Master Course in Heart Failure | 25 BAKU

Baku Marriott Hotel Boulevard
30st of May - 1st of June

Azerbaijan Society of Cardiology

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HFA Heart Failure Association

Lifestyle interventions: key issues of diet and exercise

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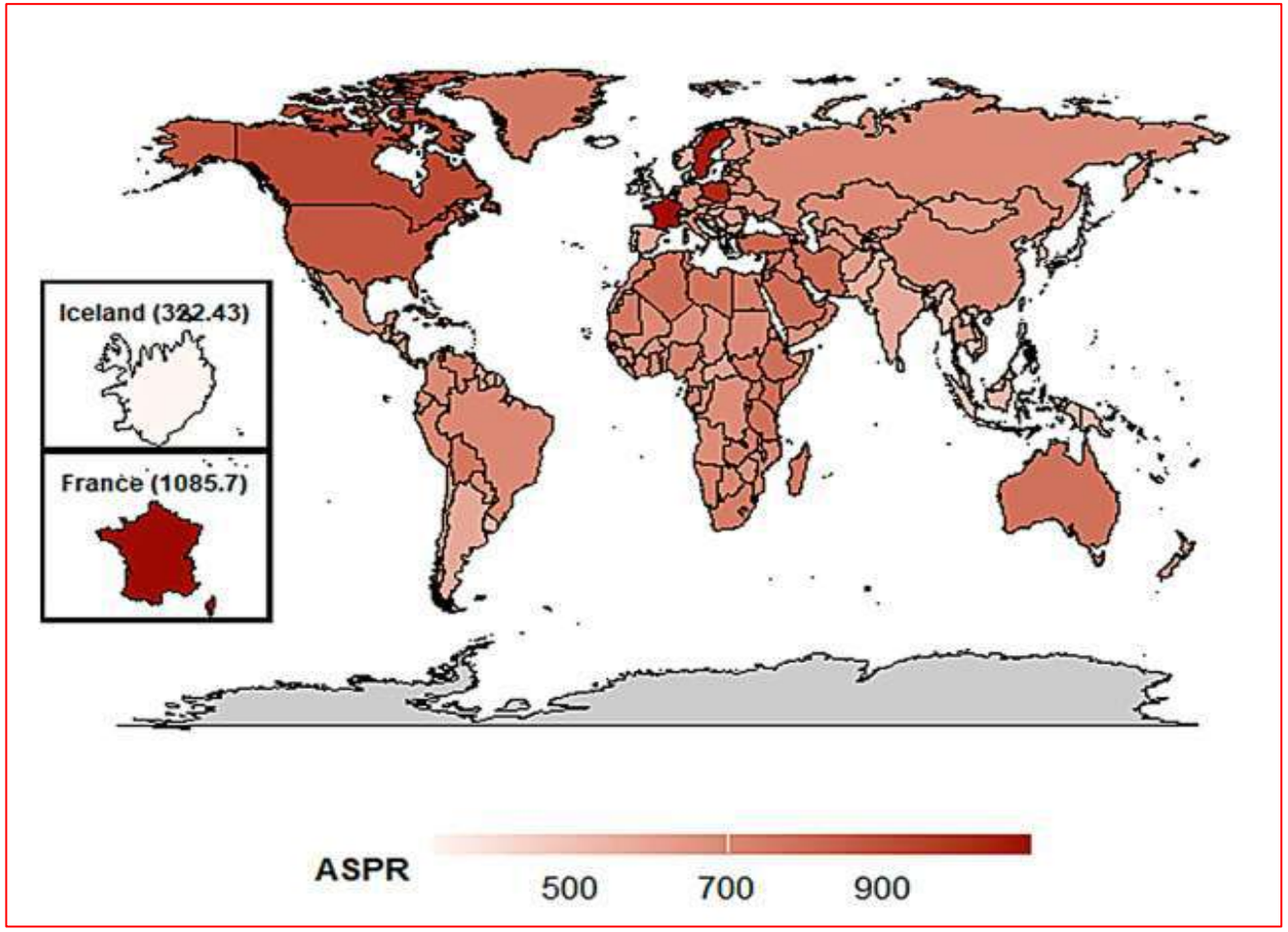
Disclosure

I have nothing to declare

Global, regional, and national burden of heart failure and its underlying causes, 1990–2021: results from the global burden of disease study 2021



Heart failure is a rapidly growing public health issue with an estimated prevalence of 64 million people globally.

This is a highly comorbid condition associated with significant mortality, despite advances in current medical management.

B.Shahim, et al. *Cardiac Failure Review 2023;9:e11.*

Ran, J.. et al. *Biomark Res 2025; 13, 16.*

https://doi.org/10.1186/s40364-025-00728-8

ESC European Society of Cardiology

European Heart Journal (2021) 42, 3599–3726
doi:10.1093/eurheartj/ehab368

ESC GUIDELINES

2021 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure

Developed by the Task Force for the diagnosis and treatment of acute and chronic heart failure of the European Society of Cardiology (ESC)

With the special contribution of the Heart Failure Association (HFA) of the ESC

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ESC Clinical Practice Guidelines Committee (CPG): listed in the Appendix.

ESC subspecialty communities having participated in the development of this document:

Associations: Association for Acute CardioVascular Care (ACVC), Association of Cardiovascular Nursing & Allied Professions (ACNAP), European Association of Cardiovascular Imaging (EACVI), European Association of Preventive Cardiology (EAPC), European Association of Percutaneous Cardiovascular Interventions (EAPCI), European Heart Rhythm Association (EHRA), Heart Failure Association (HFA).

Councils: Council of Cardio-Oncology, Council on Basic Cardiovascular Science, Council on Valvular Heart Disease.

