflict of interest regarding the publication of this paper.
Received: 13.02.2026. Revised: 17.03.2026. Accepted: 17.03.2026. Published: 26.03.2026.

Leveraging mHealth to Support Physical Exercise in Hematologic Malignancies: A Narrative Review

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Abstract

Background: Hematological malignancies (HMs) and their intensive treatment lead to physiological decline and cancer-related fatigue. Traditional supervised exercise programs may impose transportation costs and cross-infection risks. Consequently, mobile health (mHealth) has emerged as a viable digital delivery modality to overcome these barriers.

Aim: This study aims to review research on the use of mHealth to support physical exercise among HM patients and analyze current implementation strategies, clinical value, challenges, and future frameworks.

Methods: A comprehensive literature search was conducted across PubMed, Embase, Web of Science, and the Cochrane Library. Data extraction captured key study characteristics, followed by a narrative synthesis approach to analyze all the materials.

Results: mHealth technology demonstrated favorable feasibility and safety, with high completion rates and no serious adverse events reported. Furthermore, mHealth interventions significantly alleviated severe physical decline, reduced cancer-related fatigue, and improved overall health-related quality of life. The most effective interventions utilized a multicomponent architecture and hybrid supervision models. However, several challenges persist, including severe bone destruction risks, the absence of immediate remote emergency support, the digital divide, and technological friction.

Conclusion: mHealth exercise interventions demonstrate significant clinical feasibility and efficacy in promoting rehabilitation for HM patients. However, numerous challenges remain at both the theoretical and practical levels. Future research must prioritize adaptive intervention frameworks, integrated clinical ecosystems, and multidisciplinary collaborative care.

Key words: telehealth, mobile health, hematologic neoplasms, physical exercise, narrative review.

1. Introduction

Over the past several decades, the incidence of hematologic malignancies (HMs) has shown a persistent increasing trend[1]. Approximately 1.187 million new cases of hematologic malignancies are diagnosed globally each year, resulting in approximately 690,000 deaths[2]. With continuous innovations in targeted therapies, immunotherapies, and hematopoietic stem cell transplantation (HSCT) techniques, the survival rates of patients with HMs have significantly improved[1,3]. Nevertheless, the combined effects of the disease's underlying pathophysiology and intensive anticancer treatments may lead patients to experience physiological decline, cancer-related fatigue, an increased risk of cardiovascular complications, and accelerated frailty during treatment and throughout prolonged survival periods[4,5]. These factors severely compromise patients' quality of life and overall well-being.

In this context, substantial evidence-based medical research indicates that structured, personalized physical activity can help preserve muscle mass, alleviate fatigue, improve cardiorespiratory fitness, and ultimately enhance patients' health-related quality of life[5-7]. However, leveraging exercise interventions among HM patients presents considerable challenges. On the one hand, traditional exercise programs typically rely on supervised settings within medical centers. This not only imposes substantial time and transportation costs on patients but also exposes those with severe immunosuppression to higher risks of cross-infection in public rehabilitation facilities[8]. On the other hand, specific contraindications to exercise for HM patients, such as osteolytic lesions in multiple myeloma (MM) patients, may make unsupervised home exercise unsafe without tailored guidance[9]. Consequently, many real-world HM patients remain associated with low levels of physical activity[10,11].

Mobile health (mHealth), as a digital health delivery modality that transcends time and space constraints, offers a viable pathway for the effective implementation of exercise oncology. Specifically, by integrating smartphone applications, wearable biosensors, remote video conferencing platforms, and instant messaging tools, mHealth not only has the potential to extend specialized exercise prescriptions to patients' homes but also enables real-time, multimodal monitoring of exercise adherence, physiological indicators, and adverse events[12,13]. In this context, making the physical and mental benefits of exercise accessible to a broader population of HM patients is becoming increasingly achievable.

This study aims to comprehensively review research on the use of mHealth in supporting physical exercise among patients with HMs. It first analyzes current mainstream implementation strategies and their clinical value and then explores challenges in this field. Finally, on the basis of precision oncology frameworks and advanced artificial intelligence algorithms, this study investigated how to construct an mHealth exercise support framework to guide future digital exercise interventions for HMs.

