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Mobile Health Information Technology for Physical Activity Education during Cardiac Rehabilitation: A Scoping Review

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Abstract

Introduction: In healthcare delivery system, mobile health is a modern information and communication technology system that facilitates the delivery of nursing care and services to remote locations. Research indicates that mobile health education can enhance physical activity in chronic diseases patients like cardiovacular disease overall. Nonetheless, the effects of mobile health on cardiac disease patients during cardica rehabilitation have yet to be assessed.

Objective: To assess the impact of mobile health education on the physical activity levels of cardiac patients during cardica rehabilitation from previous studies.

Method: This study used a scoping review method approach. The inclusion criteria encompassed papers published in English from 2019 to 2024. Participants with adult cardiac disease underwent therapies utilising information technology, with outcomes measured in terms of physical activity, the studies employed a randomised controlled trial methodology. Exclusion criteria included psychiatric diseases, literature reviews, systematic reviews, and overviews. This review was performed across four databases: PubMed, Scopus, Wiley, and Emerald Insight. A critical appraisal was performed utilising the Joanna Briggs Institute's Critical Appraisal Checklist.

Findings: There are a total of 16 articles included in this review. Three themes emerged in this study. The results indicated that mobile health technology can effectively assist cardiac patients during cardiac rehabilitation by providing tools for real-time monitoring, patient education, and behavioural adjustment. These therapies markedly enhanced physical activity levels and overall quality of life in cardiac patients

Conclusion: The educational interventions utilising mobile health, including mobile health, applications, and websites, can enhance the physical activity levels of cardiac patients during cardiac rehabilitation. Thus, mobile health can be utilised in hospitals to deliver nursing care, facilitate education, and remotely monitor the physical activity of cardiac patients during cardiac rehabilitation.

Keywords- Cardiac disease, Mobile health, Physical activity, Telehealth, Website

INTRODUCTION

The most usual cause of death is non-communicable diseases, mainly vascular diseases. Cardiovascular disease is the chief cause of death globally, and its rate is expected to rise. Cardiac structural and functional abnormalities lead to haemodynamic imbalances, either from ventricular filling or blood ejection. Dyspnoea and weariness, resulting in exercise intolerance, along with fluid retention, causing lung congestion and marginal oedema, are the most indicative manifestations of heart disease. Annually, around 3.6 million patients in Europe are detected with heart failure. Among individuals over the age of 20, 5.7 million Americans are afflicted with heart failure. By 2030, this disease will have a 46% increase. Heart failure prevalence in Asia ranges from 1.26% to 6.7%. South-eastern Asia (13.0%) and East Asian nations (7.5%) exhibit greater mortality rates from heart failure compared to South Asia (7.3%) (1). According to basic health research, 1.17 million Indonesians are afflicted with heart disease, including 1.6% of women and 1.3% of men, with the predominant age group being individuals over 75 years (2). The peak incidence of heart disease in West Java province is 186,809.

Cardiac patients experience numerous issues that detract from their quality of life, including mental challenges such as hindrance, disappointment, unease, and mood instability (3, 4). In comparison to individuals with other chronic illnesses, most cardiac patients exhibit diminished levels of physical activity. Numerous factors, including bodily restrictions, general health, public functioning, emotional constraints, and mental health, influence patients' quality of life (5). The New York Heart Association (NYHA) indicates that gender and oldness are significant determinants of heart disease prevalence. With advancing age, both mental and physical functioning deteriorates. Similarly, men have sex-specific advantages in physical talents, notably in terms of physical fitness, compared to women. The decline in physical capability adversely influences the quality of life of individuals with cardiac disease (6).

Enhancing physical activity levels and exercise capacity constitutes an excellent preventive strategy for cardiac patients. Engaging in physical activity significantly reduces the mortality risk for individuals who adhere to the WHO guideline of a minimum of 150 minutes of medium-intensity physical activity or at least 75 minutes of vital-intensity aerobic exercise weekly (7). Consequently, physical exercise has emerged as a fundamental element of cardiac rehabilitation and an integral aspect of the home care continuum for cardiac patients (8, 9). Cardiac rehabilitation with information technology can be provided in both outpatient settings and home-based environments. Nevertheless, post-cardiac rehabilitation, patients frequently fail to sustain a healthy lifestyle. There is an urgent need for new initiatives to enhance physical activity through sustainable health and behavioural change (10).

Smartphone-based mobile technology offers an effective solution for objective monitoring of physical activity. Objective monitoring has numerous benefits compared to self-reported physical activity tracking, including comprehensive data on type, intensity, and volume. Self-reported physical activity is vulnerable to many biases, such as misinterpretation, recollection bias, and exaggeration stemming from social desirability bias (8). Moreover, documenting and evaluating self-reported physical activity is labour-intensive. Objective monitoring of physical activity is favoured as it facilitates the implementation of behaviour modification strategies (11). Numerous recent studies with cardiovascular patients employed objective physical activity assessment in home-based cardiac rehabilitation (8).

Home-based cardiac rehabilitation is

also known as telerehabilitation. A significant transition towards home-based cardiac rehabilitation has been noted and is anticipated to persist. To our knowledge, no evaluation has specifically addressed physical activity monitoring and education via information technology for cardiac patients. This scoping review is to evaluate the recent studies which has used Randomised Controlled Trials (RCTs) that employed mobile health, mobile applications, and websites for monitoring physical activity in relation to patients' exercise capacity during or following cardiac rehabilitation. Additionally, we evaluated the technologies employed in the education of cardiac patients, found research deficiencies, and outlined prospective research avenues for mobile health for objective monitoring and education of this patient population. This review seeks to facilitate the design and development of mobile health educational initiatives.

