



O IMPACTO DAS APLICAÇÕES MÓVEIS NO AUTOCUIDADO DA PESSOA COM INSUFICIÊNCIA CARDÍACA: UMA REVISÃO SISTEMÁTICA DA LITERATURA

THE IMPACT OF MOBILE APPLICATIONS ON THE SELF-CARE OF PEOPLE WITH HEART FAILURE: A SYSTEMATIC REVIEW OF THE LITERATURE

EL IMPACTO DE LAS APLICACIONES MÓVILES EN EL AUTOCUIDADO DE LAS PERSONAS CON INSUFICIENCIA CARDÍACA: UNA REVISIÓN SISTEMÁTICA DE LA LITERATURA

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RESUMO

Introdução: A insuficiência cardíaca é uma doença crónica e progressiva, com altas taxas de readmissão hospitalar, de mortalidade e morbilidade. Sendo uma doença crónica, é fundamental que as pessoas adotem comportamentos de autocuidado para poderem gerir mais eficazmente a sua doença. A utilização da tecnologia digital em saúde como o uso de aplicações móveis pode ser um facilitador do autocuidado na pessoa com insuficiência cardíaca.

Objetivo: Identificar a eficácia da utilização de aplicações móveis na melhoria do autocuidado em pessoas com insuficiência cardíaca.

Métodos: Revisão sistemática da literatura nas bases de dados eletrónicas – CINAHL *Complete*, MEDLINE *Complete* e SciELO realizada em janeiro de 2021. Consideram-se artigos publicados entre maio de 2015 e dezembro de 2020.

Resultados: Da pesquisa resultaram 67 artigos, dos quais 7 foram incluídos nesta revisão. Os participantes dos diversos estudos analisados melhoraram o seu autocuidado após a utilização de aplicações móveis.

Conclusão: Os resultados sugerem que a utilização de aplicações móveis é eficaz na melhoria do autocuidado na insuficiência cardíaca.

Palavras-chave: insuficiência cardíaca; aplicações móveis; autocuidado

ABSTRACT

Introduction: Heart failure is a chronic and progressive disease, with high rates of hospital readmission, mortality and morbidity. As a chronic disease, it is essential that people adopt self-care practices to manage their disease more effectively. Digital health technologies, such as mobile applications, can work as facilitators for the self-care of people with heart failure.

Objective: Identify the efficacy of mobile applications in the improvement of self-care in people with heart failure.

Methods: Systematic review of the literature from the electronic databases - CINAHL *Complete*, MEDLINE *Complete* and SciELO carried out in January 2021. Articles published between May 2015 and December 2020 are considered.

Results: The research resulted in 67 articles, and 7 of them were included in this review. The use of mobile applications led to improvements in the self-care of the participants from the various studies analysed.

Conclusion: The results suggest that the use of mobile applications is effective in improving self-care in cases of heart failure.

Keywords: heart failure; mobile applications; self care

RESUMEN

Introducción: La insuficiencia cardíaca es una enfermedad crónica y progresiva, con altas tasas de reingreso hospitalario, mortalidad y morbilidad. Como enfermedad crónica, es fundamental que las personas adopten comportamientos de autocuidado para poder manejar su enfermedad de manera más eficaz. El uso de la tecnología digital de la salud como el uso de aplicaciones móviles puede ser un facilitador del autocuidado en personas con insuficiencia cardíaca.

Objetivo: Identificar la efectividad del uso de aplicaciones móviles para mejorar el autocuidado en personas con insuficiencia cardíaca.

Métodos: Revisión sistemática de la literatura en las bases de datos electrónicas – CINAHL *Complete*, MEDLINE *Complete* y SciELO realizada en Enero de 2021. Se consideran artículos publicados entre mayo de 2015 y diciembre de 2020.

Resultados: La investigación resultó en 67 artículos, de los cuales 7 fueron incluidos en esta revisión. Los participantes de los distintos estudios analizados mejoraron su autocuidado tras utilizar aplicaciones móviles.