2. Research methods

A comprehensive literature search was conducted on PubMed, Embase, Web of Science, and the Cochrane Library. The search strategy utilized a combination of Medical Subject Headings and free-text terms focusing on three core domains: target population ("hematologic neoplasms", "leukemia", "lymphoma", "multiple myeloma"); intervention ("physical activity", "exercise", "aerobic", "resistance training"); and technology delivery mode ("mHealth", "mobile applications", "wearable electronic devices", "telemedicine").

Studies were considered eligible if they met the following criteria: (1) enrolled patients diagnosed with any subtype of HMs across the care continuum and (2) evaluated an exercise or physical activity intervention partially or fully delivered by mHealth technologies.

Data extraction was systematically performed to capture key characteristics of the included studies. The extracted variables included the following: study trial and target population; core mHealth technology components; details of the exercise prescription; incentive and behavioral maintenance strategies; and core clinical findings, including completion rates and adverse events. A narrative synthesis approach was employed to analyze the extracted data, identifying current technological capabilities, clinical effectiveness, and persistent gaps. Furthermore, the synthesis critically explored the potential barriers and challenges, thereby informing the future direction of mHealth exercise oncology.

3. Principal Progress and Findings

In the past decade, mHealth exercise intervention studies for HM patients have shown considerable evolution: evolving from "simple adjuncts" to "deep integration," expanding from "general populations" to "vulnerable groups," and shifting from "short-term behavioral observation" to "long-term physiological mechanism exploration." Currently, mHealth exercise interventions have begun to integrate behavioral science theories with rigorous clinical trial designs, advancing toward a more scientific and sustainable model. Table 1 summarizes representative studies on mhealth supporting physical exercise for patients with HMs, reflecting several key evidence points.

First, the notable finding is that mHealth technology has demonstrated favorable feasibility and safety among HM patients—a population considered increased risk for exercise. The retention rate and study completion rates exceeded 80% and in some cases 90% in most studies. Moreover, under strict digital or virtual video monitoring of heart rate, perceived exertion, and exercise trajectory, no serious (≥Grade 3) intervention-related adverse events were reported in these studies. This is similar to the prevailing academic view that individuals with HMs can engage in physical exercise[6], and such evidence also applies to remote delivery settings.

Second, mHealth exercise interventions effectively and significantly attenuated the severe physical decline caused by high-dose chemotherapy and stem cell transplantation. Improvements in objective functional measures, including substantial increases in the 6-minute walk test (6MWT) distance[4,14], accelerated Timed Up and Go Test (TUGT) speed[15], handgrip strength, and restored lower-body core strength[16]. With respect to patient-reported outcomes, the intervention significantly alleviated patients' perception of cancer-related fatigue and also improved depressive symptoms and overall health-related quality of life[17-19]. Furthermore, preliminary findings at the biological level appear promising. Studies have reported a significant reduction in the levels of clinical inflammatory biomarkers, such as soluble intercellular adhesion molecule-1 (sICAM-1)[14], whereas other studies have reported improvements in patients' cardiovascular risk scores. These findings suggest that mHealth-driven, precise exercise prescriptions may extend beyond skeletal muscle rehabilitation, with potential beneficial effects on systemic inflammation, endothelial function, and potentially the tumor microenvironment. Given that HM survivors who have undergone cardiotoxic chemotherapy and HSCT represent a population at elevated risk for secondary cardiovascular disease and metabolic syndrome, this highly accessible, comprehensive mHealth intervention holds immeasurable value in preventive medicine and public health.

Table 1. Basic information about the representative studies.