METHOD

This study employs a scoping review methodology adapted from prior research (12). Five steps are outlined to set a refine and key research question. Identify pertinent articles; select articles, extract data; and graph, organise, summarise, analyse, and report data. This scoping review investigates the scientific literature regarding the information technologies utilised for physical activity education in cardiac patients. Only articles published in open access English language versions, with full text in their original form, from 2019 to 2024, will be included in this review. This study's participants were heart disease patients who received the mobile health intervention. The outcomes were physical activity and quality of life. The research design includes a randomised controlled trial, a quasi-experimental approach, and a pilot study.

Inclusion Criteria

Research articles published in English between 2019 and 2024. Original articles on information technology such as mobile health, websites for physical activity education for cardiac patients, and studies done among adult cardiac patients.

Exclusion criteria

Inaccessible articles in full text, patients with mental health disorders, literature review articles, systematic reviews, and overviews. About journal databases, including PubMed, Scopus, Emerald, and Willey use keyword search techniques.

Table 1: *Keywords in advanced search engines.*

Data Based	Search Strategy	Hasil
Scopus	"cardiovascular disease" AND "mobile health" OR website AND "physical activity" AND "randomized controlled trial" AND “Pilot Study”	507
PubMed	(cardiovascular disease) AND mobile aplication) AND physical activity) AND randomized controlled trial	746
Emerald	(cardiovascular disease AND (mobile health) OR (website) AND (physical activity) AND (quality of life) AND (randomized controlled trial))	318
Willey	"cardiovascular disease" and "mobile health" and "website" and "physical activity" and "randomized controlled trial" and “Experimental Study”	105

Selection of Relevant Studies

Table 1 shows the keywords that used to searched the relevant studies for this review. Besides, the PICO framework was employed to establish tailored criteria for research eligibility. The population comprises individuals afflicted with cardiovascular illnesses. This study examined physical activity treatments

utilising mobile health, mobile applications, and websites to standard care, characterised as in-person consultations with a physician or nurse. Following the search for papers and their entry into EndNote X9 bibliographic software, duplicates were eliminated, and two reviewers independently chose article titles and abstracts. Additional analysis was conducted on the abstracts of the chosen papers. To resolve any uncertainty over the inclusion of the research article in the second selection phase, the writers conducted a comprehensive evaluation of the publication. If required, it is addressed through consultation with another reviewer (13). Moreover, we applied PRISMA flow for selecting the article (Fig.1). There are 16 articles included in this scoping review.

STUDY SELECTION

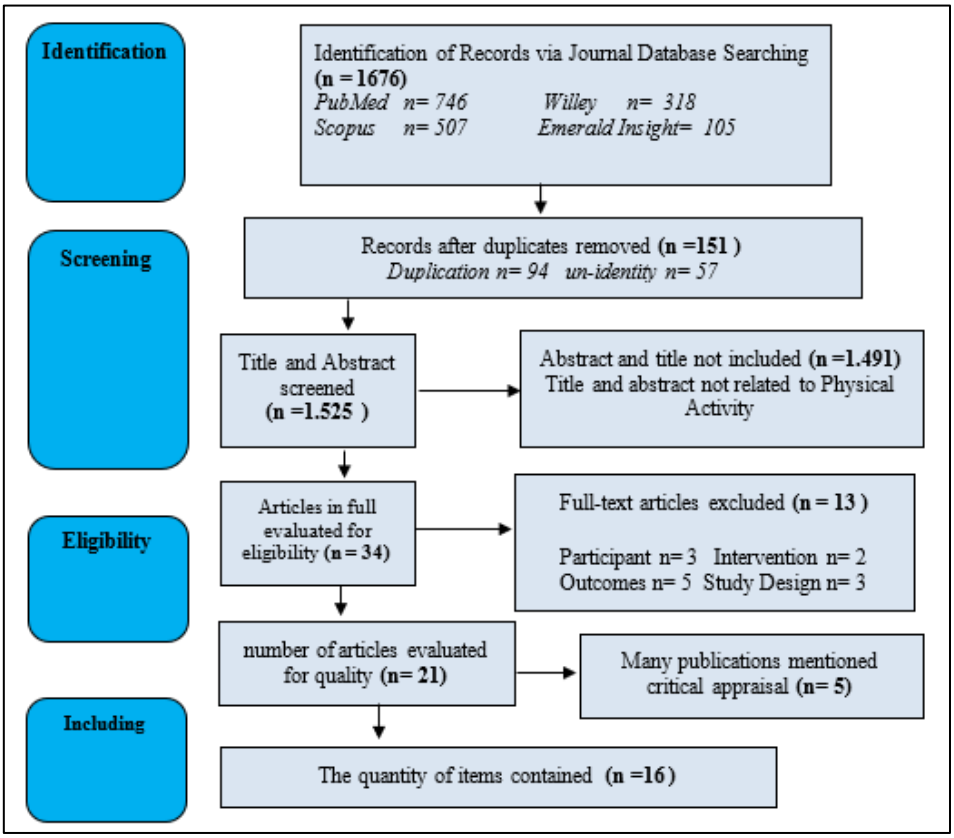

Figure 1: *PRISMA.*

CRITICAL ASSESSMENT

For the critical appraisal assessment, the Joanna Briggs Institute (JBI) critical assessment framework was employed to independently evaluate the methodological quality of qualifying studies through two reviews of efficacy data reports. Reviewers assigned a score of "yes," "no," "unclear," or "not applicable" for each essential criterion of the assessment instrument in every study. According to Jamaludin et al. (14), we classified the quality. The overall score was determined as a percentage of affirmative responses for crucial evaluation outcomes utilising the JBI tool. Checklists for randomised controlled trials included in the tabular data extraction received a minimum score of 9 (70% of the total score of 13). In the process of evaluating research quality Errors in the research quality assessment process can be rectified through consultation with other reviewers, if necessary.