Conclusión: Los resultados sugieren que el uso de aplicaciones móviles es eficaz para mejorar el autocuidado en la insuficiencia cardíaca.

Palabras Clave: insuficiencia cardíaca; aplicaciones móviles; autocuidado

INTRODUCTION

Heart failure (HF) is a chronic disease and is a growing challenge to global health, with a major economic burden on health systems. The prevalence is approximately 1 to 2% of the population in developed countries, and this percentage increases to above 10% in people over 70 years of age (Long et al., 2019; Tucker et al., 2019).

Self-care is considered essential in the treatment and management of chronic diseases. This concept can be defined as the person's decision-making process to manage their level of health and clinical well-being through health promotion and disease self-management practices (Riegel et al., 2012). The International Council of Nurses describes self-care as the "activity performed by oneself: dealing with what is necessary to maintain oneself; stay operational and deal with basic and intimate individual needs and activities of daily living" (International Council of Nurses, 2019).

The use of mobile applications can be a facilitator of self-care behaviours, due to the possibility of continuous recording of self-surveillance and self-monitoring, transmission of various data remotely to health professionals, making it difficult to lose information and allowing the person to be monitored remotely (Arulnathan et al., 2019).

In order to verify the existing scientific evidence that reports the association of the use of mobile applications in improving self-care in people with HF, it was decided to carry out a systematic review of the literature to clarify this topic.

1. THEORETICAL FRAMEWORK

HF is a chronic disease characterized by typical symptoms (dyspnoea and activity intolerance) that may be accompanied by elevated jugular venous pressure, pulmonary crackles and peripheral oedema (Ponikowski et al., 2016).

Due to its complex and progressive nature, it usually results in adverse events, such as high rates of hospital readmission, mortality and morbidity, as well as a decrease in the subjective perception of quality of life (Long et al., 2019; Ponikowski et al., 2016; Tucker et al., 2019).

Since HF is a chronic disease, it is necessary to integrate practices and recommendations in self-care, in order to maintain the highest possible level of well-being. Effective self-care involves activities and skills that must be learned and performed to maintain physiological stability, to be better able to quickly and effectively perceive adverse symptoms and to be able to respond to them with self-management interventions (Riegel et al., 2016).

The promotion of self-care in people with chronic diseases is essential throughout the life cycle, due to its impact on morbidity, mortality or hospital readmission due to HF decompensation (Riegel et al., 2012; Riegel & Dickson, 2008).

People with HF should adhere to pharmacological treatment, maintain a healthy diet, cease tobacco use, restrict the consumption of alcoholic beverages, exercise regularly and watch and monitor their signs and symptoms, in order to quickly recognize possible changes in their health status, which will enable them to adapt their behaviours in the self-management of the disease, which may include the use of health services (Toukhsati et al., 2015). This is a dynamic process, in which people choose daily the behaviours that they believe will allow them to maintain clinical stability. According to the theory of self-care in HF, each decision made is based on past experience and information available at the time (Riegel et al., 2016).

The use of mobile applications can be a facilitator of self-care behaviours, sometimes because it can allow the continuous recording of the surveillance and monitoring, or because it is possible that the transmission of various data, such as those measured by the person or even telemonitoring, can be performed remotely for health professionals, making it difficult to lose information and allowing people to be monitored remotely (Arulnathan et al., 2019).

The use of this technology has the main objective of reducing rates of hospital readmission for decompensated HF, and for this purpose they focus on promoting self-care behaviours, improving care even in the hospitalization phase and in the post-discharge period, progressing to residential follow-up (Foster, 2018). These mHealth technologies have the potential to allow patient-centred interventions, using reliable scales and obtaining results in real time (Sharma et al., 2019).

It is estimated that more than 50,000 mobile applications are available in the field of health, particularly focused on physical activity, mental health, general well-being or management of chronic diseases (Athilingam & Jenkins, 2018).

2. METHODS

This study involved a systematic literature review guided by the following research question formulated according to the PICO model: "In patients with heart failure, does the use of mobile applications improve self-care?"