Study	Population	mHealth technologies	Exercise prescription	Incentive strategies	Core findings
Mendoza et al(2017) [20]	Adolescents with HM, survivor	Fitbit Flex wristband/app, Facebook group	10 weeks physical activity program; gradually increase step count goals to meet or maintain population recommendations of 10,000–11,700 steps/day.	Assist with goal-setting and check ins; awarded digital badges for PA and participation achievements in facebook group weekly; sent affective text messages every other day.	90% completed rate; significant increase in introjected motivation; no significant change in MVPA or sedentary time.
Chow et al(2021) [21]	Adults with HM, survivor	Fitbit Flex wristband/app, Healthwatch360 app, iCanQuit app, Facebook group, text messaging and emails	16 weeks remote lifestyle intervention; Individualized daily step goals(increase 500 or 10%); reducing sodium (<2300 mg/day or reduce by 500 mg), saturated fat (<10% of energy), and added sugars (<10% of energy).	Study staff generate individualized weekly step count goals and monthly dietary goals; text messages twice a week encouraging and reminding them of goals; facebook peer support.	90.2% completed rate; 91.7% adherence; increase in MVPA (+3.5 min/day) and daily steps (+711), improvements in targeted dietary factors and HEI-2015 scores.
Fournier et al(2021) [4]	Elderly with AML/NHL, treatment	Garmin vivofit activity tracker, telephone follow-up	6 months home-based/isolation room intervention; first 3 months-weekly once resistance/balance/flexibility exercise delivered by physiologist; from second months-unsupervised structured exercise sessions guided by booklet containing(1 to 2 sessions/week).	Highly tailored to the patients' physical fitness, tolerance, and specific care setting; motivational phone follow-ups during the autonomy phase.	88% completed rate and high satisfaction; no serious adverse events;exceedingly low adherence in unsupervised sessions(<5%); significant improvements in walking endurance and quality of life/nutritional status(+53 m in the 6MWT).
Purdy et al(2022) [18]	Adults with MM, treatment/post-SCT	HEAL-Me app, Zoom real-time video	12 weeks resistance training + aerobic exercise; weekly virtually supervised group training sessions, supplemented by 1-2 independent home workouts; featuring a built-in library of over 150 exercises; avoided extremes of spinal movements and high-fall-risk activities to accommodate bone lesions.	In-app check-ins, with regular one-to-one video to adjust goals, dynamically fine-tuning based on fatigue levels	90% completion rate with excellent exercise adherence (83%–90%), and no serious (≥grade 3) intervention-related adverse events occurred; Significant improvements in quality of life and fitness parameters (aerobic capacity, lower body strength, core endurance, and balance).
Ha et al(2022) [22]	Children with CLL, survivor	iBounce app, Misfit Ray Trackers	12 weeks home-based intervention; Daily MVPA accumulation; 10 self-paced digital education modules; parent participation in physical fitness assessments.	Animated character guidance; knowledge quizzes and activity data synchronized; family member interaction	70% completed rate; no serious adverse events; significant improvement in aerobic fitness; no significant change in daily MVPA minutes or sedentary hours, 27% of participants moved to a "more active".
Loh et a(2022) [19]	Elderly with MNs, treatment	GO-EXCAP app,Garmin Forerunner activity tracker,Web Portal	8 to 12 weeks home-based progressive exercise; 5% to 20% weekly increase of aerobic step goals in daily; low- to moderate-intensity resistance exercises daily according to an instruction manual.	ACSM-certified exercise physiologist provided tailored prescription and Monitoring(digital feedback); weekly interactions to address issues/offer encouragement; flexibility adapt routines based on	88% completed rate and haigh usability scores; no serious adverse events; daily steps increased 319; scores for SPPB, fatigue, mood, and QoL improved but no significance.

Table 1. Basic information about the representative studies.