Table 2: *Included studies that answered the JBI critical appraisal items for randomised controlled trials questions.*

Study	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13
Arjunan et al., 2021 (3)	Y	Y	U	Y	Y	Y	U	Y	Y	U	Y	Y	Y
Bakitas et al., 2020 (16)	Y	Y	Y	N	Y	Y	Y	Y	Y	U	Y	Y	U
Choi et al., 2023 (19)	Y	Y	Y	Y	U	U	Y	N	Y	Y	Y	Y	Y
Davoudi et al., (20)	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y
Hudiyawati et al., 2023 (21)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Atluri et al., 2024 (22)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Jiang et al., 2021 (23)	Y	Y	Y	Y	N	U	Y	Y	Y	Y	Y	Y	Y
Mizukawa et al., 2019 (24)	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y
Elnaggar et al., 2021 (25)	Y	Y	Y	Y	Y	N	Y	U	Y	Y	Y	Y	Y
Hakala et al., 2021 (26)	Y	Y	Y	N	N	Y	U	Y	Y	Y	Y	Y	Y
Park et al., 2021 (17)	Y	Y	Y	N	Y	N	N	Y	Y	Y	Y	Y	Y
Maddison et al., (27)	Y	Y	Y	Y	N	U	Y	Y	Y	Y	N	Y	Y
Lunde et al., 2019 (28)	Y	Y	Y	Y	N	Y	Y	N	Y	Y	Y	Y	Y
Crozier et al., 2024 (29)	Y	Y	Y	Y	Y	N	Y	U	Y	Y	Y	Y	Y
Xu et al., 2022 (18)	Y	Y	Y	N	N	Y	U	Y	Y	Y	Y	Y	Y
Jiménez et al., (2024) (30)	Y	Y	Y	Y	Y	N	N	Y	N	Y	Y	Y	Y

*****Remarks: Y (Yes), N (No), U (Unclear)*

The JBI Critical Appraisal Items for Randomised Controlled Trials checklist has 13 questions. Those are;

Q1: Was the assignment of participants to treatment groups conducted through authentic randomisation?

Q2: Was the allocation to treatment groups concealed?

Q3: Were the treatment groups comparable at baseline?

Q4: Did participants lack awareness of their assigned treatment?

Q5: Did the individuals administering the therapy have knowledge of the treatment assignment?

Q6: Were the treatment groups managed uniformly, excluding the intervention of interest?

Q7: Were the outcome assessors negligent in their treatment assignment evaluations?

Q8: Did the treatment groups yield identical measurements in their results?

Q9: Were the results measured accurately?

Q10: Was follow-up conducted, and if not, were the disparities in follow-up between the groups sufficiently analysed and elucidated?

Q11: Were the individuals assessed within their randomly assigned groups?

Q12: Was the appropriate statistical analysis utilised?

Q13: Was the trial design appropriate, and did the execution and analysis of the study consider any deviations from the standard randomised controlled trial design, including individual randomisation and parallel groups?

Table 2 represent the overview of all the includedd studies that answered the JBI Critical Appraisal Items for Randomised Controlled Trials questions. Table 3 represents the data extraction for this sccoping review.

***Table 3**: Data extraction.*

Author (Year), Country	Design	Disease Types	Intervention	Outcome	Remark (Appraisal)
Arjunan and Porkodi., 2021, India (2)	RCT	Heart failure grades 2 and 3	Nurse-run CR initiative. It includes methodical guidance on how to manage your condition through diet, exercise, medicine, home care, quitting smoking, and lifestyle modifications. Following testing, all intervention group members received phone calls every two weeks for three months.	After three months of telephone heart health education delivered every two weeks, this nurse-led program was shown to increase physical activity.	• The method is appropriate. • Questionnaire piloted, analyzed, piloted, and finalized and those involved were excluded from the survey.
Bakitas et al., 2020, US (16)	RCT	Heart failure grades 3 and 4	The telehealth intervention involved six sessions, with a cardiac nurse as a facilitator. The time required for each session is approximately 30-40 minutes. Session 1 will discuss heart disease. The second session emphasizes self-care, healthy eating, physical activity, and smoking cessation. Physical and psychological symptoms are covered in Session 3. The importance of comprehension, advance care planning, and decision-making assistance are discussed in Session 4. Reflection on life and legacy building are the topics of Sessions 5 and 6.	After the 16-week telemedicine intervention, the heart failure patients reported an improvement in their physical activity and quality of life.	• The method is appropriate • The questionnaire is valid and reliable analyzed, piloted, and finalized The design in this study was randomized which helped eliminate selection bias, increasing the reliability of the findings. Limitations No Significant Improvement in Primary Outcomes
Choi et al., 2023, Korea (19)	RCT	Heart Failure grades 1,2,3 and 4	The app "Heart Failure - Smart Life." The initial meeting lasts for half an hour. In addition, by guiding patients through the Application features, nurses will instruct them on how to carry out daily physical activities and also record information such as exercise and nutritional status. The nursing staff regularly reviews patient medical records on a daily basis and communicates with each other using chat and telephone capabilities. This procedure is carried out over three months and is supervised by three cardiac nurses.	After three months, the physical activity of the intervention group could be increased with the Heart Failure-Smart Life app.	• The method is appropriate. • Inclusion criteria are clear. • The research paper was a little difficult to understand due to confusion English words used. • No conflicts of interest were reported. The sample size of the study was relatively small, which may limit the generalizability of the findings Short Duration of Follow-up: The follow-up period was only 3 months
Davoudi et al., 2020, Iran (20)	RCT	Heart failure grades 2 and 3	Smartphone app directed by nurses. This includes guidance and teaching on heart disease over the phone or through chat. Patients track their symptoms, take vital signs, and log them in the app. Patients will receive weekly notifications for six weeks in a row, followed by monthly notifications for around two months, to remind them to use the app.	Patients with heart failure can have better physical activity-quality of life if they use apps on their smartphones.	• The method is appropriate. • Inclusion criteria are clear. • No conflicts of interest were reported. • Large study sample size, appropriate statistical analysis • Short duration of follow-up: The follow-up period was only 3 months
Hudiyawati et al., (2023), Indonesia (21)	RCT	Heart failure grades 2 and 3	Telemonitoring interventions in heart failure education. A 20-minute telephone call per week is used to discuss patient status, heart failure symptoms and medication adherence issues, as well as home care challenges such as activity and eating habits. This procedure is carried out for 4 weeks	After four weeks of telemonitoring, individuals with heart failure may see an improvement in their quality of life.	• The method is appropriate • Inclusion criteria are clear. • No conflicts of interest were reported. Large study sample size that strengthens the statistics and generalizability of the results, appropriate statistical analysis. Short duration of follow-up: The follow-up period was only 4 weeks. Incomplete Reporting: Study could have provided more detailed demographic data and baseline characteristics of participants in both groups
Jiang et al., 2021, Singapore (23)	RCT	Heart Failure grades 1,2,3 and 4	M-Health is nurse-led. This component has a variety of features, including individually scheduled reminders for doctor's appointments with medications and cardio training, weight, blood pressure, and symptom logging, as well as a chat room for communicating with research nurses.	The results show that HOM-HEMP is a successful intervention to increase physical activity in cardiac patients.	• The method is appropriate. - questionnaire measurement tools are valid and reliable. • No conflicts of interest were reported. Large study sample size that strengthens the statistics and generalizability of the results, appropriate statistical analysis. Limited Diversity: The study primarily included Chinese participants, which may limit the applicability of the findings to more diverse populations.