Working Groups: Adult Congenital Heart Disease, Cardiovascular Pharmacotherapy, Cardiovascular Regenerative and Reparative Medicine, Cardiovascular Surgery, e-Cardiology, Myocardial and Pericardial Diseases, Myocardial Function

Patient Forum

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Multidisciplinary interventions recommended for the management of chronic heart failure

Recommendations	Class[a]	Level[b]
It is recommended that HF patients are enrolled in a multidisciplinary HF management programme to reduce the risk of HF hospitalization and mortality.[309,314,315,316]	I	A
Self-management strategies are recommended to reduce the risk of HF hospitalization and mortality.[309]	I	A
Either home-based and/or clinic-based programmes improve outcomes and are recommended to reduce the risk of HF hospitalization and mortality.[310,317]	I	A
Influenza and pneumococcal vaccinations should be considered in order to prevent HF hospitalizations.[315,316]	IIa	B

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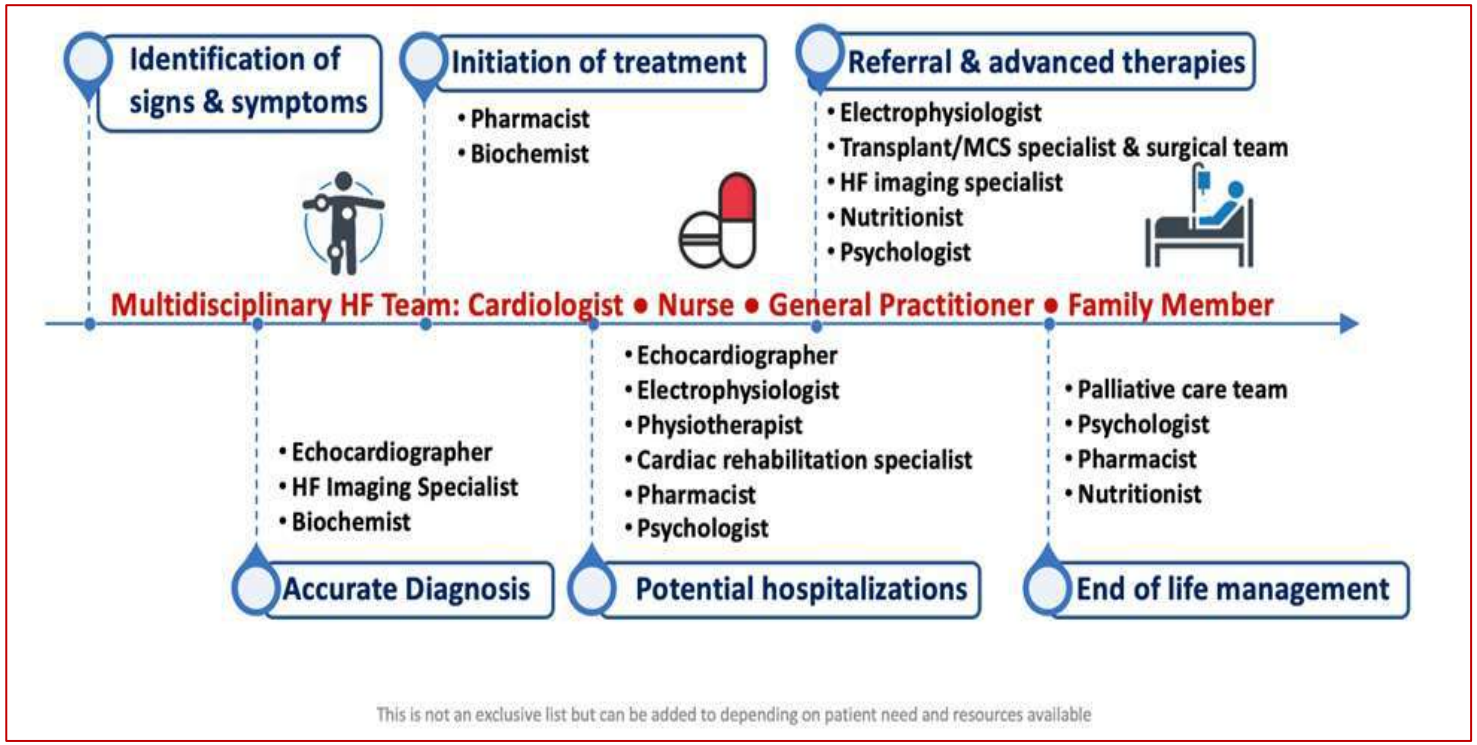
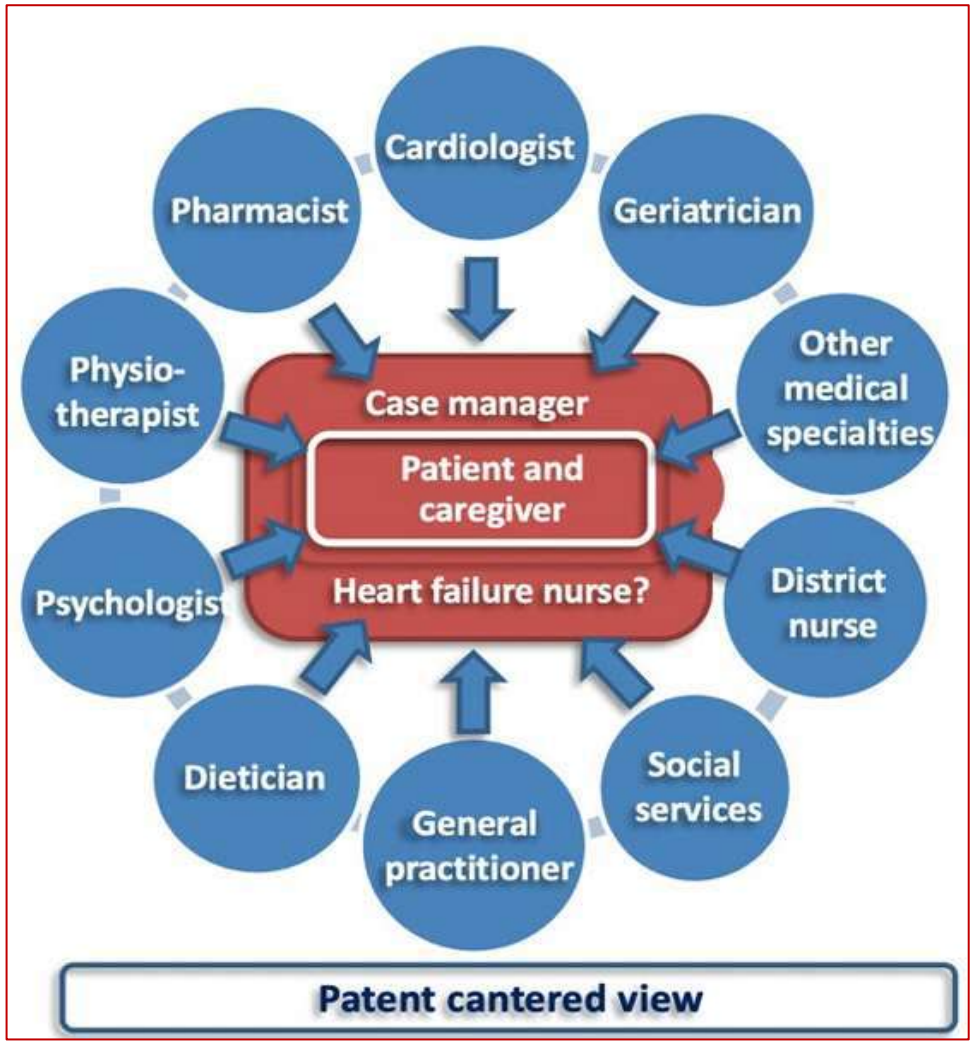
https://academic.oup.com/eurheartj/article/42/36/3599/6358045?login=false#305163067