Study	Population	mHealth technologies	Exercise prescription	Incentive strategies	Core findings
Cheung et al(2022)	Children with HM, survivor	WhatsApp or WeChat for instant messaging	6 months remote physical activity (striving for ≥60 mins/day of MVPA); 10-minute face-to-face health advice session directed(parents) and clinical assessments(children) in baseline; tailoring activity types to children's interests.	daily comfort levels/symptoms. nurse delivered a 6-month brief MI via instant messaging applications (1-3 times/week for the first 6 months); a strategy menu include engaging, focusing, evoking, and planning;	92.6% completed rate; significant increased in MVPA (72.8%); significant reductions in fatigue, and significant improvements in handgrip strength, pesk expiratory flow, quality of life.
Lee et al(2023) [23]	Adults with HM, HCT survivor	Moterum Platform, Biosensors, Zoom video	8 weeks home-based intervention; At least 3*30 mins weekly (Emphasis on stability and core strength); Full remote video supervision.	Live virtual supervision via video conference to ensure safe; real-time feedback and flexibility modification exercise content/schedule.	95% completed rate; 94.2% mean adherence; no serious adverse events; 4/5-meter gait speed significant improvements(13.9%-25.4%).
Ma et al(2025) [14]	Adults with HM, HCT survivor	Online meeting platform (Skype); Online training documents	6 weeks personalized physical exercise combine with mindfulness-based stress management; moderate-to-high intensity aerobic activities (aiming at 50%-75% predicted heart rate reserve) and resistance exercise (aiming at 65%-80% 1RM); 30-40 mins per session, 3 times per week.	Half-day session conduct in baseline; weekly 1-hour supervised training sessions via Skype; self-monitoring by logbook for their exercise and mindfulness activities.	92% completed rate; no intervention related adverse events; clinically meaningful improvements in 6-MWT(51.4 m) and STS test; significant reduction in clinical Biomarkers(sICAM-1).
Lee et al(2025) [17]	Adults with CLL, undergoing/prior treatment	Fitbit, Mobile app, text message, telephone call	16 weeks intervention adapted from the Diabetes Prevention Program; setting goals about increase daily steps and overall physical activity; elastic bands resistance training alongside aerobic.	multiphase optimization strategy (MOST); 1-3 text message reminders daily, with weekly data analysis and feedback provided by a health coach via telephone or email; daily self-monitoring via Fitbit.	Significant improvements in fatigue scores, physical function, lower and upper body strength, physical activity, and physical health QoL, along with significant weight loss; Telephone coaching, text messaging, and Fitbit-based tracking were highly feasible.
Dreyling et al(2025) [15]	Adults with MM, treatment	Xiaomi Amazfit Bip, training diaries, heart rate threshold	3 months home-based intervention; 150 mins moderate-intensity aerobic weekly; resistance training twice a week.	Supervised individual sessions of resistance training by personal trainer on therapy days (days 1, 8, and 15);adjusted/progressively intensified based on the general condition and MM-specific symptoms.	94% adherence; no serious adverse events; improved treatment tolerance; significantly less fatigue/depression, faster TUGT times, improved grip strength, and enhanced QoL; EFS and therapy response improved but no significance.
Peli et al(2025) [24]	Children with HM, treatment	Telemedicine solutions	6 months hybrid APA program(30% face to face, 70% remote); exercise content tailored as physical capacity, clinical needs and psychological condition; aerobic +muscle strengthening+balance/coordination+flexibility.	Professional supervision real time;personalization and accessibility	77% adherence; significantly improved QoL, fatigue, and functional performance (Chair stand test)

4. Effective intervention strategies

4.1. Integrating Multiple Components and Hybrid Supervision

In exploring best practices, researchers have increasingly recognized that single-dimensional interventions—such as distributing pedometers alone or providing online reading materials exclusively—often prove inadequate when addressing the complex physiological and psychological barriers faced by HM patients. The most effective mHealth interventions generally abandon such simplistic designs instead of adopting a multicomponent architecture strategy. This multicomponent approach typically integrates consumer-grade wearables (for objectively quantifying steps and monitoring heart rate zones) with smartphone apps (for data visualization, setting progressive goals, and delivering interactive health education modules). Crucially, it incorporates remote coaching from healthcare professionals—such as exercise physiologists or nurse coaches—as an indispensable component[25].

With respect to specific supervision models, research is increasingly shifting toward the adoption of a hybrid model. For example, studies by Purdy et al. and Peli et al. have all meticulously designed models that combine synchronous video conferencing (such as real-time one-on-one or group training via Zoom or Skype) with asynchronous independent home exercise (self-managed via in-app exercise libraries and logs)[18,24]. The advantage of this hybrid design lies in its dual approach. On the one hand, it leverages the real-time, high-fidelity capabilities of telemedicine technology, enabling professional trainers to instantly correct patients' exercise forms, monitor for abnormalities, and ensure safety—particularly during the initial stages of resistance training. On the other hand, as patients' skills and confidence increase, progressively increased asynchronous home training segments grant them significant time flexibility and autonomy, effectively overcoming the geographical distance and transportation fatigue barriers traditionally faced in outpatient rehabilitation[18].

4.2. Embedded Behavior Change Theory

To help patients overcome motivational barriers and achieve lasting health behavior changes, mHealth tools must integrate psychological and behavioral science mechanisms into their system interaction design. According to the internationally recognized Behavior Change Technique Taxonomy v1, successful intervention programs extensively and systematically incorporate multiple specific behavior change techniques (BCTs).

