Journal of Multidisciplinary Healthcare

Dovepress
Taylor & Francis Group

Open Access Full Text Article

REVIEW

Home Exercise Therapy in Patients with Stable Congestive Heart Failure (CHF): A Scoping Review

Iwan Shalahuddin[1], Udin Rosidin[1], Theresia Eriyani[2], Indra Maulana[3], Sandra Pebrianti[4]

[1]Department of Community Nursing, Faculty of Nursing, Padjadjaran University, Sumedang, Indonesia; [2]Department of Basic Nursing, Faculty of Nursing, Padjadjaran University, Sumedang, Indonesia; [3]Department of Psychiatric Nursing, Faculty of Nursing, Padjadjaran University, Sumedang, Indonesia; [4]Department of Medical Surgical Nursing, Faculty of Nursing, Padjadjaran University, Sumedang, Indonesia

Correspondence: Iwan Shalahuddin, Faculty of Nursing, Padjadjaran University, Jl. Raya Ir. Soekarno KM. 21, Hegarmanah, Jatinangor, Sumedang, West Java, 45363, Indonesia, Tel +62 8122338025, Fax +622 287793411, Email shalahuddin@unpad.ac.id

Background: Congestive Heart Failure (CHF) is a chronic condition that drastically lowers patients' quality of life. In addition to pharmaceutical treatment, physical activity is crucial for improving cardiovascular function. However, limited access to health facilities makes home exercise therapy a more realistic option for many patients with stable conditions.

Objective: To identify and map scientific evidence related to the application of home exercise therapy in stable CHF patients and the clinical outcomes it produces, using a scoping review technique.

Methods: The search was conducted using keywords related to the predetermined topic of discussion by applying the PICO approach with keywords about adults with congestive heart failure, home exercise therapy, and cardiac rehabilitation. The databases used in the article search were PubMed, Science Direct, Research Gate, Sage Journals, mbase, Web of Science, and Google Scholar.The literature search was done in accordance with the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-analyses) standards. Articles published in the previous ten years were selected using preset inclusion and exclusion criteria.

Results: The analysis indicated that several types of home exercise treatment, such as light to moderate intensity aerobic exercise, breathing exercises, and structured activity programs, were safe and useful in enhancing functional ability, quality of life, and decreasing rehospitalization rates. Regularity of exercise, family support, and simple monitoring by health workers greatly influenced the success of the intervention.

Conclusion: Home exercise therapy is a feasible and practical approach for patients with stable CHF. Exercise programs tailored to the patient's condition can help improve cardiovascular function while positively impacting psychological and social aspects.

Keywords: congestive heart failure, physical activity, home-based exercise treatment, quality of life, scoping review

Introduction

Heart failure (HF), or congestive heart failure, is a serious condition in which the heart cannot pump sufficient blood to meet the body's metabolic demands, often requiring higher filling pressures. Affecting around 38 million people worldwide, its prevalence continues to rise, with over 6.5 million cases and approximately 960,000 new diagnoses annually.[1] In fact, data from 2018 shows that heart failure is among the top 10 non-communicable diseases in Indonesia, with an estimated 229,696 (0.13%) people suffering from heart failure.[2] The incidence of heart failure, particularly chronic or congestive heart failure (CHF), continues to rise despite advances in detection and management. In 2020, the Global Health Data Exchange reported 64.34 million cases of CHF worldwide, resulting in 9.91 million deaths.[3] In high-income countries like the United States, 1–2% of adults have chronic heart failure, with treatment costs estimated at $346.17 billion. In China, approximately 0.9% of the population, or around 4 million people, are affected by CHF.

Fatigue experienced by heart failure patients occurs when they carry out daily activities.[4] Heart failure is an incurable disease, so sufferers must undergo lifelong treatment to reduce morbidity and mortality. They must undergo treatment,

https://doi.org/10.2147/JMDH.S582501
Received: 18 November 2025
Accepted: 31 January 2026
Published: 10 February 2026

therapy, and regular health checkups. Another study showed that of the 60 heart failure patients studied, 27 patients (42.2%) took their medication on time, 28 patients (43.8%) took the correct dosage, and 32 patients (50%) took the correct type of medication, concluding that heart failure patients have low compliance in managing their treatment. Non-compliance with medication can lead to rehospitalization.[5]

Rehospitalizations are additionally related to a decreased in patients' quality of life. One effort to address these incidents is through cardiac rehabilitation programs. Cardiac rehabilitation programs for heart failure benefit patient fitness, can improve quality of life, increase VO2Max and cardiac endurance capacity, and serve as a preventive measure by preventing worsening heart health.[6] Cardiac rehabilitation is a program that includes exercise, health education, and risk factor counseling for people with heart failure. Home-based cardiac rehabilitation is more cost-effective and time-efficient than hospital-based cardiac rehabilitation. Physical activity is one method of cardiac rehabilitation.[7] Physical activity at home has also been proven to increase exercise capacity and self-efficacy, reduce rehospitalization rates, increase physical capacity, reduce weight, improve autonomic nerve control, improve blood vessel endothelial function, and increase skeletal muscle oxidation capacity.[8] Therefore, the purpose of this study is to identify and map the scientific evidence related to the application of home exercise therapy in stable CHF patients and the clinical outcomes it produces.

Methods

This literature study utilizes a scoping review design, which maps the concepts underlying the research area, sources of evidence, and available evidence types.[9] As shown in Figure 1, the article search was undertaken methodically in accordance with the 2020 PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-analyses) Flow criteria.

This method was chosen because it can improve the quality of publication reporting.[10] The databases used in the article search were PubMed, Science Direct, Research Gate, Sage Journals, mbase, Web of Science, Google Scholar and Neliti.

This literature evaluation included studies on physical activity treatment in adult patients with congestive heart failure (CHF). The selected publications were published within the previous ten years (2012–2023) and were either experimental or interventional studies. The target articles were from all Indonesian and English-speaking countries and were full-text.