Multidisciplinary approach to heart failure management

Hill, L., Koehler, F., Jaarsma, T., Polovina, M., McCreary , K., & Coats, A. J. S. (2023). Multidisciplinary approach to heart failure management. In P. Seferovic, A. Coats, G. Filippatos, J. Bauersachs, & G. Rosano (Eds.), *The ESC textbook of heart failure* (pp. 913-922). (The European Society of Cardiology Series), (Oxford Textbooks in Cardiology). Oxford University Press. https://doi.org/10.1093/med/9780198891628.003.0082

Published in:
The ESC textbook of heart failure



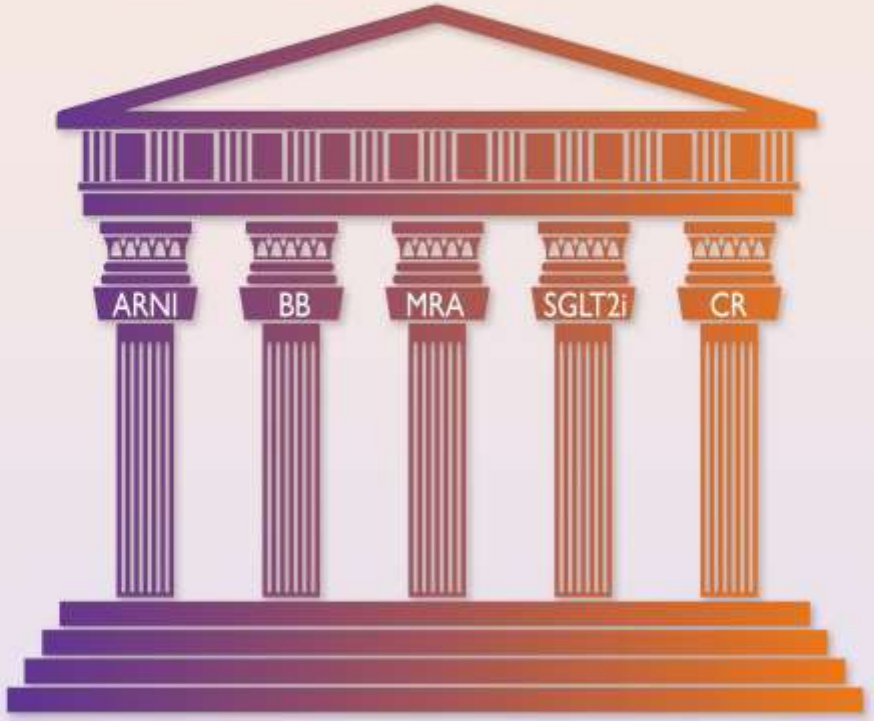


chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://pure.qub.ac.uk/files/430920409/Multidisciplinary_Approach_to_Heart_Failure_Managementv6_ajscLH.pdf

Cardiac rehabilitation for heart failure (HF) improves health-related quality of life and contributes to reduced hospitalization and is Class I / level A evidence by international (US & EU) Guidelines

Despite this, referral to cardiac rehabilitation for HF is suboptimal and currently ranges from **5% to 50%** across countries

Cardiac rehabilitation should be the 5th pillar in HF management alongside drug and medical device provision



Choice of cardiac rehabilitation delivery models (centre-based/home-based ± digitally supported) should be developed and be available to patients in the future

Eur Heart J, Volume 44, Issue 17, 1 May 2023, Pages 1511–1518,
https://doi.org/10.1093/eurheartj/ehad118

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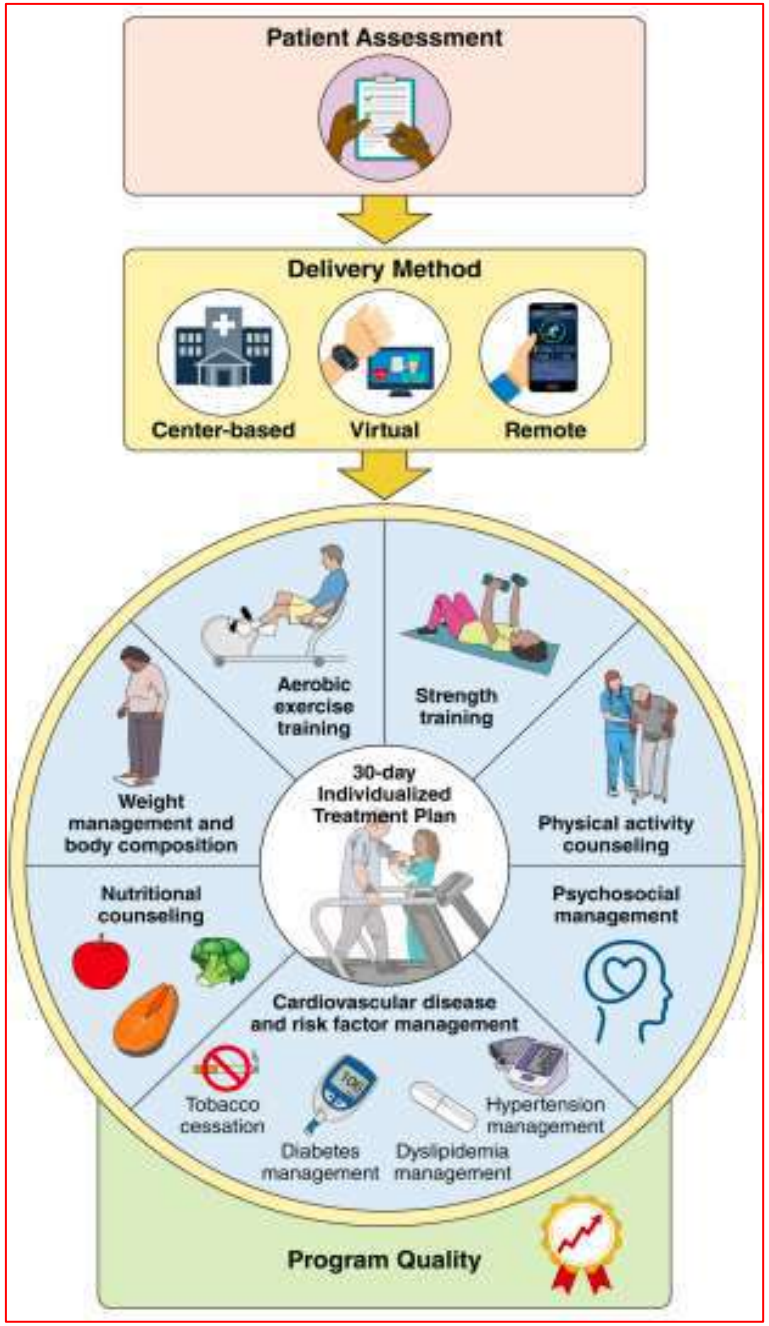
Circulation