Mizukawa et al., 2019, Japan (24)	RCT	Heart failure grades 1, 2 and 3	After using a smartphone app, nurses were observed for a whole year. Patients are provided with a notebook to log daily self-monitoring information, including blood pressure, pulse, and body weight. Intervention nurses provided monthly counseling interventions for the first six months. Each session lasts 30 minutes. The intervention nurse reviewed the data each morning at 10 a.m. and evaluated patient notes regarding laboratory data each month during monthly sessions.	At 18 and 24 months of age, remote monitoring interventions were found to increase cardiac physical activity.	• The method was appropriate as it was tailored to the needs of the participants and no conflicts of interest were reported.-the questionnaire was valid and reliable. • The sample size of the study was small which could generalize the results
Atluri et al., 2024, American (22)	RCT	Coronary heart disease	The intervention was designed for participants to receive 1 activity message per day and 3 to 4 exercise planning messages per week on average. Finally, all intervention arm participants were sent weekly email summaries that contained encouraging messages and an activity summary with comparisons with earlier phases of the study. All interviews were conducted over the telephone, with interviews audio- recorded and subsequently transcribed. Interviews lasted ≈30 minutes and were conducted between January 2022 and September 2022.	Participants reported increased physical activity levels and found the intervention useful, although they expressed a desire for more personalization and contextual relevance in the messages.	• The method is appropriate. • The inclusion criteria are clear. • Participants suggested improvements such as better integration of social support and more tailored messages based on individual health goals and real-time activity levels.
Elnaggar et al., 2021, US (25)	RCT	Coronary heart disease	Intervention patients in the randomized controlled trial wore the Fitbit Charge 2, used the Movn mobile app, and received push messages on cardiovascular disease prevention and physical activity for over 2 months. We asked 26 intervention group participants for feedback about their experience with the technology and conducted semi structured individual interviews with 7 representative participants. We used thematic analysis to create the main themes from individual interviews.	Technology uses increased motivation to be physically active, technology use serves as a reminder to be physically active, recommendations for technology to improve user experience, and desire for personal feedback.	• The method is appropriate. • The inclusion criteria are clear. • Encouragement for Future Research: The positive reception of mobile health (mHealth) tools suggests potential for broader implementation in supporting long-term physical activity among older adults. • Need for Personalization: Many participants felt that push messages lacked personalization, leading to decreased engagement.
Hakala et al., 2021, Finland (26)	RCT	Cardiovascular Disease	The 12-month CR program was executed in groups of 10 rehabilitates each, which is standard practice at the Peurunka rehabilitation center. Sample size was defined by the rehabilitation groups that began the rehabilitation during the years 2015-2016. Physical activity outcomes were measured 3 times during the intervention: at baseline, 6 months, and 12 months. Participants or caregivers were not blinded to the intervention.	The use of additional distance technology increased the duration of light physical activity at the beginning of cardiac rehabilitation (for the first 6 months), but statistically significant differences were not observed between the two groups for moderate or vigorous physical activity or steps per day for both 6-month self-exercise periods.	• The method is appropriate. • The use of distance technology showed initial effectiveness in increasing light physical activity but did not provide significant benefits in moderate to vigorous physical activity or total steps per day over the entire 12-month period. • The study highlights the potential of technology to enhance rehabilitation but suggests that its added value may be limited to specific activity types. Further research is needed to explore effective methods for promoting physical activity across diverse populations.
Park et al., 2021, US (17)	RCT	Cardiovascular Disease	The intervention group downloaded the Movn mobile app, received supportive push-through messages on motivation and educational messages related to Cardiovascular Disease (CVD) management 3 times per week.	We tested the functional capacity outcome of the standardized change score in 6MWT from baseline and 2 months also using linear mixed models, with the same approach.	• The method is appropriate.