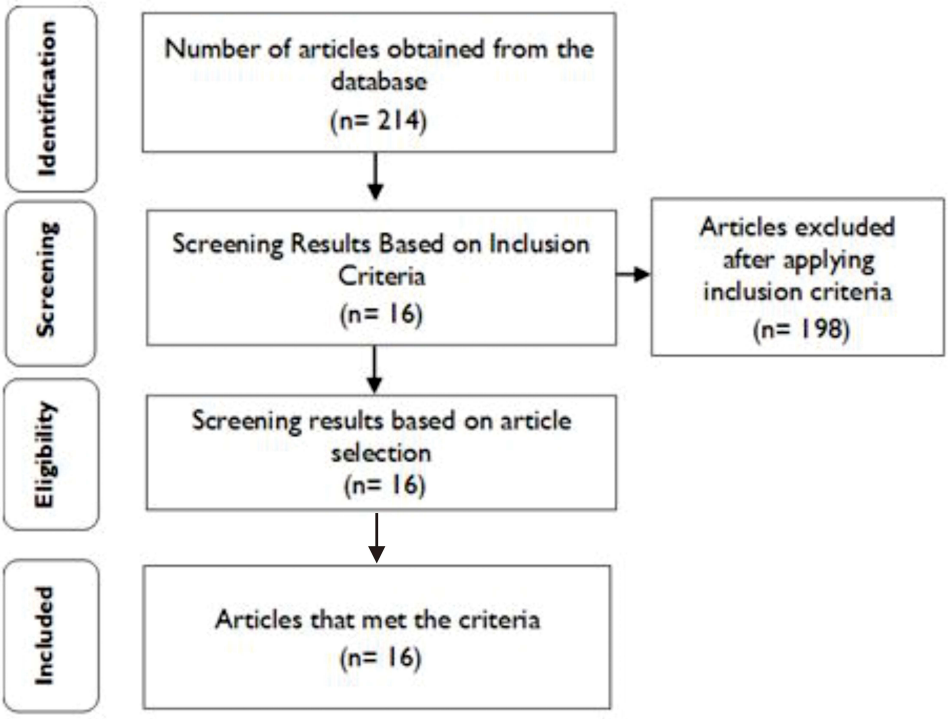

Figure 1 Illustration of the PRISMA flow diagram.

The search was conducted using keywords related to the previously determined topic of discussion by applying the PICO approach according to the database used. The first article search used the PICO formula as described in Table 1:

Literature selection utilized The Joanna Briggs Institute (JBI) Critical Appraisal to examine and analyse the methodological quality of the retrieved papers. The selected papers for evaluation were then assessed for eligibility using (JBI) Critical Appraisal Tools. An article is considered eligible if it meets > 60% of the assessment criteria. All articles (n = 16) in this review were considered eligible because they scored higher than 60%. Table 2 shows the outcomes of the evaluation.

Results

The search results based on the keywords found 214 articles, Articles excluded after applying inclusion criteria 198, Screening Results Based on Inclusion Criteria 16, and 16 Articles that met the criteria discussing "Home exercise therapy for adult patients with congestive heart failure." Following selection using the predefined inclusion criteria, 16 articles were found relevant. These are shown in Table 3.

Table 1 PICO Approach

PICO	Keyword	MeSH Term
P	(Adult with congestive cardiac failure))	Adult, cardiac failure
I	(Physical activity at home))	Physical activity, home care services
C	–	–
O	(cardiac rehabilitation)	Cardiac rehabilitation

Table 2 Literature Selection Evaluation Findings

Article	JBI Critical Appraisal	Study Design	Literature Quality Assessment
(Suharsono, T. et al 2013)[11]	(7/9 x 100%) = 78%	Quasi-experimental with a pre-post design and a control group	Good Quality
(Servantes, D. M. et al 2012)[12]	(9/13 x 100%) = 69%	Randomizedcontrolled trial	Good Quality
(Long L. et al 2019)[13]	(10/13 x 100%) = 76%	Randomizedcontrolled trial	Good Quality
(Permadi, A. W. et al 2020)[14]	(9/13 x 100%) = 69%	Randomizedcontrolled trial	Good Quality
(Chen, X. et al 2018)[15]	(10/13 x 100%) = 76%	Randomizedcontrolled trial	Good Quality
(Piotrowics, E. et al 2014)[16]	(10/13 x 100%) = 76%	Randomizedcontrolled trial	Good Quality
(Gary, R. A. et al 2022)[17]	(11/13 x 100%) = 84%	Randomizedcontrolled trial	Good Quality
(Leite J. C. et al 2020)[18]	(10/13 x 100%) = 76%	Randomizedcontrolled trial	Good Quality
(Doherty, P. et al 2019)[19]	(6/9 x 100%) = 67%	Observations	Good Quality
(Donesky, D. et al 2017)[20]	(11/13 x 100%) = 84%	Randomizedcontrolled trial	Good Quality
(Belardinelli, R. et al 2012)[21]	(11/13 x 100%) = 84%	Randomizedcontrolled trial	Good Quality
(Peng, X. et al 2021)[22]	(10/13 x 100%) = 76%	Randomizedcontrolled trial	Good Quality
(Amedro, P. ei al. 2019)[23]	(9/13 x 100%) = 69%	Randomizedcontrolled trial	Good Quality
(Norman, J. et al 2017)[24]	(10/13 x 100%) = 76%	Randomizedcontrolled trial	Good Quality
(Jiang. Y. et al 2018)[25]	(10/13 x 100%) = 76%	Randomizedcontrolled trial	Good Quality
(Safiyari-Hafizi H. et al 2016)[26]	(10/13 x 100%) = 76%	Randomizedcontrolled trial	Good Quality

Table 3 Article Review Results

No	Title	Objective Study	Population & Sample	Method of Study Design:	Instruments and Variables	Results	Strengths and Weaknesses Research
1	[11]	The purpose of this study was to determine the effect of Home-Based Exercise Training (HBET) on the functional ability of heart failure patients at Ngudi Waluyo Wlingi Hospital.	This study's population consisted of all stable heart failure patients who were indicated for immediate discharge or outpatient care. The sample approach utilized was non-probability sampling, specifically sequential sampling.	This study utilized a quasi-experimental design with a pre-post design and a control group.	This study assessed the variables body mass index (BMI), causes of heart failure, hypertension (HT), ischemic cardiomyopathy (IC), and hypertension and ischemic cardiomyopathy (HT&IC).	After receiving treatment with HBET for four weeks, The functional capacities of the control and intervention groups improved to 290.2 (70.9) and 315.8 (41.5), respectively. Statistical test findings also revealed a significant difference between functional ability before and after treatment with HBET in both the control and intervention groups. The statistical test findings comparing functional ability after treatment between the control and intervention groups revealed a p-value of 0.311 (α=0.05). This indicates there was no significant difference in functional capacity between the control and intervention groups following treatment, despite the fact that the intervention group had a higher average functional capacity.	This study has several strengths, such as comprehensive instruments, but the achievement parameters and variables are not very diverse.
2	[12]	To assess the impact of home-based exercise training on functional capacity, strength, and endurance of the lower body, quality of life, and sleep for patients with chronic heart failure and sleep apnea.	In this study, there were 326 respondents. Fifty respondents met the criteria for this study, groups 1 and 2 each had 18 participants, while Group 3 had 14 people.	Randomized controlled trials (RCT)	Metabolic measures were done using the Medgraphics CPX Ultima system running Breeze Suite 6.41 software (Minneapolis, MN, United States). A 12-lead electrocardiogram (Welch Allyn Cardioperfect, Skaneatles, NY, USA) evaluated the heart rate and rhythm. A mercury sphygmomanometer (Oxygel, São Paulo, Brazil) was used to measure blood pressure at rest and after each step.	45 of the 50 patients in this study completed the research program. In group one, one died; in group two, one suffered a myocardial infarction; and in group three, one died and two had strokes. There was no relationship to training. The training group improved in all measured outcomes, and compliance was an important factor (group 1, 98.5% and group 2, 100.2%, P 0.743). After three months of no training, the untrained group 3 had a substantial reduction or no change in measures.	This study was the first to adequately illustrate that home-based exercise training improves exercise capacity and sleep-disordered breathing in individuals with chronic heart failure, that it improves muscular strength and endurance, and that it is more beneficial than aerobic exercise plus strength training in home-based training for chronic heart failure. The inclusion of respondents is a constraint of this study, as 84.7% of patients treated by heart failure specialists did not match the criteria.