AHA SCIENTIFIC STATEMENT

Core Components of Cardiac Rehabilitation Programs: 2024 Update: A Scientific Statement From the American Heart Association and the American Association of Cardiovascular and Pulmonary Rehabilitation

Endorsed by the American College of Cardiology

Delivery methods and core components of cardiac rehabilitation programs



Circulation. 2024;150:e328–e347. DOI: 10.1161/CIR.0000000000001289

JOURNAL ARTICLE GUIDELINES

2021 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure: Developed by the Task Force for the diagnosis and treatment of acute and chronic heart failure of the European Society of Cardiology (ESC) With the special contribution of the Heart Failure Association (HFA) of the ESC FREE

Theresa A McDonagh , Marco Metra , Marianna Adamo , Roy S Gardner , Andreas Baumbach , Michael Böhm , Haran Burri , Javed Butler , Jelena Čelutkienė , Ovidiu Chioncel ... Show more

Author Notes

European Heart Journal, Volume 42, Issue 36, 21 September 2021, Pages 3599–3726,
https://doi.org/10.1093/eurheartj/ehab368

Published: 27 August 2021

EXERCISE REHABILITATION

Recommendations	Class[a]	Level[b]
Exercise is recommended for all patients who are able in order to improve exercise capacity, QOL, and reduce HF hospitalization.[c] 324–328,335–337	I	A
A supervised, exercise-based, cardiac rehabilitation programme should be considered in patients with more severe disease, frailty, or with comorbidities. 95,324–327,338	IIa	C

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https://academic.oup.com/eurheartj/article/42/36/3599/6358045?login=false#305163067

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EXERCISE REHABILITATION

- physical conditioning by exercise training improves exercise tolerance, and health-related QOL in patients with HF.
- Several meta-analyses also show that it reduces all-cause and HF hospitalizations, although uncertainty persists about its effects on mortality.
- The effect on hospitalization is seen in those who are highly adherent to the exercise programme.
- High-intensity interval training, in patients who are able and willing, may improve peak oxygen consumption (VO_2).
- Supervised exercise-based rehabilitation should be considered in those who are frail, who have more severe disease or comorbidities.

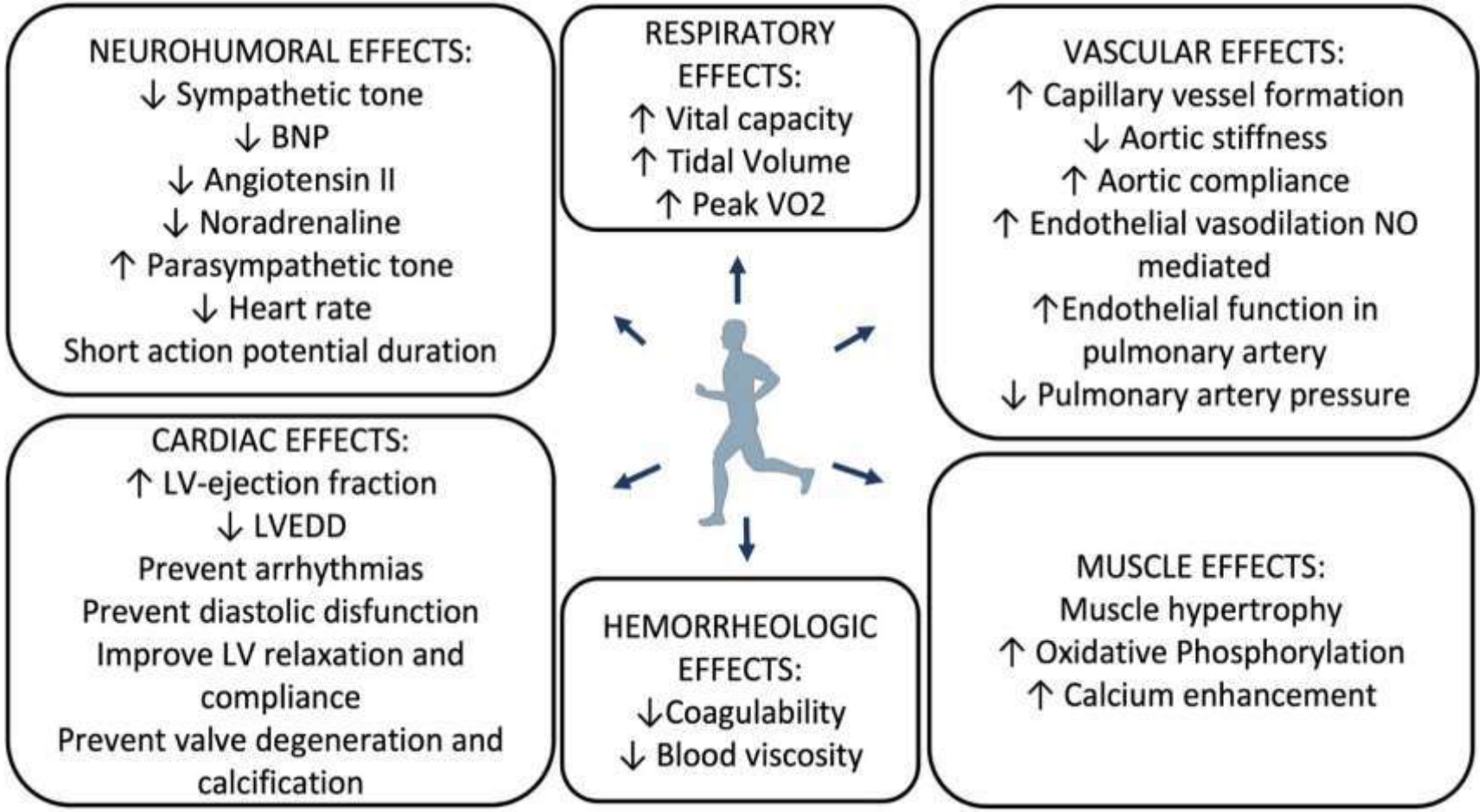
https://academic.oup.com/eurheartj/article/42/36/3599/6358045?login=false#305163067

