



Smartphone Digital Applications for Heart Failure Surveillance: A Scoping Review

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ABSTRACT

Background: Developments in the information and digital technology sector have provided a solid foundation for its emergence smartphones. Heart failure is very important to monitor. Given this, a remote monitoring strategy that involves smartphones. **Objective:** to get an overview of digital applications smartphones or m-Health, which allows independent monitoring and remote surveillance of self-care heart failure patients. **Method:** The methodology for this review follows the JBI coverage review methodology. Several searches were made databases: Pubmed, CINAHL, Scopus, and ScienceDirect. The PRISMA-ScR conceptual framework was followed for data extraction and categorization purposes. **Results:** 15 studies were included, screened and assessed for inclusion by 2 independent reviewers involving 8273 patients from 7 different countries. All studies were analyzed as part of this review, facilitating digital application smartphones for self-care heart failure management. 1 study applied fluid measurement, 4 studies applied NT pro-BNP level measurement, and 1 study used bilingual. 5 studies reviewed patient satisfaction levels, 2 studies reviewed staff satisfaction and 4 studies reported LVEF data. **Conclusion:** This review shows that the use of digital applications is based on smartphones can improve self-care management, quality of life, readmission event monitoring, health literacy, monitoring of symptoms, blood pressure, monitoring of NT-Pro BNP levels, monitoring of depressive symptoms, reporting of LVEF results, with positive feedback, good medical results, and satisfaction with the application of this application from patients and staff can be an integral part of the management of heart failure.

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Kata kunci:

Gagal jantung
Pasien gagal jantung
Gagal jantung kongestif
Aplikasi ponsel pintar
Aplikasi m-health
Aplikasi telephone
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Surveillance

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ABSTRAK

Latar Belakang: Perkembangan di sektor informasi dan teknologi digital telah memberikan dasar yang kuat untuk smartphone kemunculannya. Gagal jantung sangat penting untuk dipantau. Mengingat hal ini, strategi pemantauan jarak jauh yang melibatkan smartphone. **TUJUAN:** Untuk mendapatkan gambaran umum smartphone aplikasi digital atau M-Health, yang memungkinkan pemantauan independen dan pengawasan jarak jauh dari pasien kegagalan sendiri. **Metode:** Metodologi untuk ulasan ini mengikuti metodologi ulasan cakupan JBI. Beberapa pencarian dilakukan basis data: PubMed, Cinahl, Scopus, dan ScienceDirect. Kerangka kerja konseptual PRISMA-SCR diikuti untuk tujuan ekstraksi dan kategorisasi data. **Hasil:** 15 studi dimasukkan, disaring dan dinilai untuk dimasukkan oleh 2 pengulas independen yang melibatkan 8273 pasien dari 7 negara yang berbeda. Semua studi dianalisis sebagai bagian dari ulasan ini, memfasilitasi smartphone aplikasi digital untuk manajemen gagal jantung perawatan diri. 1 Studi pengukuran cairan yang diterapkan, 4 studi

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menerapkan pengukuran tingkat NT-BNP, dan 1 penelitian menggunakan bilingual. 5 Studi meninjau tingkat kepuasan pasien, 2 studi meninjau kepuasan staf dan 4 studi melaporkan data LVEF. Kesimpulan: Ulasan ini menunjukkan bahwa penggunaan aplikasi digital didasarkan pada smartphone dapat meningkatkan manajemen perawatan diri, kualitas hidup, pemantauan peristiwa penerimaan kembali, melek kesehatan, pemantauan gejala, tekanan darah, pemantauan tingkat BNP-NT, pemantauan Gejala depresi, pelaporan hasil LVEF, dengan umpan balik positif, hasil medis yang baik, dan kepuasan dengan aplikasi aplikasi ini dari pasien dan staf dapat menjadi bagian integral dari manajemen gagal jantung.