In order to facilitate the search for the best scientific evidence through the search engine EbscoHost, in the electronic databases – CINAHL Complete, MEDLINE Complete and SciELO – Table 1 was prepared. It contains the selected MeSH descriptors and the deconstruction of the research question according to the PICO model.

Table 1 - PICO model and selected Mesh descriptors

Population (P)	<i>Patients with heart failure</i>
Intervention (I)	<i>Use of mobile applications</i>
Comparison (C)	<i>Don't use mobile applications</i>
Outcomes / Results (O)	<i>Improve self-care</i>
MeSH descriptors: heart failure; mobile applications; self-care	

The following Boolean phrase was thus constituted: heart failure AND mobile applications AND self-care.

In preparing a systematic review, it is necessary to define inclusion and exclusion criteria in advance, in order to implement transparent and rigorous criteria. The inclusion criteria were: articles in English, Portuguese or Spanish, published between May

2015 and December 2020. The exclusion criteria defined were: presence of articles that are not published in scientific journals, opinion articles and editorials due to its low methodological quality.

Two independent reviewers selected and identified the original articles for inclusion in systematic reviews, following the recommendations of the PRISMA Statement, as shown in Figure 1.

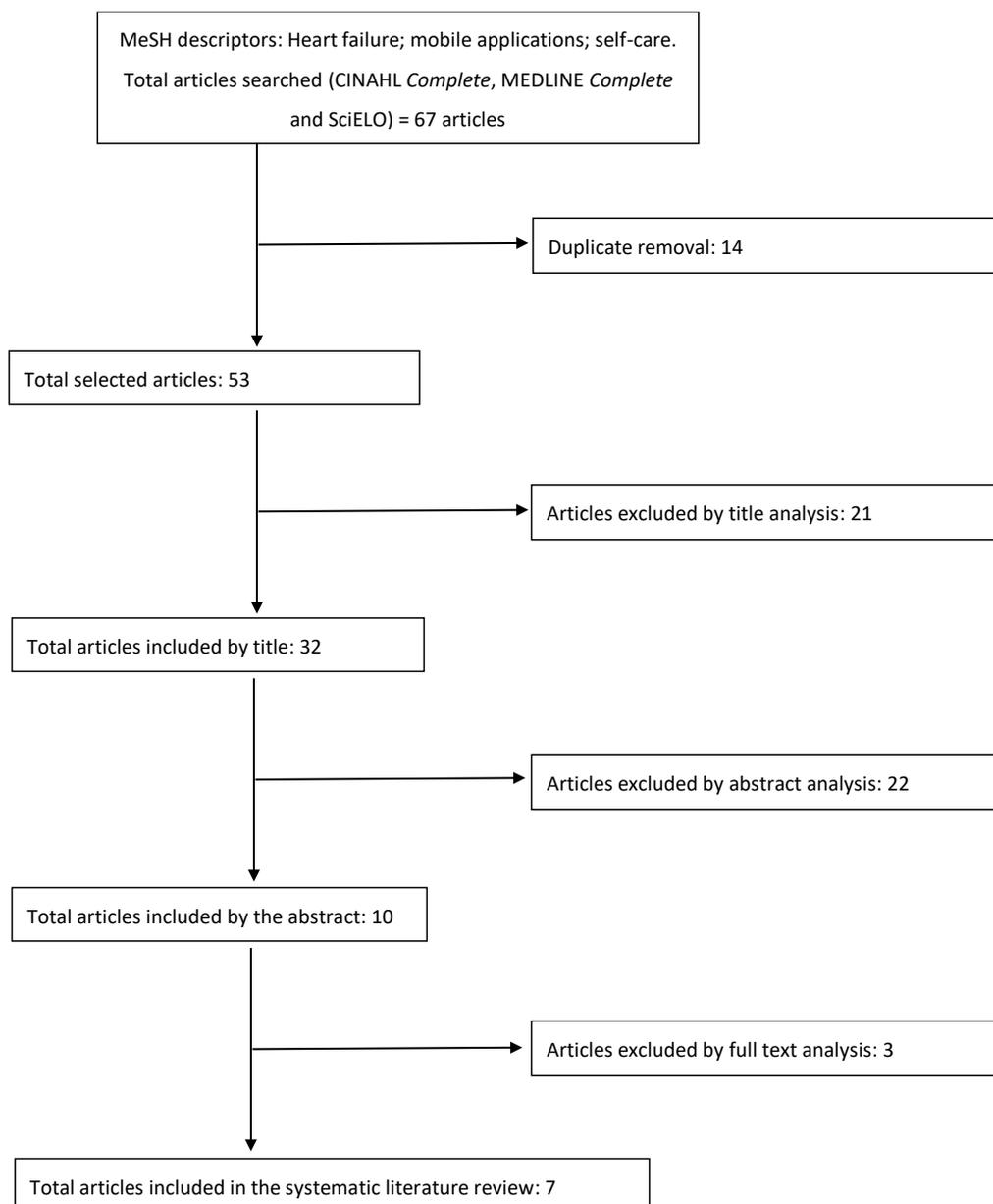


Figure 1 - PRISMA flowchart

For data extraction, a matrix was previously prepared and used independently by the reviewers, composed of the following items: authors/year, objective, participants, methodology, results, conclusion and level of evidence (Table 2).

To assess the level of evidence for each article, the hierarchy of evidence from Joanna Briggs Institute, 2013, was used (Joanna Briggs Institute, 2013).

3. RESULTS

An overview of the seven selected studies with a summary of the main characteristics can be found in Table 2

Table 2 - Summary of the main characteristics of the studies

Authors, year	Objective	Participants	Methodology	Results	Conclusion	Level of evidence
Marva Foster, 2018 (Foster, 2018)	To evaluate the effectiveness of a mobile application in supporting self-care behaviours and improving the perception of symptoms in people with HF and over 50 years of age, in a community context.	10 participants over the age of 50, with HF and in a home context.	