Recommendations for Management of Stage C HF: Activity, Exercise Prescription, and Cardiac Rehabilitation

COR	LOE	Recommendations
1	A	1. For patients with HF who are able to participate, exercise training (or regular physical activity) is recommended to improve functional status, exercise performance, and QOL.[1–9]
2a	B-NR	2. In patients with HF, a cardiac rehabilitation program can be useful to improve functional capacity, exercise tolerance, and health-related QOL.[1,2,5,6,8]

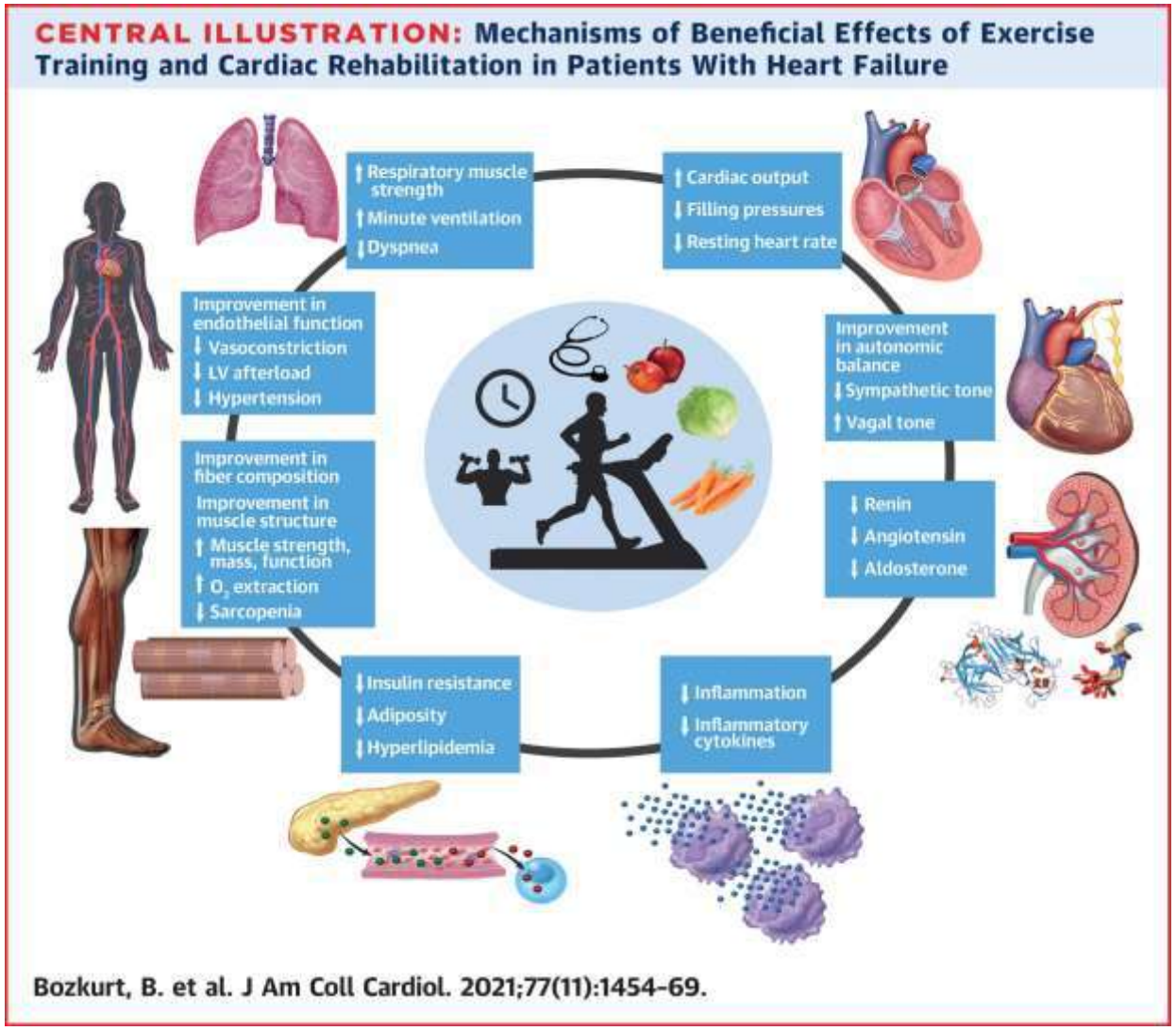
2022 AHA/ACC/HFSA Guideline for the Management of Heart Failure

Effects of exercise training in Heart failure



BNP, brain natriuretic peptide; LV, left ventricular; LVEDD, left ventricular end diastolic diameter; NO, nitric oxide; peakVO2, peak oxygen consumption.

https://www.imrpress.com/journal/RCM/23/4/10.31083/j.rcm2304144/htm#b22



Effects of exercise training in Heart failure

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Risk stratification and preliminary evaluation

1. ***Exclusion of contraindications to*** initiating an exercise programme in chronic HF (hypotension or hypertension at rest or during exercise, unstable cardiac disease, deteriorating symptoms of HF, myocardial ischaemia despite)

2. ***Performing a baseline assessment*** of comorbidities and HF severity.

A maximal exercise test (preferably CPET) is important to assess functional capacity, exercise-induced arrhythmias or hemodynamic abnormalities and for prescription of exercise intensity, based on VO_{2peak}, or on resting and maximal HR, HRR or Borg's rating of perceived exertion

3. Optimizing medical therapy: All individuals with HF should be treated according to current Guidelines, including device implantation when required.

2020 ESC Guidelines on sports cardiology and exercise in patients with cardiovascular disease https://academic.oup.com/eurheartj/article/42/1/17/5898937

Risk stratification and preliminary evaluation

- Cardiopulmonary exercise testing (CPET) provides important information for the assessment and management of patients with heart failure.

- This testing measures the respiratory and cardiac responses to exercise and allows measurement of the oxygen uptake ($\dot{V}O_2$) max and the relationship between minute ventilation ($\dot{V}E$) and carbon dioxide excretion ($\dot{V}CO_2$).

- These two parameters help classify patients into categories that help predict prognosis, and patients with a $\dot{V}O_2$ < 14 mL/kg/min and $\dot{V}E/\dot{V}CO_2$ slope >35 have a poor prognosis.

Juarez M, J Cardiovasc Dev Dis. 2024 Feb 20;11(3):70. doi: 10.3390/jcdd11030070.