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INTRODUCTION

Self-monitoring, generally defined as awareness to monitor symptoms through measurement, recording, and basic observation, for the successful management of any chronic health condition (Heiney et al., 2020). The positive exploitation of the exponential growth and development seen in the information and communication technology sector in the last decade has provided new solutions to operational challenges such as overcrowding and staff shortages in the healthcare area (Smyth et al., 2022). Heart failure is one condition that has been shown to be easily adaptable to self-management or self-care and remote monitoring. Heart failure affects 6.5 million Americans and more than 26 million people globally, causing a significant symptom burden and human suffering with a considerable economic burden due to rehospitalization events. The prevalence of heart failure is expected to increase by 46% by 2030 (Athilingam & Jenkins, 2018).

Recent studies have discussed the possibility of telemonitoring and observing the health behavior of patients using it smartphones and the possibility of implementing interventions aimed at improving patient health (Park & Lee, 2021). Cellular health (m-Health) is an aspect of telemedicine that focuses on using mobile phone technology to facilitate the exchange of health information between patients and staff. More and more applications are being downloaded by patients and users to personal/handheld smart devices. smartphones, such as mobile phones, tablets which are used as data storage devices, channels for exchanging and sharing health information and storage of disease-specific information and education (Smyth et al., 2022).

This review seeks to identify digital applications smartphones that have been developed, for remote monitoring, of self-care management, type of digital application technology used, feedback from the medical team, patient and staff satisfaction with the application, and medical clinical effects of left ventricular ejection fraction for heart failure patients. m-Health promote the care model self-care precise management by maintaining communication channels between patients, their families and health professionals, while focusing on responsibilities self-care on the patient himself. Using digital applications smartphones can be useful for ongoing communication with chronic patients, increasing motivation, following treatment, and evaluate symptoms disease for early diagnosis of complications of a disease (Giordan, Ronto, et al., 2022). Previous reviews have identified m-Health in the context of all heart failure, including the obsolete model of web and

SMS care (Baker et al., 2011; de Jongh et al., 2012; Vodopivec-Jamsek et al., 2012). Researchers are trying to perfect this existing knowledge by identifying technology in digital applications smartphones for remote monitoring.

METHODS

This review done accordingly with JBI methodology for scoping review Peters et.al, (2020) and in line with Preferred Reporting Items for Systematic Review and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) (Tricco et al., 2018). Scoping review is a method used to identify in-depth and comprehensive literature obtained through various sources with various research methods and has links with research topics (Arksey & O'Malley, 2005). Scoping review aims to answer questions from a predetermined topic by using various sources of similar research articles and then grouping them and making conclusions. The question in this article is "how is the smartphone application for surveillance in heart failure patients?"

Search literature which comprehensive done. With the aim of identifying digital applications smartphone used for remote monitoring of heart failure patients, by conducting a review databases as follows: Pubmed, CINAHL, ScienceDirect and Scopus. Apart from that we also do a secondary quest outside databases in Google Scholar, based on the list of references in the article all literature in

English inclusion and exclusion criteria for the review. Scoping review it uses the population, concept, and context framework recommended by JBI for Scoping review (Tricco et al., 2018). We also consider PICO (patient / population, intervention, comparison, and outcomes), a framework for systematic review in constructing our research questions. The inclusion criteria are follows, Population; heart failure patients, Concept; smartphone digital application, Context; surveillance. The exclusion criteria were: study protocol, published abstracts only, and articles from the conference proceedings.

Eligibility Criteria

The articles used in making this scoping review are related to smartphone applications used for observing or monitoring patients with heart failure. The literature used is in English. Participants in the articles reviewed were patients heart failure as the main focus of application usage

smartphone. Articles that do not use English and editorial notes are excluded.

Selection

Guidelines from the PRIMA-ScR were applied during literature search and screening process (Tricco et al., 2018). Relevant studies that met the inclusion criteria were selected for review in this study. Researchers independently checked the title, abstract, or both, of each selected article, to determine which studies could be assessed further. Types of article study designs, interventions, and outcomes used to conduct assessments. Furthermore, duplicate studies obtained will be deleted. If the article meets the requirements, the full text will be taken for data analysis. The researcher presents the PRISMA-ScR flowchart. Selected articles are reported in tabular form, which contains references, countries, number of samples, details of the technology used in smartphones digital applications, constraints, results and suggestions of researchers.