Quasi-experimental study in which the participants used a mobile application installed on a mobile phone for 2 weeks. This application provides educational information about HF, allows the insertion of data (blood pressure, pulse, weight and oxygen saturation) and assists the participant's decision-making by reading this data (depending on the data that the participant records, if they are not within normality, the device names a series of possibilities that may solve potential problems). Instruments were applied before and after 2 weeks: HF Somatic Awareness Scale, which measures awareness and anxiety secondary to HF symptoms; Self-care of Heart Failure Index, which measures the person's adherence, confidence and ability to perceive the symptoms of HF and react to them, adopting corrective measures. Student's t test was used to compare the differences between the two moments (pre- and post - intervention).	The score on both instruments improved between the pre- and post-intervention, with a statistically significant difference in the score obtained in the Self-care of Heart Failure Index instrument ($p < 0.05$); Average age of 64.5 years; 6 men and 4 women; 70% of participants with NYHA class II HF.	Self-care for people with HF is facilitated by daily monitoring of physiological data and reminders for taking medication. Symptom assessment using this application helped participants to assess their status and manage their illness. The application seems to be useful in improving self-care, as it encourages the participant to daily monitor the symptoms and signs, helping them to interpret them, which may allow better adaptation and self-management of the disease.	Level 2.b
Athilingam P, Jenkins B, Johansson M, Labrador M, 2017 (Athilingam et al., 2017)	To evaluate the effectiveness of a mobile phone application (HeartMapp) in improving self-care behaviours and improving the quality of life in patients with HF.	18 Participants: Intervention group (n = 9) received all the resources of the application (daily weight, symptom assessment, response to personalized alerts, monitoring vital signs, education about HF and performing breathing exercises and walking); Control group (n = 9) received only education about HF.	Controlled and randomized experimental study. Pilot study. Participants were registered and followed up at home after 30 days. Student's t-test was used to compare the differences between the intervention and control groups and the points between the	The results showed a statistically significant difference between the two groups at day 30, in the average score in self-care management (8.7 vs 2.3; $p = 0.01$), confidence in self-care (6.7 vs 1.8; $p = 0.28$) and knowledge about	The trends demonstrated in this pilot study justify further exploration of the use of the HeartMapp application. There was an improvement in self-management and confidence in self-care, as well as in knowledge about HF.	Level 1.c