TABLE 1 Pros and Cons of the Different Methods Used to Quantify Exercise Intolerance in HF

Modality	Pros	Cons
NYHA functional classification	Easy and rapid to perform, cost-free, prognostic value	Lack of reproducibility, low discriminatory power, no data about the mechanisms of EI
Health-related quality of life instruments*	Easy to perform, cost-free, prognostic value	Patient-derived measures, no data about the mechanisms of EI
ECG stress testing	Easy to perform, negligible cost, detection of CI	Inaccuracy in estimation of exercise capacity in patients with HF, incomplete understanding of exercise limitations due to lack of expired gas analysis, submaximal effort
6MWT	Simplicity, feasibility, negligible cost, prognostic value of the distance covered and changing overtime	Submaximal effort, no data about the mechanisms of EI
CPX	Provide insights in the understanding of the mechanism of exercise intolerance, reproducibility, high prognostic value, monitoring of therapeutic response, detection of CI, quantification of patient effort, it can be paired with cardiac imaging or invasive monitoring	Time-consuming, expensive, specialized personnel, complexity

*Such as Minnesota Living with Heart Failure Questionnaire, Kansas City Cardiomyopathy Questionnaire, Duke activity status index, EQ-5D.

6MWT = 6-min walk test; CI = chronotropic incompetence; CPX = cardiopulmonary exercise testing; ECG = electrocardiography; EI = exercise intolerance; HF = heart failure; NYHA = New York Heart Association.

https://www.jacc.org/doi/10.1016/j.jacc.2019.01.072

The relationship between NYHA functional class and the average distance in the 6-minute walk test, as well as oxygen consumption (VO_2 peak)

NYHA Class	Description	**6MWD (meters)** – Mean ± SD	Typical VO_2peak (mL/kg/min)
Class I	No limitation of physical activity	450–550 m (≈ 500 ± 60)	>20
Class II	Slight limitation; comfortable at rest	350–450 m (≈ 400 ± 50)	16–20
Class III	Marked limitation; comfortable only at rest	200–350 m (≈ 300 ± 60)	10–15
Class IV	Symptoms at rest; unable to carry out any activity	<200 m (≈ 150 ± 50)	<10

https://doi.org/10.31083/j.rcm2509336 10.18087/cardio.2024.2.n2551

ESC HEART FAILURE
ESC Heart Failure 2024; **11**: 2055–2062
Published online 26 March 2024 in Wiley Online Library (wileyonlinelibrary.com) **DOI:** 10.1002/ehf2.14754

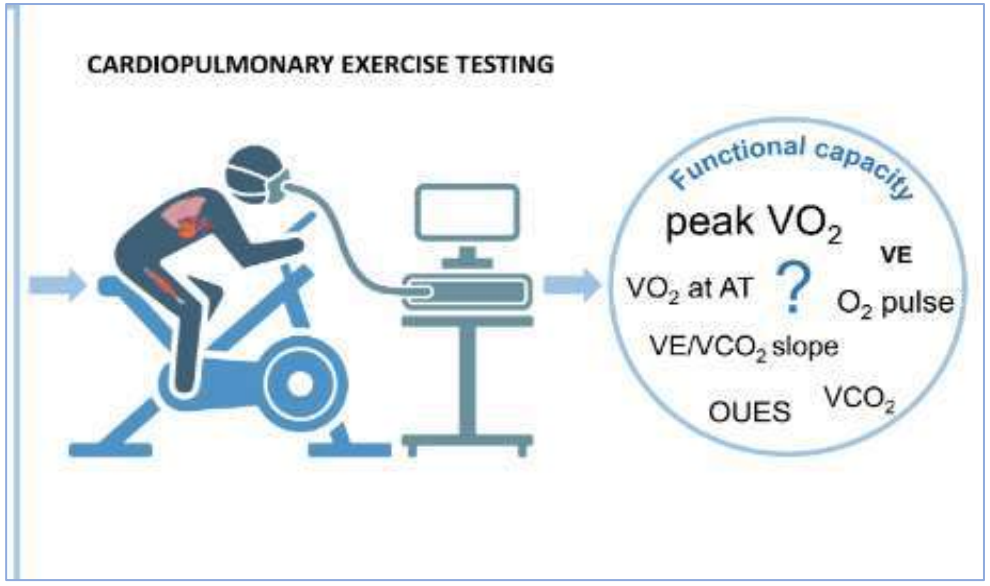
ORIGINAL ARTICLE

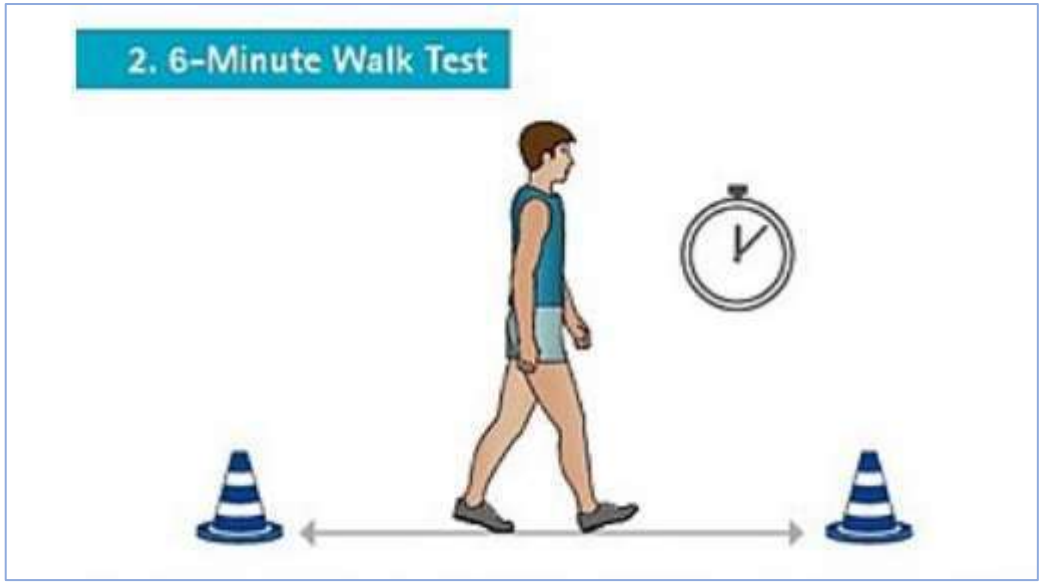
Usefulness of oxygen uptake efficiency slope in a 6 min walk test in chronic heart failure