First, "goal setting" and "graded tasks" form the cornerstone of the entire intervention logic. In the current evidence, the system employed personalized incremental targets on the basis of baseline assessments (e.g., adding 500 steps weekly or increasing aerobic duration by 5%-10%)[19,21]. This design significantly reduced the apprehension of frail patients, enabling them to achieve early success more readily. Second, "self-monitoring" and "feedback on behavior" were seamlessly achieved through a closed-loop data system connecting wearable devices to mobile apps[17]. This allowed patients to visually track their incremental progress in real time, continuously reinforcing their sense of self-efficacy.

Additionally, "prompts/cues"—such as automated daily text reminders or sedentary vibration alerts on smartwatches—serve as direct and powerful triggers to break patients' prolonged bed rest or sedentary behavior caused by fatigue. Notably, among various BCTs, "social support" has proven to be an indispensable emotional anchor for sustaining long-term adherence[16,22]. Given that HM patients often endure prolonged social isolation due to disease-induced immunosuppression or chemotherapy-related leukopenia, feelings of loneliness and depression are extremely common. Establishing social support channels—such as regular phone follow-ups with health coaches, periodic motivational interviews by specialized nurses (e.g., instant messaging) or even dedicated Facebook support groups with digital badges, as studied by Mendoza et al.—significantly fulfills patients' emotional expression needs and sense of community belonging[20]. This transforms monotonous physical exercise into a socially engaging positive experience, substantially enhancing intervention retention and intrinsic motivation.

4.3. Applying Multi-Stage Optimization Strategies

Given that mHealth systems typically incorporate numerous functional components across different dimensions (such as reminder frequency, coaching methods, and exercise types), traditional intervention approaches may struggle to identify which specific components genuinely influence final clinical outcomes during the process of translating theory into concrete screening and combination strategies. To address this, researchers have begun incorporating the multi-phase optimization strategy (MOST) from the engineering field[17].

The MOST-guided factorial experimental design enables the precise isolation and independent evaluation of each potential factor's individual or interactive effects (e.g., is the optimal SMS push frequency once daily or three times weekly?). Consequently, redundant components that proved ineffective and increased patient cognitive burden were rigorously eliminated[26]. Ultimately, it constructs a streamlined intervention module that achieves an optimal dynamic equilibrium between clinical activation effects, patient acceptance, and healthcare economic costs—facilitating the widespread adoption of mHealth systems.

5. Existing Barriers and Challenges

Although mHealth has demonstrated significant potential in supporting exercise rehabilitation for HM, scaling it from small clinical trials to real-world, large-scale applications may still encounter some pathological contraindications, safety concerns, and digital technology barriers.

5.1 Risks of Bone Destruction and the Absence of Guidelines

Among all HMs, multiple myeloma presents a major challenge to exercise interventions. Owing to the abnormal proliferation of clonal plasma cells within the bone marrow, osteoclast activity becomes markedly increased, whereas osteoblast function is suppressed. This results in diffuse osteoporosis and multiple osteolytic lesions in most of MM patients. These pathological alterations not only induce substantial bone pain but also render the spine, pelvis, and long bones highly vulnerable. Any inappropriate mechanical stress may instantly trigger pathological fractures or severe spinal cord compression[9]. Consequently, conventional exercise guidelines (such as frequency, intensity, time, and type) cannot be directly applied to MM patients and require substantial modification and adaptation. The International Bone Metastases Exercise Working Group has established explicit safety boundaries, strictly prohibiting MM patients from activities involving spinal extremity movements, high-impact loading, and terminal weight-bearing[27].

However, a significant current challenge is the lack of consistency in the design of MM exercise interventions within the existing literature. The boundaries of exercise safety for patients with both “stable bone lesions” and “unstable bone lesions” remain unclear, particularly for newly diagnosed individuals whose bone lesions have not yet been adequately controlled by medication, where data on safe exercise are virtually nonexistent. Furthermore, kinesiophobia—aversion to movement stemming from high fracture risk—remains prevalent among patients. Even when mHealth platforms provide modified, safe exercises, significant psychological resistance significantly reduce intervention adherence.

5.2 Potential Hazards of Remote First Aid

The treatment of HMs is often accompanied by substantial bone marrow suppression. Patients following HSCT, alongside those with acute leukemia undergoing high-dose anthracycline chemotherapy, endure prolonged periods of severe neutropenia (profound immunodeficiency) and thrombocytopenia (high susceptibility to bleeding)[28]. This represents the core rationale driving numerous studies toward fully remote mHealth platforms—the imperative to isolate patients at home to eliminate cross-infection risks in centralized facilities.