https://doi.org/10.2147/JMDH.S582501

3	[13]	To investigate the impact of exercise-based cardiac rehabilitation on mortality, hospitalisations, and health-related quality of life in persons with heart failure.	There are 216 participants. The research population comprised of individuals (>18 years) with indications of HF (HFrEF or HFpEF).	Multicenter, randomly assigning participants.	Randomized controlled trials (experiments) evaluate two or more interventions, sometimes including a control or no intervention, by randomly allocating individuals to learning groups. Additionally, the Cochrane Central Register of Controlled Trials (CENTRAL), MEDLINE, Embase, the bibliographies of systematic reviews, and two trial registries.	In the short term (<12 months follow-up), CR had no effect on mortality when compared to no exercise control. Low- to moderate-quality data shows that CR may lower the likelihood of hospitalization for all reasons, including HF-specific hospitalization, in the short term (up to 12 months). CR may give clinically significant gains in health-related quality of life, however we are unsure due to insufficient data. Future ExCR studies must continue to explore the enrollment of previously underrepresented HF patient populations, including elderly patients, women, and HFpEF.	Recent studies have typically been found to be of higher quality, with a low to moderate risk of bias. Using the GRADE system, we graded the quality of evidence from high to extremely low across all examined outcomes. Inconsistent and/or inaccurate results are common causes of downgrading outcomes.
4	[14]	The purpose of this study is to increase cardiac functional capacity utilizing a physical exercise program in individuals with heart failure.	This study divided 50 patients (32 men and 18 women) into five groups, each given a different exercise program. According to the New York Heart Association (NYHA) class I and II criteria, patients ranged in age from 45 to 60 years.	Randomized Controlled Trial (RCT)	Data are described using the Statistical Product and Service Solution (SPSS) application for Windows. Paired t-tests were employed to detect the difference in effect across all groups before and after therapy. Duncan post hoc. ANOVA was performed to discover the factors or groups that had the greatest influence on the treatment group.	According to the data analysis results, all therapies had a substantial influence on the functional capability of the hearts of patients with heart failure. The combined effects of Tai Chi, treadmill training, and stationary bicycle training were considerably more optimum in patients with heart failure than therapy without a mix of physical activities including Tai Chi, treadmill training, and stationary bicycle training.	The researchers effectively demonstrated that combining Tai-chi, treadmill exercise, and stationary cycling training improved cardiac functional capacity, indicating advantages for heart failure patients over 50. However, the study has limitations, as Tai-chi exercise alone does not significantly improve blood pressure.

(*Continued*)

https://doi.org/10.2147/JMDH.S582501

Table 3 (Continued).

No	Title	Objective Study	Population & Sample	Method of Study Design:	Instruments and Variables	Results	Strengths and Weaknesses Research
5	[15]	To investigate the effectiveness, safety, and acceptability of adding the BESMILE-HF program to routine therapy for individuals with chronic heart failure	The BESMILE-HF study is a mixed-design research that involves two groups: parallel, randomized controlled trials with 200 chronic heart failure patients and a qualitative component. Patients will be randomized into either an intervention group getting the 12-week BESMILE-HF program plus usual drugs, or a control group receiving only usual meds.	Randomized Controlled Trial (RCT)	A cardiopulmonary activity test was used to determine peak oxygen consumption, while the Minnesota Living with Heart Failure Questionnaire was used to measure quality of life for particular conditions. Secondary outcomes were exercise performance, exercise self-efficacy, overall quality of life, dyspnea and tiredness, depression, heart function, prognostic and inflammatory markers, hospitalizations, prescription usage, and adverse major cardiac events. Assessments will take place at the start of the study, as well as in weeks 4, 8, and 12. Semi-structured interviews will be conducted to gather qualitative data on patients' experiences with the intervention.	EBCR is indicated in CHF recommendations, however it is still in its infancy in China, where EBCR services are limited in most areas. EBCR should be delivered using an evidence-based strategy that is culturally relevant and attentive to individual needs and preferences. The BESMILE-HF trial will offer preliminary data on the efficacy and safety of the EBCR program, which will integrate Baduanjin as a fundamental component in enhancing exercise capacity and quality of life in patients with CHF. Specifically, the BESMILE-HF program has the potential to focus on CHF population segments with low physical functional ability and who are not suited to more severe physical exercise.	This study offers the advantage of demonstrating how to implement an exercise-based cardiac rehabilitation program. Meanwhile, methodological obstacles for this study stem from analyzing complicated treatments as part of EBCR, such as (1) training the entire research team, (2) issues with exercise records, and (3) monitoring additional physical activity. Furthermore, blinding is impossible in this experiment because of the nature of the intervention.
6	[16]	To evaluate the safety, efficacy, adherence, and acceptability of home-based NW telemonitoring in heart failure patients, including those with CIED (cardiac resynchronization treatment and implanted cardioverter defibrillators).	Patients of both genders with left ventricular systolic heart failure (as described in the European Society of Cardiology (ESC) guidelines) I identified for at least three months with a left ventricular ejection fraction (LVEF) of 40% on echocardiography; categorized as New York Heart Association (NYHA) class II or III; clinically stable, and receiving an optimum and stable treatment regimen for at least four weeks.	Randomized Controlled Trial (RCT)	This study's variables include telerehabilitation, Nordic walking training, and heart failure.	So far, only one research was published on the effects of NW compared to traditional cardiac rehabilitation in the setting of stretching exercises, continuous walking training twice a week for 12 weeks in patients with heart failure. Keas et al found that NW was better to traditional cardiac rehabilitation in increasing functional capacity, right handgrip strength, and relieving depressive symptoms in patients with moderate to severe heart failure.	Limitations of our study include the fact that it was a single-center experiment. This study included few women, despite the fact that gender is known to influence rehabilitation efficacy. As a result, these findings cannot be fully applied to the female population. Although our work shows that NW is successful, it does not say whether it is better or worse than other training methods. This issue might be the topic of additional investigation.