Data Extraction and Synthesis

Articles that met the inclusion criteria were summarized into data extraction tables. Similar to the screening process described above, the PRISMA-ScR conceptual framework was used to achieve data extraction and categorization while then facilitating the inferences and conclusions drawn. Data extraction was designed to make the following 5 criteria: (1) publication characteristics, including author, publication year, and country of publication (2) study method (3) study sample (4) digital application technology in smartphones (5) result. Objective Scoping review this is to provide a transparent and systematic overview of the monitoring strategy or surveillance remotely involving the patient as a data collector, medical data centers for data storage and

analysis, and healthcare workers to diagnose and perform interventions with the help of digital applications smartphones for self-care heart failure management.

RESULT

Search databases electronics produced 223.836 articles. Scopus database 720, Cinahl 3, ScienceDirect 223.075, and Pubmed 38 articles. A total of 208.360 duplicate articles issued, so that the assessment of the title of the article according to the inclusion criteria was 15.476 articles, 15.000 articles were excluded because the title was irrelevant, so that 476 articles were assessed as abstract according to the inclusion criteria, as many as 400 articles were excluded because full text not accessible, so 76 article full text which were assessed according to the inclusion criteria, then 61 articles were excluded because full text did not meet the eligibility requirements, and only 15 articles were considered to meet the criteria.

Characteristic Articles

There were 15 studies included in this review, whose characteristics are represented in table 1. The included studies were published between 2012–2022, with the majority published during or since 2022. Studies were conducted in 7 countries, 5 from USA, 1 from Canada, 2 from Australia, 2 from Iran, 2 from China, 1 from UK, 1 from Spain and 1 from India. There are 4 studies Randomized Controlled Trial, 1 Pilot Randomized Controlled Trial, 1 Protocol Randomized Controlled Trial, 1 cross-sectional study, 2 systematic review, 3 articles reviews, 1 usability studies, 1 Pilot clinical studies and 1 descriptive qualitative.