Authors, year	Objective	Participants	Methodology	Results	Conclusion	Level of evidence
			two times (pre- and post-intervention). An exploratory correlation analysis was carried out to evaluate the results obtained at the end, compared to those obtained in the initial evaluation	HF (3 vs -0.66; p=0.04). Better results in the experimental group. Depression improved in both groups, with the best results for this variable in the control group (-1.14 vs -5.17; p=0.07). Quality of life improved in both groups, being higher in the control group (2.14 vs 9.0; p=0.18).		
Lloyd T, Buck H, Foy A, et al. , 2019 (Lloyd et al., 2019)	To evaluate the effectiveness of the Penn State Heart Assistant application. This is an application provided via an electronic tablet device, with the aim of improving self-care for people with HF. It aims at self-care activities: daily adherence to medication, weight monitoring and aerobic activity level.	Participants with HF (n = 12) used the program via a tablet for 30 days - recording information and daily monitoring, as well as viewing an educational video	Prospective, non-randomized study, lasting 30 days, with 12 people who were recently discharged from the hospital. Participants would be asked to type on the tablet what medications they were taking, their daily weight measured on a household scale, and how many minutes of aerobic exercise they practised per day.	The results showed adherence to the medication regime: 66% of the participants reported taking 75% of the prescribed medications. The group's adherence over 30 days for weight monitoring and exercise was 84%. There was no persistent weight gain for more than 30 days and there was some indication of weight loss (weight slope vs time was negative (-0.17; p=0.002)), as well as exercise increase (exercise slope vs time was positive (0.08; p=0.04)).	This study suggests that mobile technology is feasible, acceptable and has a potential cost-effectiveness to control people with HF safely at home, improving their self-care.	Level 2.c
Radhakrishnan K, Toprac P, O'Hair M, et al., 2016 (Radhakrishnan et al., 2016)	To develop and test the prototype of a digital game to improve HF knowledge and self-management behaviours of elderly people in the community.	19 elderly participants living in the community with HF. Most are male, Caucasian, over 70 years old and diagnosed with HF for over 10 years; 14 of these participants did not have a university degree; 8 had attended high school or less; 13 had been hospitalized at least once for HF in the past 12 months; 11	The study included three phases: development of the game prototype, evaluation of the use and evaluation of the game's functionality. Validated instruments – the Atlanta Heart Failure Knowledge Test and the Self-Care for Heart Failure Index – were used to measure the improvement in HF self-management knowledge and in	Most participants found the game easy to play, enjoyable and useful for learning about HF. Playing the game resulted in a significant improvement in knowledge about HF self-management, a non-significant improvement in behaviours related to HF self-	It is possible to develop a digital game, for the community context, which allows improving the knowledge of the elderly about self-management of HF.	Level 3.e