https://doi.org/10.2147/JMDH.S582501

7	[17]	The major goal of this study was to examine the efficacy of 12 weeks of aerobic exercise and computerized cognitive training (CCT) treatments on heart failure (HF) self-care behaviors, in comparison to exercise alone or a control group receiving a normal stretching and flexibility program.	The sample included 69 people who completed the baseline evaluation. A total of 952 participants were assessed for research participation; 807 were declared ineligible, 76 rejected, and 69 enrolled, with women (N=37.54%) and Africans (55%). The majority of subjects had a higher education level, and several had mild to moderate CI, indicating the risk of dementia.	Pre–post randomized controlled	Basic descriptive statistics were generated for sociodemographic, clinical, and study factors and were compared between groups. The three study groups' demographics, clinicals, and results were compared using analysis of variance (ANOVA) and chi-square testing.	The results of this study show that self-care management considerably improved across the exercise-only or combined exercise/ computerized cognitive training (EX/CCT) groups, with clinically relevant gains among those in the exercise-only group. The EX/CCT group also shown significant improvements in self-care maintenance. These findings have significant therapeutic implications since self-care management tasks such as detecting and responding correctly to increasing heart failure symptoms are vital to preventing acute exacerbations and later hospitalizations.	This study analyzes the effectiveness of home-based therapies, which differ somewhat from prior studies that incorporated considerable (and hence costly) supplementary components of clinic-based follow-up. The study's shortcomings include discrepancies in main outcomes and a limited sample size, which may lead to misleading comparisons of benefits between our research and the two earlier studies. However, the data suggests that our home-based intervention is at least as successful in lowering admission rates throughout a follow-up period as employed in prior research.
8	[18]	This study assessed the impact of inspiratory muscle training (IMT) combined with a CR program on cardiac sympathetic activity regulation and maximum functional capacity, submaximal functional capacity, diaphragm muscle thickness, and mobility in patients with heart failure.	This study will be a randomized, double-blind, controlled clinical trial including men and women aged 21–60 years with poor physical activity who have been diagnosed with systolic heart failure and a left ventricular ejection fraction of <45%.	Randomized Controlled Trial (RCT)	Participants will be randomly allocated to one of two groups: experimental or control. The control group will follow the usual CR regimen, whereas the experimental group will follow the typical CR routine supplemented with IMT seven days a week. The two planned workout programs will be repeated three times each week for 12 weeks. Prior to and during the intervention regimen, cardiac muscle sympathetic innervation, maximum and submaximal functional capacity, diaphragm mobility and thickness, and participants' quality of life will be assessed.	HF is a rapidly developing public health concern with significant morbidity and fatality rates. This clinical investigation is justified and will be the first study to evaluate the extra effects of IMT on CR and sympathetic activity. Maximal and submaximal functional capacity, diaphragm mobility, thickness, and quality of life in patients with heart failure. The results of this study will help to the development of collaborative therapeutic techniques to explain whether the interaction between IMT and CR can produce clinical improvements for patients with heart failure	The strength of this study is that it is the first study to prove the contribution to developing collaborative therapy techniques that combine IMT and CR to induce clinical improvements for patients with HF. The weakness of this study is that the results have not yet been published.

(*Continued*)

https://doi.org/10.2147/JMDH.S582501

Table 3 (Continued).

No	Title	Objective Study	Population & Sample	Method of Study Design:	Instruments and Variables	Results	Strengths and Weaknesses Research
9	[19]	Develop references from fitness activities that doctors and patients can use to understand their fitness levels and assist in establishing realistic goals for their long-term cardiac rehabilitation and self-management programs	1519 heart failure patients passed the Incremental Shuttle Walk Test (ISWT).	Observations	The ISWT evaluated the maximal walking distance in meters as part of the pre-rehabilitation evaluation, which was the key variable (dependent variable).	The average age was 64.5 years, and ISWT distances varied across gender and concomitant comorbidities, ranging from 215 to 282 meters. Walking distance fell by 4.9 m for each age group above the average. After adjusting for this, women walked 42.1 meters less than males. Lung disease and depression were associated with a decrease in walking distance of 39.3 and 52.2 m, respectively. A BMI greater than 30 was related with a 28.5 m reduction in walking distance. The severity of HF did not enhance the fit of the regression model or achieve significance in the study. Walking fitness in patients with heart failure was substantially influenced by age, gender, and the presence of lung disease or depression.	Although this study investigated many covariates, It did not account for drugs such as diuretics and beta-blockers, which may have produced heterogeneity in the population in terms of weight gain and walking fitness.
10	[20]	The purpose of this study was to investigate the feasibility and clinical results of an 8-week home-based yoga program performed via simplified multipoint video conferencing in a sample of patients with COPD and HF.	The sample in this study consisted of 15 individuals with Chronic Obstructive Pulmonary Disorder (COPD) who matched the criteria and were willing to participate.	Controlled, nonrandomized trial	The variables assessed were: compliance rate, Safety, patient acceptability, and innovative technology issues	The study included fourteen COPD and heart failure patients (7 in the intervention group and 8 in the control group). After the 8-week program, the intervention participants completed the lessons, were able to participate securely, and loved the programs. In the intervention group, the incidence of dyspnea after exercise increased.	The study's weaknesses include a limited sample size and homogenous individuals, which restrict the findings' generality. Because of the convenience sample, there is a danger of selection bias, and the characteristics of the four people who declined to participate in this study cannot be compared to those of the study participants. Report on vital indicators before and after the Tele Yoga session

https://doi.org/10.2147/JMDH.S582501

11	[21]	This research explored the effects of a long-term exercise regimen on the hearts of individuals suffering from chronic heart failure (CHF).	A sample of 123 CHF patients whose status had been stable over the past three months. Following randomization, the trained group (group T, n=63) received supervised ET at 60% of peak oxygen consumption (VO2) twice a week for ten years, whereas the untrained group (group NT, n=60) did not participate in formal exercise.	Randomized Controlled Trial (RCT)	Univariate analysis of peak VO2 with metabolic, clinical, and echocardiographic variables was performed at baseline and every 12 months until the completion of the trial utilizing changes. Cardiopulmonary exercise testing (CPET), echo-Doppler tests, and quality of life (QOL) assessments were performed on all patients at baseline and every 12 months after that.	Throughout the 10-year research, the trained group's peak VO2 was greater than 60% of the age- and gender-predicted VO2 maximum. Peak VO2 in untrained subjects decreased gradually to an average of 52% of the anticipated VO2 maximum. The VE/VCO2 slope was substantially lower in trained patients compared to untrained people. The taught group had considerably higher quality of life scores compared to the untrained group. During the 10-year trial, trained patients had significantly reduced risks of readmission to the hospital and cardiac mortality than controls. In multivariate analysis, peak VO2 and resting heart rate were chosen as independent predictors of occurrences.	This study found a considerable rise in resting EF in the fifth year. It shown a significant decrease in mortality and cardiovascular events. This study is unusual in that the group was supervised and monitored in their exercise regimen, and the coronary club played an important role in promoting participation and compliance over the study period. This study was less robust in terms of cardiovascular events. This study is unusual in that the group was supervised and monitored in their exercise progress, and the coronary club played an important role in boosting participation and compliance over the study period. This study is insufficiently robust to demonstrate the influence of ET on the outcomes. Thus, the considerable reduction in cardiac events and enhanced survival must be validated in a bigger experiment. The impact of long-term fitness regimens on ventilation efficiency is unclear.
12	[22]	Evaluating the impact of a telemedicine fitness training program on health outcomes in heart failure patients.	From January 2014 to February 2015, At a teaching hospital in Chengdu, People's Republic of China, 98 volunteers were randomly assigned to the experimental group (n=49) or the control group (n=49).	Randomized Controlled Trial (RCT)	The Minnesota Living with Heart Failure Questionnaire served as the study's outcome variables. Six-minute walk distance (6MWD), resting heart rate (HR), Hospital Anxiety and Depression Scale, left ventricular ejection fraction (LVEF), and New York Heart Association (NYHA) categorization	The study's findings show that telemedicine exercise training is an excellent alternative strategy for cardiac rehabilitation, particularly in China.	Participants were recruited from only one hospital in Chengdu, which reduced the sample representation. The study was also constrained by basic randomization. Without block randomization or stratification to ensure group equality. The intervention was only short-term, and the follow-up period was limited. The requirement to have a smartphone limited the study's generalization.