However, this geographical isolation also introduces potential safety concerns. HM patients have a highly vulnerable physiological baseline, with risks of arrhythmia, severe cardiopulmonary events, or falls due to anemia-induced syncope during exercise being notable. During remote-based mHealth interventions, the absence of an onsite specialist clinical team for immediate cardiopulmonary resuscitation and emergency support in the event of an acute cardiovascular incident may lead to serious consequences owing to delayed response times. Concurrently, patients with chronic graft-versus-host disease exhibit compromised multiorgan function and highly variable physical capacity[29]. This necessitates that mHealth systems possess high sensitivity to dynamically assess patients' physiological tolerance thresholds daily. However, most current systems rely on patients' subjective self-reports, which may which may delay safety responses.

5.3 Digital divide, Technological Friction and Uneven App Quality

The success of mHealth interventions for many HM patients relies heavily on seamless human–machine interactions. However, the onset age for most patients—such as those with chronic lymphocytic leukemia, acute myeloid leukemia, and multiple myeloma—typically occurs at 65 years or older[30]. This elderly population frequently experiences deficits in vision, fine motor control (due to chemotherapy-induced peripheral neuropathy), and cognitive function, coupled with low digital health literacy[31]. In practice, wearable devices such as Fitbit and Misfit Ray devices frequently encounter issues such as Bluetooth synchronization failure, short battery life, and complex interfaces, leading to patient frustration and even dropout[22]. More critically, the clinical quality of many currently available apps is uncertain, posing risks of bias. A study screening 20 cancer-related applications revealed that only two possessed medically certified clinical decision support functions. Most commercial apps lack rigorous evidence-based foundations and robust data privacy protection mechanisms[12]. If mHealth tools fail to provide scientifically sound, safe, personalized recommendations, they may instead induce excessive training or misguided treatments, thereby undermining the very purpose of digital healthcare.

6. Future Directions

6.1 Deploying the just-in-time adaptive intervention architecture

During the extended treatment cycle, the physiological tolerance and psychological state of HM patients often exhibit dynamic and unpredictable fluctuations. Adjustments in traditional interventions require substantial manpower. Just-in-time adaptive interventions (JITAIs) may thus serve as a core component of the next-generation precision framework. The unique advantage of JITAI lies in its ability to leverage continuous, real-time multidimensional data streams for uninterrupted computation. It can identify patients' intervention windows—those optimal moments when they are "in urgent need of support," "present an actionable opportunity," and demonstrate "psychological receptivity"—and delivers the most appropriate intervention during these fleeting moments[32].

To construct a rigorous and comprehensive HMs-specific JITAI architecture, three key areas require focused attention. First, high-resolution tailoring variables are essential. These must not only rely on objective data from wearable devices and environmental data but also capture patients' high-frequency subjective symptoms through Ecological Momentary Assessment. Furthermore, real-time clinical indicators (such as complete blood counts) should be integrated as high-priority veto-level safety indicators[33]. Second, intelligent decision-making must be triggered on the basis of these tailored variables, dynamically adjusting the combination matrix of exercise frequency, intensity, time, and type in real time. Third, it is necessary to further integrate artificial intelligence and machine learning technologies based on this responsive architecture. By mining multimodal big data (treatment trajectories, genomics, sensor data), these technologies may enable early prediction of severe chemotherapy toxicity and high-risk bone lesions, allowing the system to proactively reduce exercise intensity and potentially reduce adverse event rates[34,35].

6.2 Integrated Clinical Ecosystem and Collaborative Care

Regardless of how sophisticated and advanced an algorithmic framework may be, it cannot function without the organic support of real-world clinical healthcare systems. Therefore, seamlessly integrating mHealth exercise intervention tools into standard oncology clinical pathways, creating a synergistic relationship with existing healthcare service systems, is essential[36].