Authors, year	Objective	Participants	Methodology	Results	Conclusion	Level of evidence
		had played computer games before.	behaviours related to HF self-maintenance, self-management and self-efficacy, respectively. A post-game survey assessed participants' perceptions of the game. The responses of the participants on the two instruments for the self-management of HF, knowledge and behaviour were assessed using the paired Student's t-test. Correlations were identified for the participants' demographics, game data and answers about the HF knowledge and self-management behaviour instruments.	maintenance and no difference in self-efficacy scores. Participants with a lower level of education and age preferred games to any other means of receiving information.		
Jiang Y, Shorey S, Nguyen HD, et al., 2019 (Jiang et al., 2020)	Develop and test various components of nursing intervention, which will integrate a mobile application (the HOM-HEMP). The goal is to assess its effectiveness in improving self-care behaviours in patients with HF in Singapore.	10 participants were recruited by consecutive sampling of wards in cardiology services at a public hospital in Singapore.	All participants in the pilot study received the intervention package with the complementary mobile application. Outcome measures included Self-Care Heart Failure Index, Cardiac Self-Efficacy Scale, Minnesota Living with Heart Failure Questionnaire, Hospital Anxiety and Depression Scale and the Short Form of the Social Support Questionnaire. Data were collected in an initial assessment and immediately after the study intervention (6 weeks later). The Wilcoxon test was used to assess whether the average differences between the results were significant before and after the intervention.	The results of the pilot test demonstrated that the HOM-HEMP was viable and potentially effective in improving the patient's self-care management, in addition to favourable psychological results and improved quality of life.	A psychosocial education approach to improve self-management is the preferred choice for patients with chronic illnesses. The HOM-HEMP application can help patients with HF to self-manage the disease at home. The effectiveness of HOM-HEMP will be further tested in a large-scale, randomized, controlled study.	Level 2.b
Sharma A, Mentz RJ, Granger BB, et al., 2019 (Sharma et al., 2019)	To test a mobile application (TARGET-HF-DM) to improve physical activity and adherence to the medication regimen in a	200 randomized participants in 4 different e-coaching interventions over a 4-week period. Intervention group = 100; Control group = 100.	Multicentre randomized clinical trial in eligible subjects with HF and DM. Activity levels (measured by pedometers), quality of life (Kansas City Cardiomyopathy	The study demonstrated a significant increase in the primary result of the daily step count from 189 to 250 steps.	This study demonstrated that the TARGET-HF-DM mobile application is useful in improving physical activity in patients with HF and DM.	Level 1.c

Authors, year	Objective	Participants	Methodology	Results	Conclusion	Level of evidence
	randomized controlled study of the population with HF and Diabetes Mellitus (DM).		Questionnaire), adherence to the medication regime and relevant clinical information (including baseline demographic data, socio-economic variables, history of comorbidities and prescribed medications are evaluated. The intervention has 2 phases – 1: feedback on physical activity through an mHealth device; 2: access to a training tool for adherence to the medication regimen (Duke Pillbox). An initial assessment will be performed, one at 3 months of intervention and another at 6 months of intervention. A comparison is made between the intervention group and the control group. The statistical method for testing the primary hypothesis will be the Student t-test.	Subsequently, the data obtained at 3 and 6 months of intervention will be provided, in addition to the benefits for the medication regimen.		
Kiyarosta N, Tahereh T. N, Naghashzadeh F, et al., 2020 (Kiyarosta et al., 2020)	To determine the effectiveness of the mobile smartphone application called My Smart Heart, in improving self-care behaviours in patients with HF.	120 participants who were admitted to an intensive care unit with decompensated HF. Intervention group (n = 60) received the mobile application that contains messages, videos and other educational content. They must register daily the parameters of body weight, vital signs, level of perceived fatigue, peripheral oedema, level of dyspnoea, dizziness, presence of cough, anxiety, depression and chest pain; Control group (n = 60) received routine hospital care, an educational pamphlet and training on correct drug management and scheduling an appointment two	Controlled and randomized experimental study. Participants in the intervention group were trained to use the application at home. The duration of its use was 3 months, with frequent contacts through the application, between the participants and the researchers. These contacts serve to answer the participants' doubts and to reinforce the self-care behaviours resulting from the monitoring data entered by them. Instruments were used before and after the intervention in both groups: European Heart Failure Self-Care Behavior Questionnaire, which is a 12-item	The results showed a statistically significant difference between the two groups at 3 months, in the average score of the instrument used, demonstrating better self-care in the intervention group (p<0.001). Comparing the pre- and post-intervention independently in each group, there was an improvement in self-care after 3 months in the 2 groups (p<0.001).	The results showed that telemonitoring and the educational components provided by this mobile smartphone application can improve self-care behaviours in patients with HF.	Level 1.c

Authors, year	Objective	Participants	Methodology	Results	Conclusion	Level of evidence
		weeks after hospital discharge.	questionnaire on self-care behaviours. To compare the differences between the two moments (pre- and post-intervention) and between the two groups, Student's t-test was used.			