(*Continued*)

https://doi.org/10.2147/JMDH.S582501

Table 3 (Continued).

No	Title	Objective Study	Population & Sample	Method of Study Design:	Instruments and Variables	Results	Strengths and Weaknesses Research
13	[23]	The purpose of this study was to investigate the influence of a combined home-based and cardiac rehabilitation program on the quality of life of adolescents, young, and older people (13 to 25 years) with chronic heart failure.	This study included 130 patients with chronic heart failure who were separated into two groups: an intervention group that completed a 12-week cardiac rehabilitation program and a control group.	This study utilized the QUALI-REHAB trial approach, which is a national, multicenter, randomized, controlled investigation.	The majority of the findings of the CPET measurements were maximal oxygen uptake (VO2 max), anaerobic ventilation threshold (TONG), ventilator efficiency (VE/VCO2 slope), oxygen uptake efficiency slope (OUES), and oxygen pulse (VO2/ heart rate).	Quality of life is measured on four multidimensional scales: physical, emotional, social, and school functions, totaling 23 items. Each item utilizes a 5-point Likert scale from 0 to 4. A high score represents an excellent quality of life. The CPET variable is deemed maximal if ¾ of the criteria are satisfied, which include a respiratory ratio of 1, a maximum heart rate >85% of the anticipated maximum age heart rate, the heart rate tolerance limit, and the patient's inability to sustain a minimum pedaling frequency of 60x/minute. Furthermore, physical activity levels are examined using the Ricci and Gagnon questionnaire, knowledge levels using the Leuven knowledge questionnaire for CHD, and anxiety levels using the State and Trait Anxiety Inventory (STAI). The QUALI-REHAB experiment is unique in that it mixes home and inpatient training regimens, making it ideal for adults.	This analysis demonstrates that the majority of these trials assess quality of life as a secondary result, but further research from randomized trials is required as a primary endpoint. Furthermore, the dearth of randomized research makes the impact of rehabilitation programs on this group problematic.

https://doi.org/10.2147/JMDH.S582501

14	[24]	This study investigated the impact and feasibility of mindfulness-based treatments (MBIs) on symptoms and indicators in patients with chronic heart failure in an outpatient clinical environment.	This study included 50 patients who were stable but symptomatic with chronic heart failure, while receiving optimum therapy, with a median sample age of 76 years. Most patients (n=17) were randomized to MBI (mindfulness-based ntervention), an education and training program based on.	Randomized Controlled Trials (RCT)	The instruments used were the Fatigue Severity Scale (FSS) using the Karolinska Sleep Questionnaire Sleep Quality Index (KSQ-sqi). The FSS questionnaire looks at the impact of severe tiredness on everyday performance throughout the previous week, whereas the KSQ-sqi asks four questions regarding difficulties going asleep, recurrent awakenings, early waking, and disturbed sleep.	The results of this study show that an eight-week structured mindfulness-based intervention (MBI) education and training program, in addition to standard therapy in the MBI group, may be useful in lowering the effects of self-reported exhaustion on daily life, instability/dizziness, and shortness of breath/fatigue linked to physical function (NYHA class). MBI significantly improved sleep quality in the MBI group. Positive outcome modifications have the potential to help to lessening the suffering of people with CHF. The NYHA Functional Classification based on self-reported shortness of breath/fatigue appeared to improve in the MBI group, indicating a possible favorable physical effect.	The strengths of this study include a representative population of heart failure patients with verified diagnoses, Comorbidities were clearly present, symptoms were assessed, and the average age was 76 years. Another advantage is the systematic use of MBI in a randomized and controlled way. Although not all individuals were randomly assigned to the research, the two groups looked to be equivalent in terms of characteristics at baseline. The study's shortcomings include its center-based character, limited sample size, and very short-term follow-up.
15	[25]	The purpose of this study is to assess the effectiveness of a home-based psychosocial self-management education intervention conducted by nurses (HOM-HEMP).	The sample in this study included 213 patients admitted for heart failure in the inpatient ward of a tertiary general hospital in Singapore.	This study used a three-level Randomised controlled trial (RCT) with repeated evaluations	All subjects got the standard hospital treatment. Experimental groups A and B got the HOM-HEMP intervention, but experimental group B received an extra smartphone application.	The results indicated that while all individuals increased their self-care over time, this improvement was much more in the two experimental groups than in the control group, Consistent with prior research on multi-component treatments to enhance HF self-care, favorable short-term effects on self-care improvement immediately after the study intervention and up to three months post-intervention were noted.	The study offers various advantages. First, it is the first research to investigate the effectiveness of a nurse-led, home-based self-management intervention combining psychological and mHealth technology components as an intervention method for heart failure patients in Singapore. Traditionally, nurses offer clinical support services after patients were released. To some extent, this paradigm has aided in the migration of clinical treatment from hospitals to community settings. Nonetheless, it has not given adequate attention to the psychosocial requirements of patients. As a result, our study intervention has enhanced the nurse-led patient care paradigm in HF self-care.

(*Continued*)

https://doi.org/10.2147/JMDH.S582501

Table 3 (Continued).