Min Sun Kim[1†], Woori Bong[1,2†], Jung Hyun Choi[1,3*‡], Myung-Jun Shin[4] and Byeong-Ju Lee[4*‡]

[1]Division of Cardiology, Department of Internal Medicine, Biomedical Research Institute, Pusan National University Hospital, Busan, Republic of Korea; [2]Division of Cardiology, Department of Internal Medicine, Busan Veterans Hospital, Busan, Republic of Korea; [3]Division of Cardiology, Department of Internal Medicine, Pusan National University Hospital, Pusan National University School of Medicine, Busan, Republic of Korea; and [4]Department of Rehabilitation Medicine, Biomedical Research Institute, Pusan National University Hospital, Pusan National University School of Medicine, Busan, Republic of Korea

- **OUES does not require maximal effort and is reliable when derived from submaximal exercises.**
- **can integrate the cardiovascular and peripheral factors that determine oxygen uptake and pulmonary function**
- **6 MWT is clinically helpful because most patients can perform it without sophisticated equipment and is relatively inexpensive.**





https://pubmed.ncbi.nlm.nih.gov/38529745/

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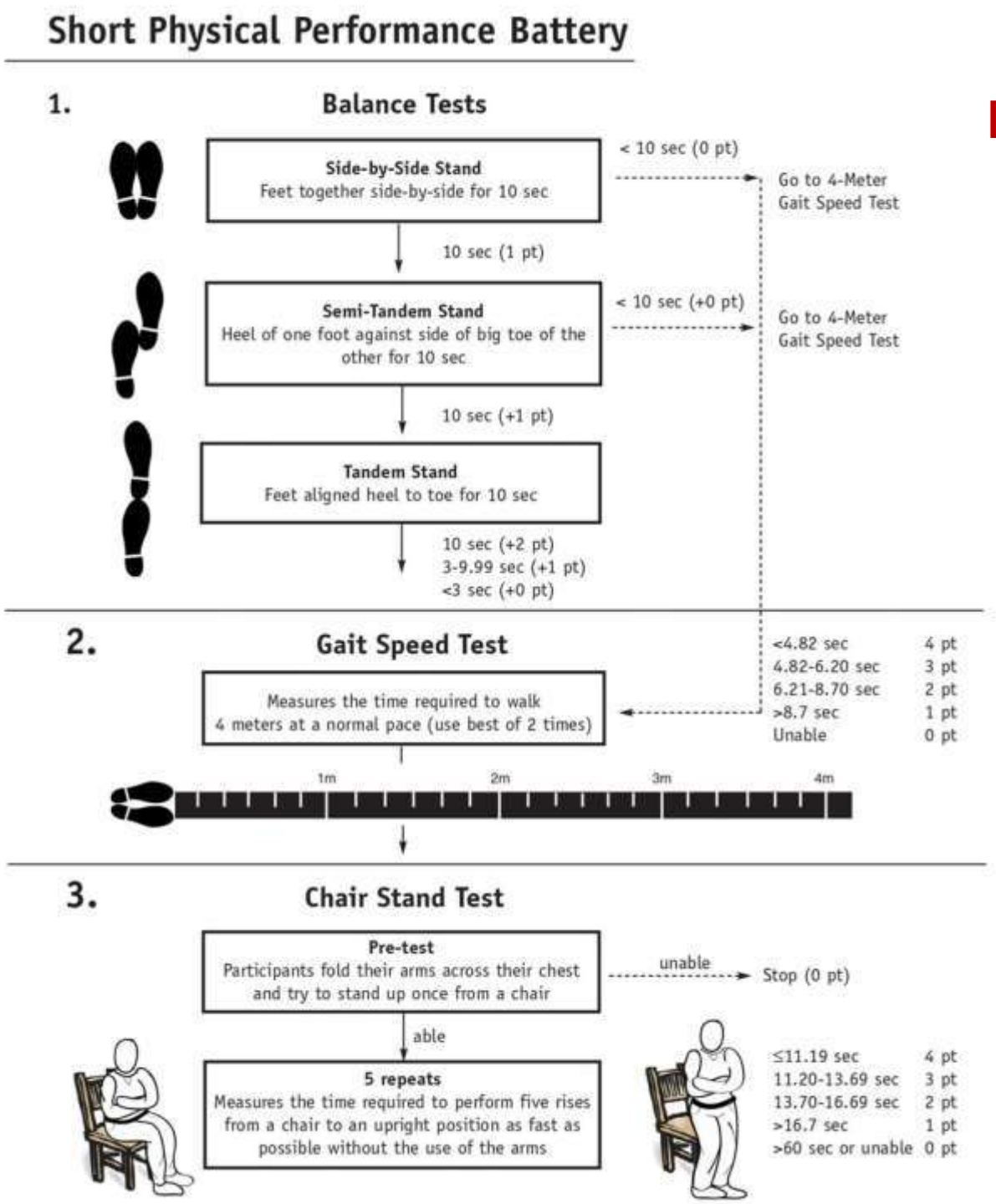


PHYSICAL FUNCTION MEASURES IN PATIENTS WITH HEART FAILURE

SPPB - easily applicable and low-cost instrument that may be implemented in the routine health assessment for screening geriatric clinical conditions (falls, sarcopenia, frailty, dyspnea etc)
Associated with mortality

Int. J. Environ. Res. Public Health 2021, 18, 10612. https://doi.org/10.3390/ijerph182010612

Exercise prescription

- **The exercise session should be individually tailored** for several weeks, according to symptoms and objective findings during exercise testing

- **High-risk patients should be counselled more frequently** during the initial phases, non-supervised home-based sessions should be gradually added.

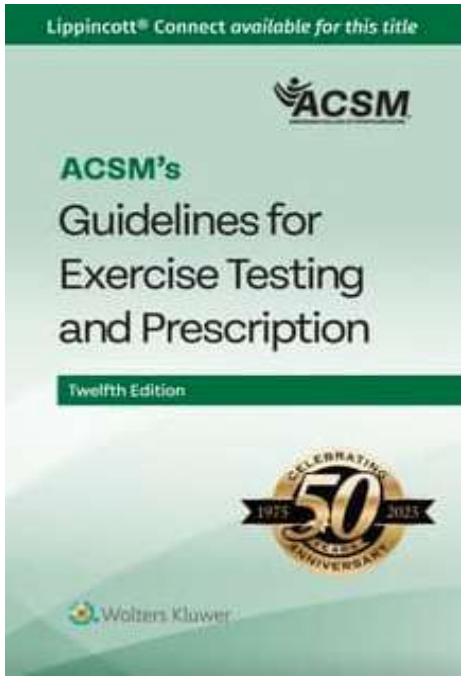
- **Follow-up examinations for exercise recommendations should be scheduled at least every 3–6 months**.