4. DISCUSSION

This review included studies that tested mobile health applications for usefulness and potential effectiveness in improving self-care in people with HF. Although the results related to self-care in HF reported in this review vary, a positive trend was observed with the use of mobile applications.

The use of mobile applications in health can offer a potentially economical solution, allowing the person to be involved in promoting self-care at home (Athilingam & Jenkins, 2018).

This finding was studied by Foster (2018), because it evaluated the effectiveness of an application in a home/community context. It was found that its use improved self-care behaviours, with statistical significance in the difference in scores before and after (use of the application) on the Self-care of Heart Failure Index scale, which assesses adherence, confidence, the ability to perceive the symptoms of HF and react to them, adopting corrective measures. Thus, it is concluded that this application was a facilitator and promoter of self-care for the management of HF in the study participants. The interaction between the device and the person proved to be simple and boosted the person's decision-making.

Despite the positive results, the application was only tested on a sample of 10 participants, without a control group and at home. Apparently, it will have the conditions to be tested in a clinical trial on a larger scale, and although the community context is fundamental in the management of chronic disease, one could also study the effectiveness of this application in the context of hospitalization, or even carry out a broader study, over time, starting in the hospital context and progressing to the home environment (Foster, 2018). Effectively, the community context and the behaviour modulating intervention, in a phase prior to the possible worsening of the disease, is fundamental in the management of HF. However, the application focuses on helping an adequate response that the person must have in the face of changes in their basal state, in order to avoid decompensating the disease. However, for a correct process of self-care, the person must be able to adopt behaviours that prevent these possible health changes and that will be predictive of aggravation. The person must be competent to quickly perceive adverse symptoms in order to act accordingly, but must also prevent these symptoms from appearing in the first instance (Riegel et al., 2016).

In turn, Athilingam and collaborators (2017) decided to evaluate the viability of a mobile phone application (HeartMapp) in improving self-care behaviours and improving quality of life in patients with HF. This application aims at an interactive, person-centred approach, using individualized alerts, focused on their needs, to improve self-care and adherence to therapy. In addition, it allows the monitoring of physiological parameters, through a chest strap. The results obtained are important, with improved self-management and confidence for self-care, as well as knowledge about HF. These results corroborate the idea of the importance of mobile applications in the control of HF. However, these data are sensitive to generalizations, as a small sample was used, as in the previous study. The authors intend to calculate the sample size, necessary for a future large-scale randomized clinical trial.

Contrary to the previous study, this includes the encouragement and monitoring of physical exercise (walking and breathing exercises), which is one of the fundamental components for the management of HF (ACSM, 2018). However, the focus on the experimental group includes education about HF and self-management, depending on symptoms and adverse events, not addressing the maintenance component in the spectrum of the theory of self-care, which reflects the importance of maintaining physiological stability and preventing possible adverse symptoms. (Ponikowski et al., 2016; Riegel et al., 2016).

Similarly, Lloyd and colleagues (2019) intended to assess the impact of an application (Penn State Heart Assistant) on the self-care of people with HF, focusing on daily adherence to medication, weight monitoring and aerobic activity. Participants would be asked to type on the tablet what medications they were taking, their daily weight measured and how many minutes of aerobic exercise they practised per day. The results demonstrated a good adherence to the medication regime (66% reported taking 75% of the prescribed medications). The group's adherence over 30 days for weight monitoring and exercise was 84%. Thus, this study suggests that mobile technology is feasible, acceptable and has a potential cost-effect to control patients with HF safely at home, improving their self-care. The limitations of this study will be very similar to that of Athilingam and collaborators (2017), where the focus will be on the person's reaction to the change in homeostasis. Although an educational video is included in the Penn

State Heart Assistant application, the effective transition to a state in which the person's ability and self-confidence to fully manage their self-care in HF implies a series of interventions and an assessment of whether they are being facilitators of this same transition. Of course, educational videos will be useful tools, but they may be insufficient (Harkness et al., 2015; Toukhsati et al., 2015).