No	Title	Objective Study	Population & Sample	Method of Study Design:	Instruments and Variables	Results	Strengths and Weaknesses Research
16	[26]	The purpose of this research was to examine the safety and efficacy of a 12-week home-based rehabilitation program incorporating interval and resistance training compared to standard treatment.	The study's sample size was 40 individuals with heart failure. Aerobic strength, endurance capacity, ventilation threshold, and quality of life were measured in 40 patients with heart failure before and after 12 weeks. Patients were matched and randomly assigned to either the control (CTL; n = 20) or experimental (EXP; n = 20) conditions. The EXP The CTL group resumed their regular daily activities after 12 weeks of high-intensity intervals and a brief endurance training program.	Randomized Controlled Trial	This study's outcome variables were the 6-minute walk distance (6MWD) and an electronic braking cycle ergometer with direct gas monitoring to determine VO2 peak. The Minnesota Living with Heart Failure Questionnaire, stress testing, medicines, and levels of exercise.	Significant gains were observed in aerobic strength, endurance capacity, ventilation threshold, and quality of life in the EXP group. There were no significant differences in the CTL group. At baseline, patients in both groups were well matched for age, BMI, baseline VO2peak, and NYHA functional class. There was a substantial interaction effect for VO2peak, indicating that EXP increased while CTL decreased after the intervention. We observed substantial gains in aerobic strength, endurance capacity, ventilation threshold, and quality of life in the EXP group. The CTL group showed no significant differences. Patients from both groups were well matched at baseline in terms of age, body mass index, initial VO2peak, and NYHA functional class. There was a significant interaction effect for VO2peak, which represented an increase in EXP and a decrease in CTL throughout the intervention. Minutes for the EXP group against the CTL group. There was a significant interaction effect on Quality of Life, indicated in less unfavorable symptoms in EXP than CTL, which exhibited a modest rise in bad symptoms. There was a substantial interaction effect for the 6-minute walk test, indicating an increase in EXP and a decrease in CTL EXP showed a significant increase in power production and VO2 at the ventilation threshold compared to CTL. There were no adverse activity-related events in EXP and CTL, and EXP had a good adherence to the exercise prescription (77% ± 20%).	This study has crucial implications for treating heart failure (HF), with considerable improvement found in patients. One weakness of this study is the small sample size, which was caused by the use of simple randomization rather than block randomization.

https://doi.org/10.2147/JMDH.S582501

Discussion

Several studies have shown that home exercise treatment is a safe and effective non-pharmacological intervention for stable congestive heart failure (CHF) patients. A training program that includes light-to-moderate intensity aerobic exercise, strength training, and breathing exercises has been proven to enhance patients' functional ability, as seen by increases in 6-Minute Walk Test distance, higher activity tolerance, and peak VO_2.

Furthermore, the majority of trials indicated benefits in quality of life, notably in physical aspects and symptom management such as fatigue and shortness of breath, however the extent of the impact varied depending on the length of the intervention and adherence. Home-based exercise therapy is also linked to fewer hospital admissions and better symptom management, with no increase in serious cardiovascular events, making it a viable option for cardiac rehabilitation, particularly for stable CHF patients with limited access to healthcare services.

In the study[11] Indonesia, The intervention consisted of 30 minutes walking three times a week for four weeks at an intensity of 40–60% heart rate reserve in stable heart failure patients who were recommended for termination or outpatient therapy. After receiving *Home-Based Exercise Training (*HBET) for 4 weeks, the functional capacity of both the control and intervention groups improved. HBET can be used as a nursing modality for heart failure patients. This study demonstrates that home-based cardiac rehabilitation improves aerobic capacity, quality of life, and lowers readmission rates in CHF patients.[27] Research suggests that home-based exercise improves peak VO_2 and 6MWT distance in CHF patients compared to regular activities.[28]

According to research[29,] Using a randomized, prospective controlled trial, 50 patients with persistent heart failure and sleep apnea were randomized and put into two groups: one with aerobic exercise, 2 with aerobic and strength training, and 3 with no training. During the training sessions, no traumatic, orthopedic, or cardiovascular concerns occurred. The results of the data analysis showed significant rise in functional ability, strength, and muscular endurance compared to the non-training group. According to research,[30] it is concluded that cardiac rehabilitation at home is safe and effective in improving the functional capacity of HF patients, although the effects on quality of life, mortality, and readmission vary.

Supporting research results, such as those conducted by[31] In all, 92 (86%) individuals in the REACH-HF group and 93 (85%) in the control group contributed to the primary result. Participants were mostly male (78%) and New York Heart Association class II (59%), with a mean age of 70 years and a mean left ventricular ejection fraction of 34%. Participants with HFrEF (heart failure with preserved ejection fraction), who underwent the innovative 12-week REACH-HF home cardiac rehabilitation intervention in addition to usual treatment, exhibited benefits in disease-specific HRQoL and self-management at 12 months compared with usual care alone. Other research findings reported that home-based exercise had a positive impact on functional capacity, quality of life, and reduced readmission rates within 2–12 months.[32]

Similar studies, such as the results of the study[14] According to the data analysis results, all treatments had a significant impact on the functional capacity of the hearts of patients with heart failure, and the combined effects of tai chi physical exercise, treadmill exercise, and stationary bicycle exercise were significantly more optimal in patients with heart failure than treatment without physical combination.

In the study[24] Used a prospective feasibility study. There were 40 patients at Gothenburg University Hospital in Sweden met the inclusion criteria, namely patients diagnosed with CHF, NYHA functional class II–IV with symptoms of shortness of breath and/or weariness. All were randomly assigned to two groups: a control group of 18 participants and an intervention training group (MBI) of 22. This intervention was performed immediately by qualified educators. The first session featured an overview of the MBI curriculum, which was subsequently examined and reflected on regularly. After that, individuals may do this intervention at home for 20–30 minutes each day, six days a week, for eight weeks.

Mindfulness meditation activities focus attention on thoughts, emotions, and physiological sensations to make persons more aware of sickness and limits in life. The results showed that the intervention group had a significantly lower felt weariness than the control group. Furthermore, the intervention group reported lower symptoms of dizziness or light-headedness and increased physical function.[4]

Freudman Marilyn's functional structural model theory explains the family structure in terms of how families are organized. This concept focuses on role structure, value systems, communication patterns, and power structures. According to Friedman[33] The functions of the family a) Affective function; b) Socialization and socialization venue

function; c) Reproductive function; d) Economic function; e) Health care/maintenance function. This health care function is relevant to *home care*. In this function, the family provides all the needs of the family, both physical food, clothing, shelter, and health care. The ability of families to care for their sick members needs to be improved to achieve a prosperous condition.[34]

Therefore, Friedman's theoretical model was chosen as a guide for the family nursing process because it facilitated the analysis of interactions between family members and between families and the community.[35,36] Based on this theory, our *evidence-based practice* uses the concepts of Friedman's theoretical model to maximize the family's ability to care for family members with heart failure by implementing interventions carried out by the family from home through telenursing or telehealth.

Friedman's Structural-Functional Model Theory (Marilyn M. Friedman) is used because home exercise therapy for stable Congestive Heart Failure (CHF) patients is highly dependent on the family's role as the primary support system. This model views the family as a system whose structure and function mutually influence the health maintenance of family members. A clear family structure allows for the division of roles in monitoring, motivating, and ensuring patient safety during exercise, while family functions particularly healthcare, affective, and coping functions play a crucial role in improving adherence, exercise sustainability, and adaptation to chronic illness. Thus, Friedman's model provides a strong conceptual framework for explaining how family support contributes to the success of home exercise therapy, improved functional capacity, and the quality of life of stable CHF patients.