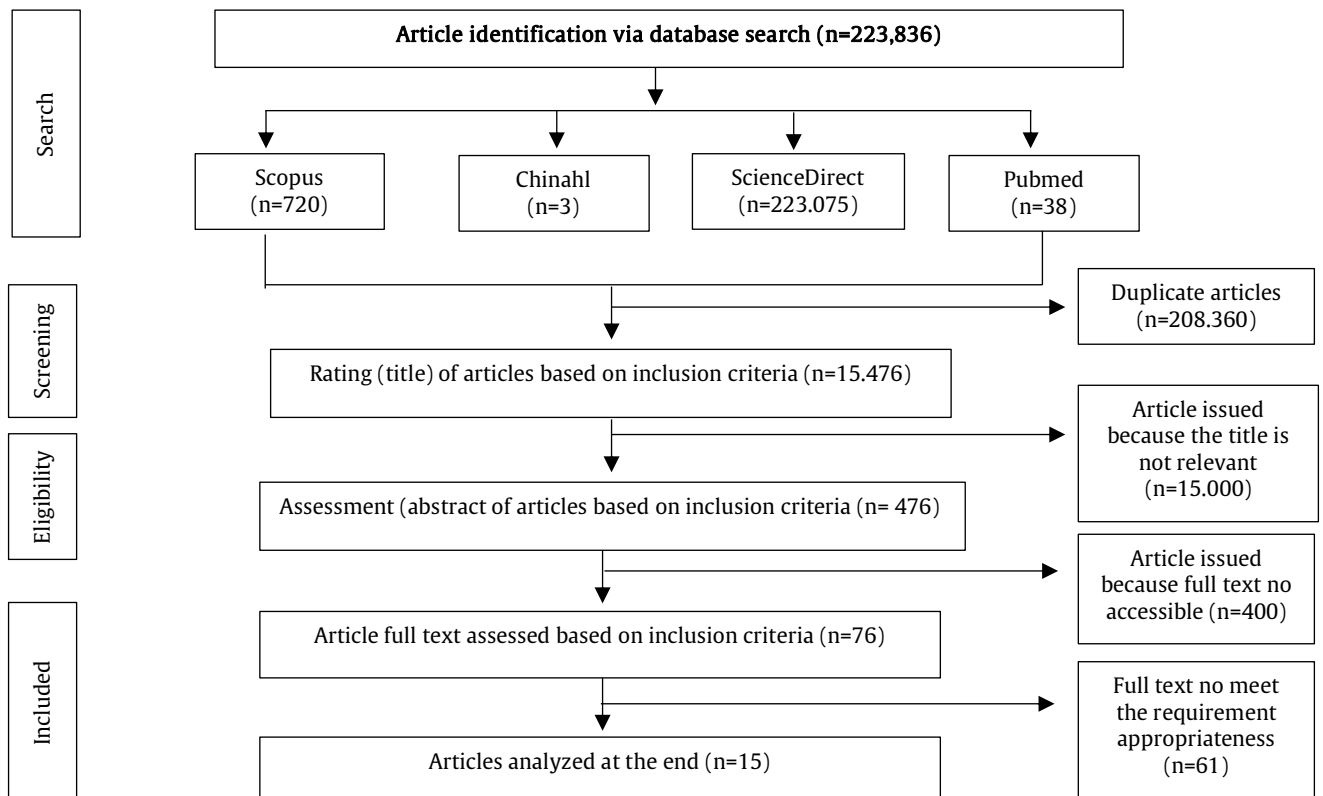


Figure 1. Article Selection Process

Distance far monitoring with smartphone for self-care heart failure

All studies (Creber et al., 2016; Davoudi et al., 2020; Dorsch et al., 2021; Giordan, Tong, et al., 2022; Indraratna et al., 2020; Jain et al., 2019; Johnson et al., 2022; Leigh et al., 2022; Park & Lee, 2021; Schmaderer et al., 2021; Seto et al., 2012; Shen et al., 2022), which included reported uploading of data on self-monitoring of self-care management such as monitoring symptoms, weight, physical activity, medication adherence, and blood pressure in heart failure patients. Only one study implemented a monitoring application intake-output fluids, symptoms, hospitalization information and notes on diuretic use real time namely (Shen et al., 2022). All studies involve the use of an app smartphone. Study participants are given smartphone in the study site were in 1 study (Shen et al., 2022), but in other cases, smartphones patient privacy used. Self-care management application that is independent and compatible with several operating systems, such as Android and IOS, which is used in 14 studies (Athilingam et al., 2017; Bartlett et al., 2014; Bas-Sarmiento et al., 2022; Creber et al., 2016; Davoudi et al., 2020; Dorsch et al., 2021; Giordan, Ronto, et al., 2022; Indraratna et al., 2020; Jain et al., 2019; Leigh et al., 2022; Schmaderer et al., 2021; Seto et al., 2012; Shen et al., 2022; P. Zhang et al., 2015). Only one study was incompatible with the IOS operating system, namely (Park & Lee, 2021). The most frequently disclosed variable in the smartphones application self-care management data or self-care management. Other monitored variables regarding self management, quality of life and readmission events were monitored daily (Athilingam et al., 2017; Davoudi et al., 2020; Dorsch et al., 2021; Park & Lee, 2021; Schmaderer et al., 2021).

Variabels to improve health literacy, self-care management and increasing knowledge of heart failure (Bartlett et al., 2014; Bas-Sarmiento et al., 2022). Variables to monitor symptoms, blood pressure, and NT Pro-BNP levels (Masterson Creber et al., 2016; Seto et al., 2012; Shen et al., 2022; P. Zhang et al., 2015). Variables that review the improvement status of depressive symptoms in heart failure patients are found in one study, namely (Athilingam & Jenkins, 2018). Variables that use two languages or bilingual was in one study (Jain et al., 2019).

Automatic feedback and messages

The use of digital feedback applications by servers to the app in response to patient data on smartphones as a form of follow-up from a team of health and medical personnel found in 10 studies (Athilingam et al., 2017; Bartlett et al., 2014; Bas-Sarmiento et al., 2022; Creber et al., 2016; Giordan, Ronto, et al., 2022; Indraratna et al., 2020; Leigh et al., 2022; Schmaderer et al., 2021; Seto et al., 2012; Shen et al., 2022). In 1 study, this feedback was presented in a digital application in smartphones with images such as color coded traffic lights, green indicates normal results and red indicates the patient's heart failure condition is within abnormal limits (Dorsch et al., 2021). Alerts to patients in the form of messages were generated in settings of above-threshold readings in 2 other studies (Jain et al., 2019; L. Zhang et al., 2015). In 4 another 4 studies (Davoudi et al., 2020; Dorsch et al., 2021; Park & Lee, 2021; Seto et al., 2012), patients were asked and directed to a link questionnaire to complete the effect of the previously used application.