For Radhakrishnan and colleagues (2016), a new way to promote effective self-management skills in elderly people with HF is offered by digital health games. In this way, they sought to develop and test the prototype of a digital game, to improve HF knowledge and self-management behaviours of elderly people in the community. These games can provide flexible, accessible and attractive educational environments within which people can learn about self-management of their illness, seek information, practise skills and receive social support. In this study, there was a significant improvement in knowledge about self-management of HF, a non-significant improvement in behaviours related to self-maintenance and no difference in self-efficacy scores. Participants with a lower level of education and age preferred games to any other means of receiving information, which translates into an important conclusion to be developed.

In another study included in this review, they sought to develop a system of multiple components of nursing intervention to integrate an application, the HOM-HEMP. A psychosocial education approach predominated in order to improve self-care behaviours in patients with HF. The results suggest that this application is potentially effective in improving self-care in people with HF, in addition to improving psychological and quality-of-life components. However, in order to obtain more accurate data, this application will be tested in a large-scale controlled and randomized study (Jiang et al., 2020).

In the study by Radhakrishnan and colleagues (2016) and Jiang and collaborators (2020) the educational component of HF predominates. The focus on this approach is fundamental for effective self-care, and the knowledge that the person with HF has about the pathology and management of the therapeutic regime is essential in their self-care process (Riegel et al., 2012, 2016). Sharma and collaborators (2019) conducted a 6-month randomized multicentre clinical trial, the final results of which are not yet available. Activity levels (measured by pedometers), quality of life, adherence to the medication regime and relevant clinical information are evaluated. The study showed a significant increase in a primary result of the daily step count from 189 to 250 steps. The results obtained in this phase are related only to the level of physical activity. There is an increase in the daily step count, which may not be significant in order to achieve the benefits resulting from the systematic practice of physical exercise. It is recommended that a person with HF practise aerobic exercise, in which walking is the most recommended exercise, since it is easy to perform and without monetary costs. In this type of training, it should be prescribed that the person exercises between 30 and 60 minutes a day and at least 5 times a week. The monitoring of the volume of physical exercise should be calculated using the product of the frequency, duration and intensity of the training (ACSM, 2018; Long et al., 2019).

In the randomized clinical trial conducted by Kiyarosta and colleagues (2020), the effectiveness of a mobile application for smartphones in improving self-care of participants who were hospitalized in an intensive care unit was evaluated. Comparing the intervention group with the control group, they found that the results obtained in the European Heart Failure Self-Care Behavior Questionnaire were better in the intervention group ($p < 0.001$) and better in both groups at 3 months ($p < 0.001$). The authors stated that, with the results obtained, it is suggested that the continuous remote monitoring and the ease with which the participants can ask their questions or that health professionals can interact quickly with the participants, educating and motivating them regarding their health and closely monitoring the signs and symptoms of HF, can be key points in controlling the disease and improving self-care behaviours in patients with HF. One of the important limitations was the exclusion of participants with HF class IV, only including in the study those with HF class II or III (according to the classification of the New York Heart Association). Effectively, patients with HF class IV will be those who are functionally most affected by the disease, with adverse symptoms even at rest. It is essential that these patients are able to manage their disease effectively, with self-care as the central figure in this process (Ponikowski et al., 2016; Riegel et al., 2016).

CONCLUSION

With this review, it was not possible to effectively answer the elaborated research question. However, there is enough scientific evidence to support the potential that mobile applications present in this area, and there must be a continuous investment in clinical trials that test this type of technology.

The major limitation of this review is related to the characteristics of the design or methodology of the included studies, the majority of which are pilot studies with small samples, indicating the possibility of methodological bias.

Given the novelty of mobile health interventions in HF and the emerging evidence on the development of mobile health applications worldwide, it is considered important that these studies be extended to larger samples and with an experimental-type design.

We believe that, in the near future, the use of mobile applications to improve self-care in people with HF will be a fundamental tool in health systems.

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