Chronic heart failure patients can combine standard care with non-pharmacological therapy that can be performed at home. Physical activity can reduce symptoms, enhance exercise tolerance and quality of life, and help patients.[11] Physical activity at home can increase exercise capacity and self-efficacy while decreasing readmissions.[11]

Heart failure patients experience a decline in heart function and neurobiochemical changes as a compensatory response to the disorder. A heart that fails to pump can cause an increase in ventricular volume at the end of diastole, which leads to increased venous pressure and a decrease in cardiac output. This problem results in poor blood circulation and decreased peripheral perfusion, causing heart failure patients to experience fatigue.[37]

We found several physical exercise interventions from articles we reviewed for adult patients with heart failure: walking therapy, aerobic exercise, ancient baduanjin gymnastics, inspiratory muscle training, Tele Yoga, physical education and exercise programs, and chair exercises. These interventions produced different results, but they all helped heart failure patients improve their condition, especially regarding their physical activity capacity.

Based on these interventions, determining the exercises that families can do at home for patients with heart failure requires consideration not only of effectiveness, but also of the ability of families and clients to apply the exercise therapy. Physical exercise instructions are important for defining treatments in telehealth, which comprise components such as frequency, intensity, duration, and form of physical activity. The current trend is to regularly tailor exercises to the patient's capabilities, and to ensure that patients meet their expected targets, individual adjustments and continuous monitoring are required.[11]

Based on our *review*, walking therapy is the most effective intervention to be included in telehealth interventions. This is because, besides being able to be performed by family members without direct supervision by an expert, this intervention also does not require any equipment or costs.[38,39] In addition, the results obtained from this exercise therapy are increased functional capacity, increased respiratory muscle strength, and increased peak VO2.[40,41] Adult patients with chronic heart failure who have been stable for 3 months, with or without sleep apnea, have limited physical functional capacity, a ventricular ejection fraction (EF) $\leq$ 40%, and are receiving outpatient treatment are eligible for this intervention.[42]

Meanwhile, the intensity and duration of walking exercises are adjusted to each patient's condition. However, exercising three times a week is the minimum requirement to positively affect heart function, with an ideal duration of 3–6 months to achieve optimal results.[43,44]

Limitations

This scoping review has limitations, including that most studies originate from countries with more advanced healthcare facilities, making them potentially less relevant to the local context; variations in exercise methods and intensity, leading

to heterogeneity; relatively small sample sizes and short intervention durations; and language limitations, as it only includes articles in English and Indonesian.

Conclusion

Heart failure is a chronic condition that need ongoing treatment and monitoring, with tiredness being a common and severe symptom that hampers everyday activities. Exercise therapy is an essential nonpharmacological treatment for this illness. Walking, aerobic and strength training, tai chi, cardiac rehabilitation, and home-based physical activity have all been shown to improve functional ability, activity tolerance, and health status in adult patients with heart failure.

Acknowledgments

The author wishes to thank the Faculty of Nursing at Padjadjaran University in Sumedang, West Java, Indonesia, for providing help and facilities in producing this scoping review. We also express our highest appreciation to all the author teams that have provided guidance, input, and valuable advice.

Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

Funding

This article did not receive financial support or funding from any institution.

Disclosure

The authors report no conflicts of interest in this work.

References

1. Tsao CW, Aday AW, Almarzooq ZI, et al. Heart disease and stroke statistics - 2023 update: a report from the American Heart Association. *Circulation*. 2023;147:e93–e621. doi:10.1161/CIR.0000000000001123
2. Putri AA, Hudiyawati D. Relationship between heart failure treatment and self-management compliance in congestive heart failure patients. *J Ber Ilmu Keperawatan*. 2022;15:224–230. doi:10.23917/bik.v15i2.15860
3. Lippi G, Sanchis-Gomar F. Global epidemiology and future trends of heart failure. *AME Med J*. 2020;5:15. doi:10.21037/amj.2020.03.03
4. Serenity K, Komariah M, Sriati A. The implementation of mindfulness-based intervention to overcome anxiety in adolescents: a narrative review. *REAL Nurs J*. 2023;6:110. doi:10.32883/rnj.v6i2.2472
5. Agustina A, Afiyanti Y, Ilmi B. Experiences of congestive heart failure patients in implementing self-care. *Heal J*. 2017.
6. Lumi AP, Joseph VFF, Polii NCI. Cardiac rehabilitation in patients with chronic heart failure. *J BiomedikJBM*. 2021.
7. Ulandari S, Munir N, Asnaniar WOS. quality of life level of patients after acute myocardial infarction undergoing exercise-based cardiac rehabilitation program (literature review). *Wind Nurs J*. 2022.
8. Husein M, Waluyo A. the importance of cardiac rehabilitation for coronary heart disease patients. 2019.
9. Tricco AC, Lillie E, Zarin W, et al. A scoping review on the conduct and reporting of scoping reviews. *BMC Med. Res. Method*. 2016;16. doi:10.1186/s12874-016-0116-4
10. Iannizzi C, Akl EA, Anslinger E, et al. Methods and guidance on conducting, reporting, publishing, and appraising living systematic reviews: a scoping review. *Syst Rev*. 2023;12. doi:10.1186/s13643-023-02396-x
11. Suharsono T. Home based Exercise Training. 2015;4:63–68.
12. Servantes DM, Pelcerman A, Salvetti XM, et al. Effects of home-based exercise training for patients with chronic heart failure and sleep apnoea: a randomized comparison of two different programmes. *Clin Rehabilitat*. 2012;26:45–57. doi:10.1177/0269215511403941
13. Long L, Mordi IR, Bridges C, et al. Exercise-based cardiac rehabilitation for adults with heart failure. *Cochrane Database Syst Rev*. 2019;2019. doi:10.1002/14651858.CD003331.pub5
14. Permadi AW, Hartono S, Wahjuni ES, Lestari NKD. The impacts of combination of physical exercise programs on the functional capacity of patients with heart failure. *J Hum Sport Exerc*. 2021.
15. Chen X, Jiang W, Lin X, et al. Effect of an exercise-based cardiac rehabilitation program "Baduanjin Eight-Silken-Movements with self-efficacy building" for heart failure (BESMILE-HF study): study protocol for a randomized controlled trial. *Trials*. 2018;19. doi:10.1186/s13063-018-2531-9
16. Piotrowicz E, Zieliński T, Bodalski R, et al. Home-based telemonitored Nordic walking training is well accepted, safe, effective and has high adherence among heart failure patients, including those with cardiovascular implantable electronic devices: a randomised controlled study. *Eur J Prev Cardiol*. 2015;22:1368–1377. doi:10.1177/2047487314551537