Patient and staff satisfaction with heart failure smartphones digital application

Patients satisfaction was explored in 6 studies (Athilingam et al., 2017; Bas-Sarmiento et al., 2022; Dorsch et al., 2021; Jain et al., 2019; Schmaderer et al., 2021; Shen et al., 2022). Staff satisfaction with this model of providing remote monitoring was evaluated in 2 studies (Jain et al., 2019; Shen et al., 2022), and all studies strongly support the direction of digital transition with digital applications smartphones (Athilingam et al., 2017; Bartlett et al., 2014; Bas-Sarmiento et al., 2022; Creber et al., 2016; Davoudi et al., 2020; Dorsch et al., 2021; Giordan, Ronto, et al., 2022; Indraratna et al., 2020; Jain et al., 2019; Leigh et al., 2022; Park & Lee, 2021; Schmaderer et al., 2021; Seto et al., 2012; Shen et al., 2022; P. Zhang et al., 2015).

Left Ventricular Ejection Fraction / LVEF

Data related to left ventricular ejection outcomes were reported in 4 studies (Athilingam et al., 2017; Dorsch et al., 2021; Park & Lee, 2021; Seto et al., 2012), reporting increase in the patients monitored intervention group heart failure wear application in smartphones with each result; 29.42 versus 29.19 in study (Davoudi et al., 2020). 25 versus 22.75 in study (Park & Lee, 2021). 27.1 versus 27.0 in study (Dorsch et al., 2021).

DISCUSSION

This review provides a comprehensive conclusion or overview regarding the functionality of digital applications smartphones capable of being manifested produces feedback in surveillance patients with heart failure. Researchers have noted that app-assisted monitoring and treatment are undeniable when compared to standard clinic-based monitoring and care in terms of self-care management of heart failure, and in fact, 3 of the studies reviewed identified an increase in left ventricular ejection fraction (Davoudi et al., 2020; Dorsch et al., 2021; Park & Lee, 2021). Such evidence demonstrates the feasibility of adopting monitoring for application-assisted healthcare for heart failure patients. If platforms digital application smartphones as a monitoring aspect or surveillance feasible, as well as want to succeed, hence, the level of patient satisfaction and acceptance as well as the staff must be high. Use new solutions and breakthroughs in healthcare management and remote monitoring, such as digital applications smartphones, requires access that is easy to use, easy to interpret, and aesthetically pleasing. As is well known, that m-Health or digital applications smartphones offers a new approach to delivering content, in information intended to, enhance patient knowledge, modify attitudes, and motivate and change behavior. Patients who are well informed and motivated are able to engage in the daily practices necessary for focused health behaviors, and are more likely to derive greater health benefits (Athilingam & Jenkins, 2018). In this review, researchers have demonstrated that the 9 studies reviewed did not attempt to assess patient and staff satisfaction levels through satisfaction surveys in their applications (Bartlett et al., 2014; Creber et al., 2016; Davoudi et al., 2020; Giordan, Tong, et al., 2022; Indraratna et al., 2020; Leigh et al., 2022; Park & Lee, 2021; Seto et al., 2012; P. Zhang et al., 2015).