Maddison et al., 2019, Australia (24)	RCT	Cardiovascular disease.	Participants received 3–5 text messages per week (total of 118 messages over 24 wk). Participants were encouraged to log onto the Web site once per week to view new information and video messages (three new messages added per week, 30–60 s in length). In total, 171 participants were randomized and all were able to access usual care, which could involve usual cardiac rehabilitation services.	M-Health interventions can support the modification of lifestyle risk factors such as exercise among people with coronary heart disease.	• The method is appropriate. • This article also explains the advantages and disadvantages of using M health..
Lunde, et al., 2019, Norwegia (25)	RCT	Cardiovascular disease.	There are 113 participants divided into two groups, the intervention will receive individual follow-up via the app every week for 12 months with the app to be prepared with the participants' own goals in mind and follow-up will be based on these individual goals, while the control group will receive usual care, including general advice regarding physical activity, exercise, and diet. Participants will be assessed at baseline (when CR is completed) and 12 months after baseline.	The primary outcome measure will be change in VO2peak. Secondary outcome measures will include exercise performance, quality of life (QoL), health status, health literacy, self-perceived goal achievement, exercise habits, body weight, blood pressure, lipids, and triglycerides. All assessments will be performed at baseline and at 12 months. .	• The method is appropriate. • The inclusion criteria are clear. • The study has the potential to generate new knowledge that may improve the design of future technology-based follow-up interventions of patients who have completed rehabilitation.
Crozier et al., 2024, UK (29)	RCT	Cardiovascular disease	The control group will be given standard CR treatment, while the intervention group will be given standard CR treatment + exercise counseling supported by mHealth for 12 months.	The primary outcome measures will be taken using remote 'home-based' solutions, which do not require travel or in-person contact. These measures include adherence to exercise, body composition, blood pressure, and blood lipids and HbA1c levels	• The method is appropriate. • The inclusion criteria are clear. • This research explains some of its strengths and weaknesses
Xu et al., 2022, China (18)	RCT	Coronary heart disease	There are 108 patients with CHD who will be randomly divided into three groups. Control group: WeChat applet + step goal setting. Individual group: WeChat applet + step goal setting + gamification. Team groups: WeChat applets + gamification step goal setting + collaboration. The intervention will last for 12 weeks and follow-up for 12 weeks.	Intervention gamification enhances the transformation of controlled motivation into autonomous motivation by fulfilling competence, autonomy, relatedness, enjoyment and ultimately increasing physical activity participation.	• The method is appropriate. • The inclusion criteria are clear. • There are several limitations to this article as already stated
Jiménez, et al., 2024 Spain (30)	RCT	Coronary disease	The mHealth intervention began during their hospital stay, after the coronary event. All the patients in this group had an app installed on their mobile phone or tablet and completed a brief online tutorial to learn how to use it. The participants were advised to use the app for a minimum of 15 minutes daily during the 36-week follow-up period. The app aims to achieve self-control of PA, food consumption, blood pressure, smoking, and therapeutic adherence.	Significant improvements were observed in the mHealth group compared with the control group regarding adherence to the Mediterranean diet, frequency of food consumption, patient-reported physical activity, giving up smoking, level of knowledge of healthy lifestyles and the control of CVRFs, and the physical component of the quality of life 12-item Short Form survey. Overall satisfaction was higher in the mHealth group and app satisfaction and usability were high.	• The method is appropriate. • The inclusion criteria are clear.

FINDINGS

Information Technology (IT) significantly supports physical activity education for cardiac patients, particularly during cardiac rehabilitation. According to the review, information technology, including mobile health (mHealth) applications, websites, and telemonitoring systems, is utilised to deliver continuous advice, monitoring, and education (15). This section elaborates on the findings related to the three themes identified through the data analysis of the articles included in this study.

Information Technology-Based Education to Increase Physical Activity in Heart Failure Patients

Findings from seven studies investigating the application of information technology in heart failure patients indicate that technological interventions, with digital health applications and virtual monitoring, significantly enhance physical activity levels among cardiac patients. These studies demonstrate that information technology is crucial for facilitating education, monitoring, and ongoing communication between patients and healthcare professionals. A study shown in the United States implemented a telehealth intervention involving six interactive sessions with a nurse for patients (16). Each session focused on various components of cardiac management, encompassing self-care, physical exercise, and treatment planning.

Telehealth technology enabled patients to access education from home, facilitating the practice of physical activity through consistent and clear guidance. Following a 16-week period, patients indicated increase in physical action and quality of life, thereby illustrating the

technology's efficacy in facilitating cardiac rehabilitation. This study demonstrates that information technology significantly contributes to educating cardiac patients regarding the importance of physical activity. Technologies like mobile health applications, telemonitoring, and telehealth offer accessible platforms for patients, facilitating their engagement in the rehabilitation process. Education delivered via these technologies emphasizes not only the dissemination of information but also promotes behavioral modifications that enhance physical activity levels. Easy access and continuous monitoring enhance patient adherence to rehabilitation programs, thereby increasing overall physical activity. In this context, information technology serves as an effective tool for integrating health education and physical monitoring essential for managing heart disease.

Information Technology-Based Education to Increase Physical Activity in Cardiovascular Disease Patients

The use of information technology-based education, particularly through mobile health (mHealth) interventions, shows promising results in increasing physical activity among cardiovascular disease (CVD) patients. A study by Park et al. (17) explored this concept through a mobile wellness initiative focus at promoting physical activity (PA) in adults who had completed cardiac rehabilitation (CR). The intervention utilized a mobile app called Movn, combined with wearable activity monitors (such as Fitbit Charge 2), and supportive push-through messages sent three times a week.