First, at the entry point of clinical pathways, a systematic and proactive screening and triage mechanism must be established. Upon a patient's initial diagnosis of HM, the medical team should conduct comprehensive baseline risk screening and stratification covering oncological factors, cardiometabolic status, degree of aging, health behavior characteristics, and external environmental factors. Patients assessed as high risk will be referred within the hospital to undergo a rigorously supervised rehabilitation program led by specialized rehabilitation therapists and equipped with ECG monitoring. The majority of low-to-moderate-risk patients, however, can be enrolled in a remote JITAI digital therapy programme on the basis of an mHealth platform, enabling daily management through remote monitoring[37].

Second, achieving interoperability at the foundational technology level is essential. Through secure and standardized application programming interfaces, it structurally integrates patients' historical clinical data and real-time digital biomarkers into the hospital's core electronic health record (EHR) system[38]. This enables the generation of an intuitive "panoramic patient health dashboard" directly on oncologists' daily workstations, helping to reduce information overload. More critically, a trigger-based alert workflow: when cloud algorithms detect sustained abnormal heart rate fluctuations, a sharp decline in activity levels, or severe pain in a patient, the EHR system automatically sends high-priority clinical alerts to the attending physician or specialized nurse. This creates a robust remote emergency response defense system.

Third, the entire mHealth framework must operate within a collaborative care model, which requires establishing and maintaining a highly integrated multidisciplinary team (MDT)[39,40]. Within this MDT structure, roles are clearly defined and highly complementary: hematologic oncologists occupy a central position, are responsible for comprehensive medical assessment of the disease and macrolevel monitoring of biochemical indicators, and establishing safety thresholds that should not be exceeded for any exercise prescription. Exercise physiologists with specialized oncology certification utilize the vast amount of data collected via the mHealth platform to develop initial protocols and lead algorithmic parameter fine-tuning during operation. Moreover, specially trained digital health coaches, advanced practice nurses, or patient navigators serve as critical "human connection hubs." Through regular video calls or motivational phone interviews, they help patients overcome digital literacy barriers in operating smart devices and provide essential human-centered care throughout extended treatment cycles. This ensures that patients consistently feel supported, cared for, and empowered during their long and arduous rehabilitation journey[41,42].

7. Conclusion

The use of mHealth technology to support physical exercise among patients with HMs represents a valuable advancement in the field of modern rehabilitation therapy. A comprehensive review of the latest research evidence indicates that mHealth interventions—integrating wearable sensing technology, customized applications, and remote virtual supervision—demonstrate clinical feasibility and efficacy in alleviating severe physical decline caused by intensive chemotherapy and stem cell transplantation, significantly reducing persistent cancer-related fatigue, and improving quality of life across multiple dimensions.

However, owing to the inherent risk of osteolytic fractures in diseases such as multiple myeloma, the substantial immunosuppression involved, and the widespread digital divide among elderly patients, simply replicating exercise intervention strategies designed for the general population is both unsafe and ineffective. Future research and practice must prioritize the integration of adaptive intervention frameworks, clinical ecosystems, and multidisciplinary collaborative care as critical areas of focus. Concurrently, policymakers and administrators should consider advancing digital health infrastructure development to ensure secure and reliable information systems. Ultimately, enabling an increasing number of patients with hematologic malignancies to fully benefit from the health effects of physical exercise.

Supplementary Materials

Not applicable.

Author Contributions

Conceptualization: KC and CG; Methodology: KC, CG and LG; Check: KC, CG and LG; Formal analysis: KC; Investigation: not applicable; Resources: KC and CG; Data curation: KC and CG; Writing-rough preparation: KC; Writing-review and editing: CG and LG; Supervision: LG; Project administration: KC and LG; Receiving funding: KC, CG and LG. All the authors have read and agreed with the published version of the manuscript.

Funding

This study was supported by the Chongqing Graduate Student Research Innovation Program (Title: Research on the Construction of mHealth Service Model for Persons with Disabilities under the Perspective of Value Cocreation--CYB240073), Chongqing Graduate Student Research Innovation Program (Title: Effects of mHealth Interventions on Physical Activity Levels in Adults With Intellectual Disabilities—CYS240112)

Institutional Review Board Statement

Not applicable.

Informed Consent Statement

Not applicable.

Data availability statement

The original contributions presented in the study are included in the article, and further inquiries can be directed to the corresponding author.

Acknowledgments

The authors wish to thank Dr. Hengxu Liu, a researcher in exercise oncology, for his valuable comments and suggestions on this manuscript.

Conflicts of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as potential conflicts of interest.

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