Table 1. Data Extraction

Writer, Year	Country	Assisted technology details Apps	Method	Sample	Result
(Dorsch et al., 2021)	USA	ManageHF4Life, version 1 (University of Michigan), together with Fitbit (Fitbit Inc) physical activity monitor (Fitbit Charge 2) and scale (Fitbit Aria and Ari 2).	RCTs	n=83 IG; 42 CG; 41	IG experienced a decrease in the MLHFQ score at week 6 as well as a decrease in readmission events. EFa (%), mean (SD) 37.2 (20) intervention group. 38.8 (19) standard group
(Seto et al., 2012)	Canada	Telemonitoring took daily weight and blood pressure readings and weekly single-lead EKGs, and answered daily symptom questions on a cell phone for 6 months.	RCTs	n=100 IG ; 50 CG ; 50	Improved quality of life through improved self-care and clinical management of mobile phone-based telemonitoring systems, BNP (decreased by 150 pg/mL, P = .02), LVEF (increased by 7.4%, P=.005) and self-care maintenance (increased by 7 points, P = .05) and management (increased by 14 points, P = .03). EF 27.1 VS 27.0
(Indraratna et al., 2020)	Australia	A total of 26 RCTs including 6713 patients were identified and described in this review, and 12 RCTs were included in the meta-analysis.	Systematic review	n=6713	In patients with heart failure, MPI was associated with significantly lower hospitalization rates (244/792, 30.8% vs 287/803, 35.7%; n=1595; or 0.77, 95% CI 0.62 up to 0.97; P=0.03; I2 =0%).
(Athilingam et al., 2017)	USA	The HeartMapp application is downloaded for daily use	Pilot RCT	n=18 IG ; 9 CG ; 9	HeartMapp group participants had significant changes in mean scores on self-care management (8.7 vs 2.3; t3.38=11, P=.01), self-care confidence (6.7 vs 1.8; t2.53=11, P=. 28), and HF knowledge (3 vs -0.66; t2.37=11, P=.04. Depression improved between the two groups, more so in the control group (-1.14 vs -5.17; t1.97=11, P=. 07) Quality of life decreased between the two groups, more so in the control group (2.14 vs 9.0; t-1.43=11, P=.18).EF 28.09
(Leigh et al., 2022)	USA	Survey with 34 questions including the use of the mHealth application to monitor vital signs and manage HF independently	Cross-sectional Survey Study	n=144	Use of mHealth apps and wearable activity trackers (e.g. Fitbits) for self-monitoring of HF-related parameters is low (15/68.22% and 15/100.15%, respectively). The most popular HF-related self-care measures that participants wanted to monitor using mHealth technology were physical activity (46/68, 68%), blood pressure (44/68, 65%), and medication use (40/68, 59%).
(Giordan, Tong, et al., 2022)	Australia	A total of 28 articles (randomized controlled trial [RCT]: n=10, 36%), assessed 23 applications, and a total of 1397 participants entered	Systematic Review of Experimental and Qualitative Studies	n=1397	The most common application features were weight monitoring (19/23, 83%), symptom monitoring (18/23, 78%), and vital signs monitoring (15/23, 65%). Only 26% (23/6) of the applications provided all of the heart failure core components specified by self-management program