One of the study's findings indicate that patients utilizing mHealth tools exhibited significantly higher daily step tallies than those in the control group (17). In their study, the intervention group recorded an average of 8,860 steps per day, while the control group averaged 6,633 steps, suggesting that technology-based strategies can effectively enhance adherence to physical activity. Nonetheless, no significant differences were found in functional capacity (assessed by the six-minute walk test), levels of depression, or exercise self-efficacy between the two groups (17).

Moreover, the same study highlights the role of technology in sustaining the advantages of cardiac rehabilitation, highlighting the importance of physical activity in preventing future cardiac events and enhancing long-term health outcomes. The mHealth approach utilizes self-evaluation and principles of social intellectual theory, including self-efficiency, self- discipline, and peer support, alongside personalized motivation to assist patients in maintaining physical activity following rehabilitation (17).

Information Technology-Based Education to Enhance Physical Activity in Heart Artery Disease Patients

In recent years, a great number of mobile health applications, often known as mHealth, have been developed and are making widespread usage. The use of cellular devices is inextricably linked to aspects of daily life, such as the processing of regular work activities. It is becoming an important medium for delivering behavior and shows hopeful ability to increase levels of physical activity. Mobile health, also known as mHealth, is the use of e-computing and communications devices (mobile phones, wearable devices) for the purpose of providing health services and information.

One of the advantages of the application is that it gives medical professionals the chance to give patients immediate feedback on their experiences. This is based on the findings of four research that investigated applications that have the potential to boost motivation for physical exercise and induce behavior change. Based on the findings of a study that was carried

out in China by Xu et al. (18) employing. Gamification involves integrating game design features—like points, leaderboards, progress indicators, and badges—into non-gaming settings such as education, management, marketing, and healthcare to enhance motivation and user involvement. There is a growing interest in the application of gamification in mobile health with the goal of promoting healthy behavior change, particularly in promoting levels of physical work. The patient reported an increase in their level of physical activity after a period of twelve weeks.

DISCUSSION

This scoping review examines physical activity education facilitated by information technology, including e-health, apps, and sites. The education of cardiac patients can be enhanced by technology, facilitating therapeutic services in areas with restricted access. Furthermore, following the implementation of mobile application-based physical activity therapies for cardiac patients, an enhancement in their quality of life is anticipated. Both trials included cybernetic clinics, disease-associated information, and mental support. This demonstrates how mobile applications might enhance physical activity in cardiac patients. Sixteen of the studies analysed indicated that the intervention positively influenced the enhancement of physical activity. Interventions provided included education on heart disease, adherence to medication, monitoring of physical work, checking of vital signs, and resources to develop health knowledge.

Advocating for healthy lifestyles is a viable public health strategy to combat the rise in heart disease; employing mHealth techniques is practical for encouraging physical activity and managing heart disease at home. This scoping review indicates that mHealth therapies may effectively enhance the physical activity of cardiac patients. This review indicated that 50% of mHealth interventions effectively enhanced physical activity, while 70% of the identified interventions successfully improved the quality of life for cardiac patients. These results align with findings from earlier review articles on telenursing interventions undertaken in wealthy nations. This review's findings contribute to the existing evidence about the efficacy of mHealth programs aimed at evaluating various health outcomes, such as medication adherence.

The majority of research in this analysis (n=16) investigated intervention modalities that are potentially viable and capable of reaching a substantial population to combat the rise in heart disease.

Although additional high-quality RCT studies are necessary to enhance the evidence base, it is also essential to perform real-world implementation studies, as the majority of the included research indicated that mHealth interventions yielded favourable results. The research by Bakitas et al. (16) presents a compelling illustration of the practical application of a mHealth intervention aimed at enhancing physical activity. An mHealth intervention aimed at enhancing physical activity could also be a viable alternative for researchers in other developing nations. The advantages of these relationships encompass the exchange of expertise, with academia contributing behavioral health information and industry enhancing the appeal of interventions. The potential for these partnerships is especially significant in nations where preliminary evidence suggests that such initiatives are viable.

Information Technology (IT) has emerged as a crucial element in educating cardiac patients, especially about physical exercise during rehabilitation. Principal technologies employed are mobile health (mhealth) applications, web-based platforms, and telemonitoring systems. These technologies facilitate an interactive and continuous exchange of information between patients and healthcare practitioners. The mHealth application

enables patients to track their daily physical activity and obtain prompt feedback. Websites provide health education resources accessible to patients at all times, with the aim of enhancing health literacy. The telemonitoring technology enables healthcare personnel to remotely watch patient progress, guaranteeing compliance with recommended activities and swiftly addressing any concerns.

These tools collectively promote education and the behavioral modifications essential for ongoing enhancement of cardiovascular health. Physical work activity is a vital component in the rehabilitation of cardiac patients. The World Health Organization (WHO) advises those with heart disease to engage in 150 minutes of medium-intensity aerobic workout weekly, including activities like brisk walking or cycling. Alternatively, patients may engage in 75 minutes of vigorous aerobic activity. The strength must be involved to the patient's health status, facilitating steady enhancement while mitigating the risk of overexertion. Activities may be segmented into sessions lasting a minimum of 30 minutes, conducted across many days of the week. The timing of physical activity is a significant factor. For numerous patients, morning or evening exercising is optimal, as it facilitates superior energy management and mitigates the chance of exhaustion that may result from daytime endeavors. It is essential to tailor the exercise regimen according to the patient's preferences and medical conditions.

Utilizing IT technologies like the mHealth application, patients may monitor their progress and receive notifications regarding the ideal timing for exercise, thereby enhancing compliance with the recommended physical activity regimen. Constraints in the utilization of mobile health, communication constraints: mobile health frequently encounters challenges in promoting effective interaction between nurses and patients. Constraints of Physical Examination: mobile health cannot substitute for in-person physical assessments conducted by nurses or medical experts.