17. Gary RA, Paul S, Corwin E, et al. Exercise and cognitive training intervention improves self-care, quality of life and functional capacity in persons with heart failure. *J Appl Gerontol*. 2022;41:486–495. doi:10.1177/0733464820964338
18. Leite JC, Brandão DC, Brandão SCS, et al. Effectiveness of inspiratory muscle training associated with a cardiac rehabilitation program on sympathetic activity and functional capacity in patients with heart failure: a study protocol for a randomized controlled trial. *Trials*. 2020;21. doi:10.1186/s13063-020-04363-6
19. Doherty P, Harrison AS, Hossain R. Determinants of walking fitness in patients with heart failure attending cardiac rehabilitation. *Open Heart*. 2019;6:e000866. doi:10.1136/openhrt-2018-000866
20. Donesky DA, Selman L, McDermott K, Citron T, Howie-Esquivel J. Evaluation of the feasibility of a home-based teleyoga intervention in participants with both chronic obstructive pulmonary disease and heart failure. *J Altern Complement Med*. 2017;23:713–721. doi:10.1089/acm.2015.0279
21. Belardinelli R, Georgiou D, Cianci G, Purcaro A. 10-year exercise training in chronic heart failure: a randomized controlled trial. *J Am Coll Cardiol*. 2012;60:1521–1528. doi:10.1016/j.jacc.2012.06.036
22. Peng X, Su Y, Hu Z, et al. Home-based telehealth exercise training program in Chinese patients with heart failure A randomized controlled trial. *Med*. 2018;97:e12069. doi:10.1097/MD.0000000000012069
23. Amedro P, Gavotto A, Legendre A, et al. Impact of a centre and home-based cardiac rehabilitation program on the quality of life of teenagers and young adults with congenital heart disease: the QUALI-REHAB study rationale, design and methods. *Int J Cardiol*. 2019;283:112–118. doi:10.1016/j.ijcard.2018.12.050
24. Norman J, Fu M, Ekman I, Björck L, Falk K. Effects of a mindfulness-based intervention on symptoms and signs in chronic heart failure: a feasibility study. *Eur J Cardiovasc Nurs*. 2018;17:54–65. doi:10.1177/1474515117715843
25. Jiang Y, Koh KWL, Ramachandran HJ, 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. *Int J Nurs Stud*. 2021;122:104026. doi:10.1016/j.ijnurstu.2021.104026
26. Safiyari-Hafizi H, Taunton J, Ignaszewski A, Warburton DER. The health benefits of a 12-week home-based interval training cardiac rehabilitation program in patients with heart failure. *Can J Cardiol*. 2016;32:561–567. doi:10.1016/j.cjca.2016.01.031
27. Chen YW, Wang CY, Lai YH, et al. Home-based cardiac rehabilitation improves quality of life, aerobic capacity, and readmission rates in patients with chronic heart failure. *Med*. 2018;97(4):1–5.
28. Chien CL, Lee CM, Wu YW, Chen TA, Wu YT. Home-based exercise increases exercise capacity but not quality of life in people with chronic heart failure: a systematic review. *Aust J Physiother*. 2008;54(2):87–93. doi:10.1016/S0004-9514(08)70041-2
29. Suna JM, Mudge A, Stewart I, Marquart L, O'Rourke P, Scott A. The effect of a supervised exercise training programme on sleep quality in recently discharged heart failure patients. *Eur J Cardiovasc Nurs*. 2015;14:198–205. doi:10.1177/1474515114522563
30. Promwong W, Meenongwah J, Kenbubpha K, Suyasa IGPD. Effectiveness of home-based cardiac rehabilitation programs on health outcomes of persons with heart failure: an umbrella review. *Belitung Nurs J*. 2025;11(5):517–527. doi:10.33546/bnj.3994
31. Dalal HM, Taylor RS, Jolly K, et al. The effects and costs of home-based rehabilitation for heart failure with reduced ejection fraction: the REACH-HF multicentre randomized controlled trial. *Eur J Prev Cardiol*. 2019;26:262–272. doi:10.1177/2047487318806358
32. Babu A, Maiya A, George M, Padmakumar R, Guddattu V. Effects of combined early in-patient cardiac rehabilitation and structured home-based program on function among patients with congestive heart failure: a randomized ontrolled trial. *Hear Views*. 2011;12(3):99. doi:10.4103/1995-705X.95064
33. Aji RP. Family support is related to self-care behavior in heart failure patients in surabaya. *J Penelit Kesehat Suara Forikes*. 2021;12:26–30.
34. Nuraenah N, Dewi IP, Aisyah PS. Kompetensi family caregiver dalam merawat anggota keluarga dengan perawatan paliatif. *Univ Muhammadiyah Yogyakarta Undergrad Conf*. 2020.
35. Friedman F. *Family Nursing Textbook: Research, Theory, and Practice*. 5th ed. Jakarta: EGC. Galang Tanjung; 2015.
36. Mukrimaa SS, Nurdyansyah, Fahyuni EF, CITRA YULIA, et al. Family and community nursing: nursing teaching materials. *J Penelit Pendidik Guru Sekol Dasar*. 2016.
37. Walthall H, Floegel T, Boulton M, Jenkinson C. Patients experience of fatigue in advanced heart failure. *Contemp Nurse*. 2019;55:71–82. doi:10.1080/10376178.2019.1604147
38. Kaharuddin RMA, Permatasari H, Fitriyani P. The use of m-health applications in lifestyle changes for heart failure patients in the community. *J Keperawatan Jiwa*. 2022.
39. Dianita EM, Sukartini T, Pratiwi IN. Development of an android-based autogenic relaxation application for stress levels in heart failure patients. *Care J Ilm Ilmu Kesehat*. 2023.
40. Utomo B, Kusumawati YR. The effect of aerobic exercise on vo2max in physiotherapy students at surakarta polytechnic. *J Keterapian Fis*. 2025;10(1):56–62. doi:10.37341/jkf.v10i1.453
41. Akhlaqul D, Eko K. The influence of cardio exercise on increasing VO2Max. *J Phys Act*. 2022;3(1):27–30.
42. Pranata R, Yonas E, Siswanto BB, Purwowiyoto BS. Exercise training in heart failure: role, prescription and program. *Indones J Cardiol*. 2018;38:226–233. doi:10.30701/ijc.v38i4.788
43. Verberk WCEP, Sandker JF, van de Pol ILE, et al. Body mass and cell size shape the tolerance of fishes to low oxygen in a temperature-dependent manner. *Global Chang Biol*. 2022;28:5695–5707. doi:10.1111/gcb.16319
44. Rachmatullah R, Widyatuti W, Sukihananto S. Pengaruh Brisk Walking Exercise terhadap Penurunan Tekanan Darah: systematic Review. *Faletehan Heal J*. 2022;9:100–110. doi:10.33746/fhj.v9i01.388