(Davoudi et al., 2020)	Iran	Patients in the intervention group received a smartphone-based application and used it daily for 3 months. Then fill out the MLHF questionnaire	RCT	n=120 IG ; 60 CG ; 60	guidelines kelompok intervensi (P <.001). Ukuran efek dari intervensi terhadap kualitas hidup adalah 1,85 (95% CI 1,41-2,3), yang di evaluasi 3 bulan
(Bas-Sarmiento et al., 2022)	Spain	(HF-SMART) programs. The program consists of a secure website with content tailored for patients with chronic HF,	Randomized Controlled Trial	n=31 IG;16 CG;15	The mHealth intervention (app) took 18 months and was completed in 2021. The mobile app is expected to be developed by late 2022, after which it will be applied to experimental groups as an adjunct to standard clinical care for 12 months.
(Creber et al., 2016)	USA	34 apps (MARS) Supporting Heart Failure Symptom Monitoring and Self Care Management.	Systematic Review		34 apps (MARS) Supporting Heart Failure Symptom Monitoring and Self Care Management.
(Shen et al., 2022)	China	highest performing apps include Heart Failure Health Storylines, Simple, ContinuousCare Health Apps, WebMD, and AskMD. AskMD has the highest average total MARS (4.9/5). More than half of the applications (23/34, 68%) had an acceptable MARS score (>3.0).	A Usability Study	n=36	automatically calculates the water content of food and performs I&O analysis in real-time. The mean SUS score was 81.74 (SD 5.44). 36 patients and 80.80 (SD 13.26) among 28 nurses (scale 0–100, with 100 being the best use)
(Bartlett et al., 2014)	UK	SMART (PSMS) for CHF, provides self-management support to people with congestive heart failure (CHF). Two devices are programmed to provide the necessary support;	Review	n=7	PSMS CHF increases knowledge related to heart failure in those who have low levels of knowledge at baseline, by providing information and quizzes.
(Park & Lee, 2021)	Iran	Patients in the intervention group used the My Smart Heart Android smartphone application. for three months every day then fill out the ESHF questionnaire	RCT	n=120 IG; 60 CG; 60	the mean score in the intervention group was lower (p<0.001), indicating better self-care. Based on the results, the intervention effect was reported at 0.787. EF mean±SD 25±8.33 intervention group, 22.75±8.45 control
(P. Zhang et al., 2015)	China	The prediction of HF and non-HF patients was achieved by a structure classification algorithm (SVM).	Pilot Clinical Study	n=34	pilot clinical study of 34 samples, the NT-pro-BNP assay used an accuracy of 79.4% to predict HF at day 7 based on daily weight and blood pressure data, obtained for 30 days
(Jain et al., 2019)	India	Android™ based mobile application named 'Happy Heart' which is peer-reviewed, objective and MARS, which contains 6 modules	Review	N/A	this mobile application, the Mean MARS score is 3.60 ± 0.86 and the subjectivity score is 3.30 ± 1.03. The overall user satisfaction response for the mobile app is 4.09 ± 0.75 indicating that most of the testers find it useful. Contains two languages, Hindi and English.
(Schmaderer et al., 2021)	USA	Exploring experiences using self-management mHealth interventions in individuals with heart failure to inform future mHealth intervention studies	Qualitative	n=10	Study participants were middle-aged (mean age 55.8 years, SD 12 years; range 36-73 years). They had completed an average of 13.5 (SD 2.2) years of education (range 11-17 years). Of the 10 participants, 6 (60%) were male. Half of them (5/10, 50%) were NYHA III and half NYHA IV patients. The intervention revealed four themes of self-management,

including (1) I didn't realize, and now I know; (2) It feels good to focus on my health; (3) I am the leader of my health care team; and (4) My health is improving.

Description: CG; Control Group. IG; Intervention Group. mHealth; mobileHealth. MARS; Mobile Application Rating Scale. HF-SMART: Heart Failure Self-care Application to Reduce Readmission Trial. CHF; Congestive Heart Failure. PSMS; Personalized Self Management System. LVEF; Left Ventricle Ejection Fraction. MPI; Mobile Phone Intervention. MLHFQ; Minnesota Living with heart Failure. SCHFI; Self-care Heart Failure Index. ESHF; European Society of Heart Failure.

and staff must be high. Using a solution and new breakthroughs in management health care and distance monitoring far, like a digital smartphone application, requires easy access to use, easy to interpret, and aesthetic. Such that It is known, that, mhealth or application Digital smartphones offer approaches new to convey content, in information intended to, increase patient knowledge, modify attitudes, and motivate as well change behavior.

Informed patients and well motivated, can be involved in daily practice needed for focused health behavior, and maybe more benefits greater health (Athilingam & Jenkins, 2018). In this review, researchers have shows that 9 studies that were reviewed were not trying to assess the level of satisfaction patients and staff through the satisfaction survey at in the application (Bartlett et al., 2014; Creber et al., 2016; Davoudi et al., 2020; Giordan, Ronto, et al., 2022; Indraratna et al., 2020; Leigh et al., 2022; Park & Lee, 2021; Seto et al., 2012; L. Zhang et al., 2015). 6 Studies assess compliance with patients with monitoring schedules in the application, thus satisfaction canconcluded (Athilingam & Jenkins, 2018; Bas-Sarmiento et al., 2022; Dorsch et al., 2021; Jain et al., 2019; Schmaderer et al., 2021; Shen et al., 2022).