Constraints in Technological Accessibility

Not all individuals possess convenient or enough access to essential technology, such unreliable internet connectivity or inappropriate gadgets. Consequently, to accurately comprehend the mechanisms underlying the impacts of mobile health, good randomized controlled trials and standardized studies are essential. Patients with cardiac disease may get an enhanced quality of life with treatment, as indicated by a study of sixteen research. Individuals undergoing cardiac therapy may discover that the provided attributes enhance their quality of life. Implementing nursing care to aid cardiac patients in adopting healthy habits can serve as a collaborative approach.

CONCLUSION

Use of information technology information technology, particularly mobile health (mHealth) apps, websites and virtual monitoring, plays an important role in educating patients about their disease. It plays an important role in educating heart disease patients about physical work activity and personal-care. These technologies provide patients with ongoing access to healthcare information, real-time monitoring and support, which is crucial and support, which are critical in improving adherence to physical activity recommendations and improving overall health outcomes. physical activity recommendations and improving overall health outcomes overall health outcomes. By integrating objective monitoring, healthcare providers can customize interventions more effectively, reducing bias and healthcare providers can tailor interventions more effectively, reduce bias, and ensure better patient engagement. In conclusion, mHealth and related technologies offer promising solutions to

promote physical activity and improve heart disease management, especially in environments where traditional healthcare access is limited.

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CONFLICT OF INTEREST

There are no disclosed conflicts of interest for the writers.

REFERENCES

1. Roger VL. Epidemiology of heart failure: a contemporary perspective. Circulation Research [Internet]. 2021 May 14; 128(10):1421–34. Available from: https://www.ahajournals.org/doi/10.1161/CIRCRESAHA.121.318172
2. Arjunan P, Trichur Rv. The impact of nurse-led cardiac rehabilitation on quality of life and biophysiological parameters in patients with heart failure. Journal of Nursing Research. 2021 Feb 1;29(1):e130. https://doi.org/10.1097/jnr.0000000000000407
3. Borkowski P, Borkowska N, Borkowski P, Borkowska N. Understanding mental health challenges in cardiovascular care. Cureus [Internet]. 2024 Feb 18; 16(2). Available from: https://www.cureus.com/articles/230162-understanding-mental-health-challenges-in-cardiovascular-care#
4. Jamaludin TSS. Influence of perceive social support or pre-operative support program on quality of life in patients awaiting coronary artery bypass grafting (CABG) surgery: mixed method systematic review. International Journal of Care Scholars. 2019 Jan 31;2(1):36–44. https://doi.org/10.31436/ijcs.v2i1.106
5. Swathi M, Manjusha S, Vadakkiniath IJ, Gururaj A. Prevalence and correlates of stress, anxiety, and depression in patients with chronic diseases: a cross-sectional study. ProQuest [Internet]. 2023 Dec 1; 30(66):66. Available from: https://www.proquest.com/docview/2850926469/fulltextPDF/D11DB0BCA0C741EDPQ/3?accountid=10910
6. Siegersma KR, Stens NA, Groepenhoff F, Appelman Y, Tulevski II, Hofstra L, et al. Sex differences in the relationship between new york heart association functional classification and survival in cardiovascular disease patients: a mediation analysis of exercise capacity with regular care data. Reviews in Cardiovascular Medicine. 2022 Aug 10; 23(8). https://doi.org/10.31083/j.rcm2308278
7. Kunutsor SK, Laukkanen JA. Physical activity, exercise and adverse cardiovascular outcomes in individuals with pre-existing cardiovascular disease: a narrative review. Expert Review of Cardiovascular Therapy. 2024 Mar 15;22(1):1–11. https://doi.org/10.1080/14779072.2024.2328644
8. Meinhart F, Stütz T, Sareban M, Kulnik ST, Niebauer J. Mobile technologies to promote physical activity during cardiac rehabilitation: a scoping review. Sensors. 2020 Dec 24; 21(1):65. https://doi.org/10.3390/s21010065
9. Jamaludin TSS, Jorani S, Saidi S. Knowledge, awareness, and perception of coronary heart disease (CHD) among residents in Kuantan, Pahang, Malaysia. Enfermería Clínica. 2019 Sep; 29:776–9. https://doi.org/10.1016/j.enfcli.2019.04.117
10. Taylor RS, Dalal HM, McDonagh STJ. The role of cardiac rehabilitation in improving cardiovascular outcomes. Nature Reviews Cardiology [Internet]. 2021 Sep 16; 19(3):1–15. Available from: https://www.nature.com/articles/s41569-021-00611-7