In the satisfaction section assessed, all research reports positive experience from the user group application (Athilingam et al., 2018; Bartlett et al., 2014; Bas-Sarmiento et al., 2022; Creber et al., 2016; Davoudi et al., 2020; Dorsch et al., 2021; Giordan, Ronto, et al., 2022; Indraratna et al., 2020; Jain et al., 2019; Leigh et al., 2022; Park & Lee, 2021; Schmaderer et al., 2021; Seto et al., 2012; Shen et al., 2022; P. Zhang et al., 2015). Such conclusions, including guarantees that self-care management is often reviewed, And often in real time by the team failed heart, feelings of self -efficacy and comfort in regulating yourself. Satisfaction between staff technology users who are connected to applications are only assessed in 2 studies.

Effective management is a theme most often identified. Ensure collaboration and support between all stakeholders in intervention new digital -based health, very It is important for the success of the platform. The impact of the use of resources as well economic benefits have been utilized as a very telemedicine effect profitable, as well as m-health management strategy (Leigh et al., 2022; Vuorinen et al., 2014). Proof increased ejection of the left ventricular fraction on heart failure patients play a role important, if that happens, then the steps self-care management monitoring shows a positive thing, reducing the occurrence of readmissions, can recognize symptoms, better life, and as well as an indicator of quality of life good and increase. Therefore can reduce the burden of costby the hospital. As we know, at all over the world, this treatment of heart

failure, requires a very large cost, so that it becomes a burden on the hospital (Athilingam & Jenkins, 2018; de Jongh et al., 2012).

Strengths and weaknesses

This study presents several forces. The Prism Protocol is followed systematically (Arksey & O'Malley, 2005). We entering experimental, qualitative studies, and other reviews, which allowbetter understanding of impact, acceptance, and preference user, related to digital smartphone applications for self-care management heart failure. Some limits must be considered in the interpretation of our review results. Which first, given the diversity between intervention and a small number of RCT studies. Second, the diversity of research design, sample size, follow - up, intervention, and the size of the results between experimental studies is not enable to draw conclusions which is consistent about the effectiveness of the smartphones digital application in heart failure. Third, there is a feedback delivered the medical team to patients from reviews of all studies, become an indicator the continuation of the digital smartphone application and prove the effectiveness of in handling heart failure patients with long distance. Fourth, there is evidence from study reviews, which prove increase in clinical results, such as improvement of hemodynamics and taunts left ventricle, becomes strength inside our research review.

Whereas the disadvantage, in this research review, there is his studies use the number of samples little, existence of experimental studies, the results still need a lot in further testing, no many review the status of socioeconomic conditions samples that are more or less influential against the results, the questionnaire still doubt the validity and reliability, study which is mostly done in the area urban, which has not touched the area periphery, mostly done in developed countries and only 1 study conducted in the country develop (Jain et al., 2019).

Implications for practice and research

This study contributed to the m-health literature or smartphone digital application against patient's self -care management failed heart. Although almost all studies conducted in developed countries, and only 1 study done in developing countries, with characteristics of respondents or populations of course it will be different from the results If done in developing countries. In developed countries with socioeconomic conditions, high level of education, supported many medical resources, infrastructure technology like satellite to continue data that is almost evenly distributed in every place, maybe the digital smartphone application will easy to adopt and apply. Of course all that, will be very helpful patients, and medical teams in monitoring heart failure patients from a distance. All it will be very helpful in reducing hospital inpatient costs, fees patient accommodation, and will increase quality of life of heart failure patients. Matter similar can be applied by researchers in future, in developing countries, with study the advantages

and disadvantages of Smartphone Digital Application for Surveillance long distance, heart failure patients.

CONCLUSION

This stimulation shows that use smartphone based digital applications can improve self-care management, quality of life, monitoring of readmission events, health literacy, monitoring symptoms, blood pressure, BNP NT-Pro monitoring, monitoring symptoms of depression, reporting of LVEF results, with positive feedback, medical results good, as well as the satisfaction of the application from patients and staff can be a part integral from the management of heart failure.

ETHICAL CONSIDERATION

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The authors did not receive support from any organization for the submitted work.

Conflict of Interest

The authors declare no conflict of interest, financial or otherwise.

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