11. Lind L, Zethelius B, Byberg L. Self-reported physical activity and different cardiovascular diseases results from updated measurements over 40 Years. Santulli G, Editor. Plos One. 2022 Jun 3; 17(6):e0269402. https://doi.org/10.1371/journal.pone.0269402
12. Suhandal S, Setiawan H, Hidayat N. Inheritance risk calculation strategic and formulation for genetic diseases: a scoping review. Mahesa Malahayati Health Student Journal. 2024 Aug 31;4(9):3958–78. https://doi.org/10.33024/mahesa.v4i9.15248
13. Ariyanto H, Rosa EM. Effectiveness of telenursing in improving quality of life in patients with heart failure: a systematic review and meta-analysis. Journal of Taibah University Medical Sciences [Internet]. 2024 Jun 1; 19(3):664–76. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC11131077/#:~:text=In%20the%20field%20of%20health
14. Jamaludin TSS, Nurumal MS, Sanusi Z A, Che Hasan MK, Firdaus MKZH, Che Abdullah CA, Kyu KKW & Sutrisno RY. (2024). Essential Life-Saving Skills for Schoolchildren: A Scoping Review. International Journal of Care Scholars,. 2024 July; 7(2), 111–119. https://doi.org/10.31436/ijcs.v7i2.370
15. Ariyanto H, Rosa EM. Telehealth improves quality of life of COPD patients: systematic review and meta-analysis. Kontakt [Internet]. 2024 May 3;26(1). Available from: https://kont.zsf.jcu.cz/corproof.php?pdfret=1&tartkey=knt-000000-1328
16. Bakitas MA, Dionne-Odom JN, Ejem DB, Wells R, Azuero A, Stockdill ML, et al. Effect of early palliative care telehealth intervention vs usual care on patients with heart failure. JAMA Internal Medicine. 2020 Sep 1; 180(9):1203. https://doi.org/10.1001/jamainternmed.2020.2861
17. Park LG, Elnaggar A, Lee SJ, Merek S, Hoffmann TJ, Von Opened J, et al. Mobile health intervention promoting physical activity in adults post cardiac rehabilitation: pilot randomized controlled trial. JMIR Formative Research. 2021 Apr 16;5(4):e20468. https://doi.org/10.2196/20468
18. Xu L, Li J, Zhang X, Pang Y, Yu T, Lian X, et al. Mobile health-based gamification intervention to increase physical activity participation among patients with coronary heart disease: Study protocol of a randomised controlled trial. BMJ Open. 2022 Jan; 12(1):e054623.https://doi.org/10.1136/bmjopen-2021-054623
19. Choi EY, Park JS, Min D, Ahn S, Ahn JA. Heart failure-smart life: A randomized controlled trial of a mobile app for self-management in patients with heart failure. BMC Cardiovascular Disorders. 2023 Jan 9;23(1). https://doi.org/10.1186/s12872-023-03039-8
20. Davoudi M, Najafi Ghezeljeh T, Vakilian Aghouee F. Effect of a smartphone-based app on the quality of life of patients with heart failure: randomized controlled trial. JMIR Nursing. 2020 Nov 2;3(1):e20747. https://doi.org/ 10.2196/20747
21. Hudiyawati D, Nur Rosyid F, Pratiwi A, Sulastri S, Kartinah K. The effect of structured education and telemonitoring on self-care, self-efficacy and quality of life in heart failure patients: A randomized controlled trial. Evidence Based Care. 2023 Oct 1;13(3):7-16. http://dx.doi.org/10.22038/EBCJ.2023.69805.2819
22. Atluri N, Mishra SR, Anderson T, Stevens R, Edwards A, Luff E, et al. Acceptability of a text message-based mobile health intervention to promote physical activity in cardiac rehabilitation enrollees: a qualitative substudy of participant perspectives. Journal of the American Heart Association Cardiovascular and Cerebrovascular Disease. 2024 Jan 16;13(2). https://doi.org/10.1161/jaha.123.030807
23. Jiang Y, Koh Kwl, Ramachandran Hj, Nguyen H, Lim Ds, Tay Yk, Et Al. The

Effectiveness Of A Nurse-led home-based heart failure self-management programme (the Hom-Hemp) for patients with chronic heart failure: a three-arm stratified randomized controlled trial. International Journal of Nursing Studies. 2021 Jun;122(3):104026. https://doi.org/10.1016/j.ijnurstu.2021.104026

24. Mizukawa M, Moriyama M, Yamamoto H, Rahman MM, Naka M, Kitagawa T, et al. Nurse-led collaborative management using telemonitoring improves quality of life and prevention of rehospitalization in patients with heart failure. International Heart Journal. 2019 Nov 30; 60(6):1293–302. https://doi.org/10.1536/ihj.19-313
25. Elnaggar A, von Oppenfeld J, Whooley MA, Merek S, Park LG. Applying mobile technology to sustain physical activity after completion of cardiac rehabilitation: acceptability study. JMIR Human Factors. 2021 Sep 2;8(3):e25356. https://doi.org/10.2196/25356
26. Hakala S, Kivistö H, Paajanen T, Kankainen A, Anttila MR, Heinonen A, et al. Effectiveness of distance technology in promoting physical activity in cardiovascular disease rehabilitation: cluster randomized controlled trial, a pilot study. JMIR Rehabilitation and Assistive Technologies. 2021 Jun 18;8(2):e20299. https://doi.org/10.2196/20299
27. Maddison R, Rawstorn JC, Shariful Islam SM, Ball K, Tighe S, Gant N, et al. mHealth interventions for exercise and risk factor modification in cardiovascular disease. Exercise and Sport Sciences Reviews [Internet]. 2019 Apr;47(2):86–90. Available from: https://journals.lww.com/acsm-essr/Pages/articleviewer.aspx?year=2019&issue=04000&article=00005&type=Fulltext
28. Lunde P, Bye A, Bergland A, Nilsson BB. Effects of individualized follow-up with a smartphone-application after cardiac rehabilitation: protocol of a randomized controlled trial. BMC Sports Science, Medicine and Rehabilitation. 2019 Nov 21;11(1). https://doi.org/10.1186/s13102-019-0148-2
29. Crozier A, Cocks M, Hesketh K, Miller G, Mcgregor G, Thomas L, et al. Mobile health biometrics to prescribe immediate remote physical activity for enhancing uptake to cardiac rehabilitation (MOTIVATE-CR+): protocol for a randomised controlled feasibility trial. BMJ open. 2024 Feb 1; 14(2): e076734–4. https://doi.org/10.1136/bmjopen-2023-076734
30. Jiménez-Gómez M, de-Torres-Tajes JP. Association between coronary calcium detection on chest computed tomography and ischemic cardiovascular events and mortality in asymptomatic chronic obstructive pulmonary disease patients. Systematic review of the literature. Open Respiratory Archives. 2024 Oct 1;6(4):100357. https://doi.org/10.1016/j.opresp.2024.100357

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