Intervals between examinations should depend on disease severity and comorbidities, setting of the sessions (supervised vs. home-based), patient's age and adherence.

2020 ESC Guidelines on sports cardiology and exercise in patients with cardiovascular disease

FITT-VP principle ensures that exercise is personalized, progressive, and safe

Component	Prescription	Explanation
Frequency	3–5 sessions/week	Begin with 3 and increase as tolerated.
Intensity	Very low to moderate (e.g., Borg RPE 9–11)	Monitor perceived exertion.
Time	10–20 min/session initially	May begin with 2–3 bouts of 5–10 min each. build up to 30+ min.
Type	Aerobic (walking, stationary cycling); possibly seated if needed	Focus on safe, rhythmic, low-impact movements. Avoid isometric or high-resistance activity early on.
Volume	Total weekly goal: 90–150 min (progressive)	Start low, includes warm-up and cool-down.
Progression	Gradual increase in duration, then intensity	Increase time first, then frequency. Once tolerated, slowly increase intensity. Reassess every 1–2 weeks.



American College of Sports Medicine Guidelines for Exercise Testing and Prescription

Optimal exercise training dose for patients with chronic heart failure

	Aerobic exercise	Resistance exercise
Frequency	3–5 days/week, optimally daily	2–3 days/week; balance training daily
Intensity	40–80% of VO_{2peak}	Borg RPE <15 (40–60% of 1RM)
Duration	20–60 min	10–15 repetitions in at least 1 set of 8–10 different upper and lower body exercises
Mode	Continuous or interval	
Progression	A progressively increasing training regimen should be prescribed with regular follow-up controls (at least every 3–6 months) to adjust the duration and the level of the exercise to the reached level of tolerance	A progressively increasing training regimen should be prescribed with regular follow-up controls (at least every 3–6 months) to adjust the duration and the level of the exercise to the reached level of tolerance

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1 RM = one repetition maximum; RPE = rating of perceived exertion; VO_{2peak} = peak oxygen

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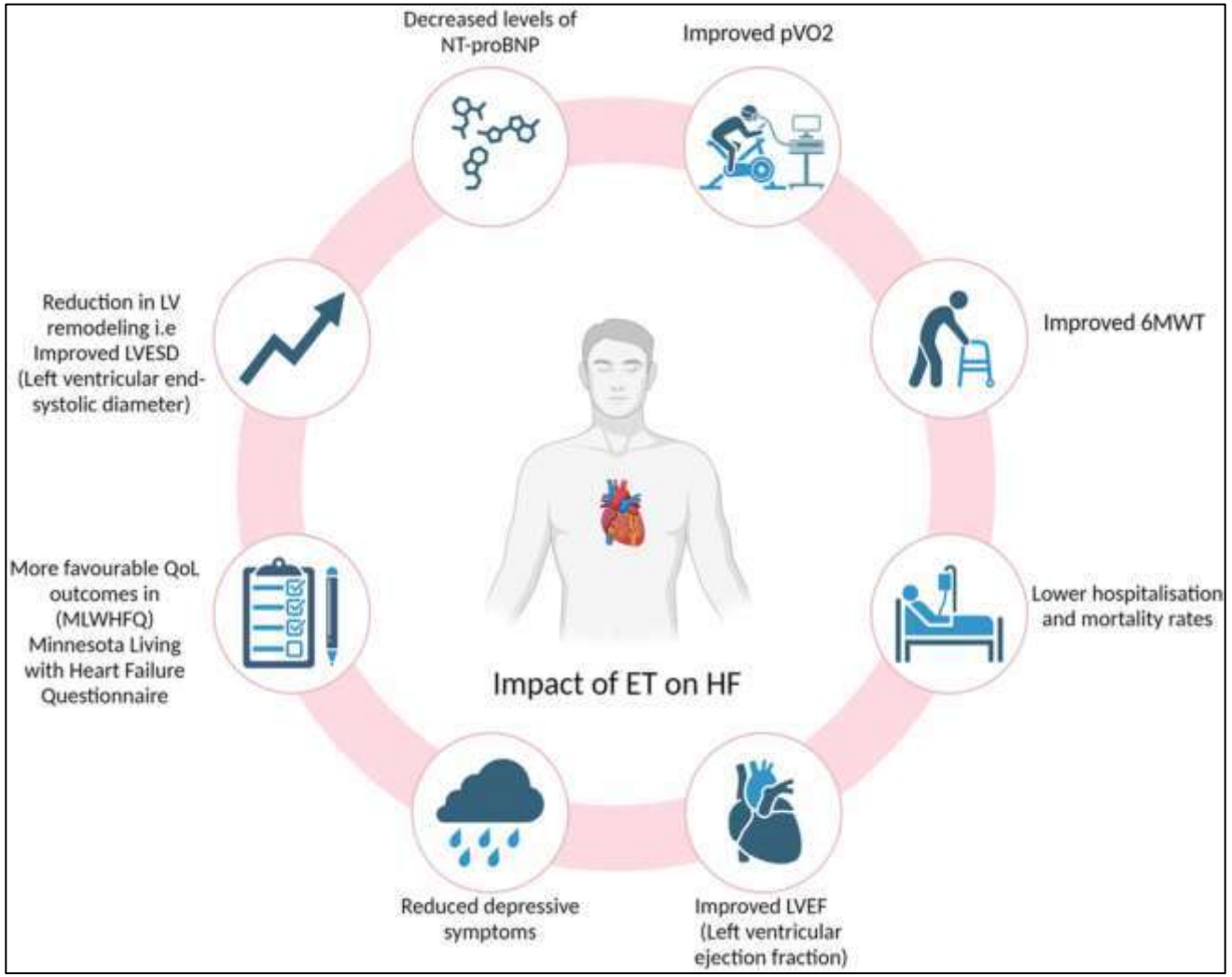
Exercise Training in Heart Failure: Current Evidence and Future Directions
The impact of ET on HF patients



ET effect on VO2 and 6MWT

- VO2 increased by 8.0% ± 15.7% post-ET
- High intensity ET increased VO2 by 3.5 ml/kg/min (3.1-4.0)
- Resistance + Inspiratory Muscle ET showed significant increases in VO2 and 6MWT distance
- Improvements in 6MWT distance at 6,12 and 18 months compared to Usual Care Group (UCG)
- Significant increase in 6MWT distance at 3 months

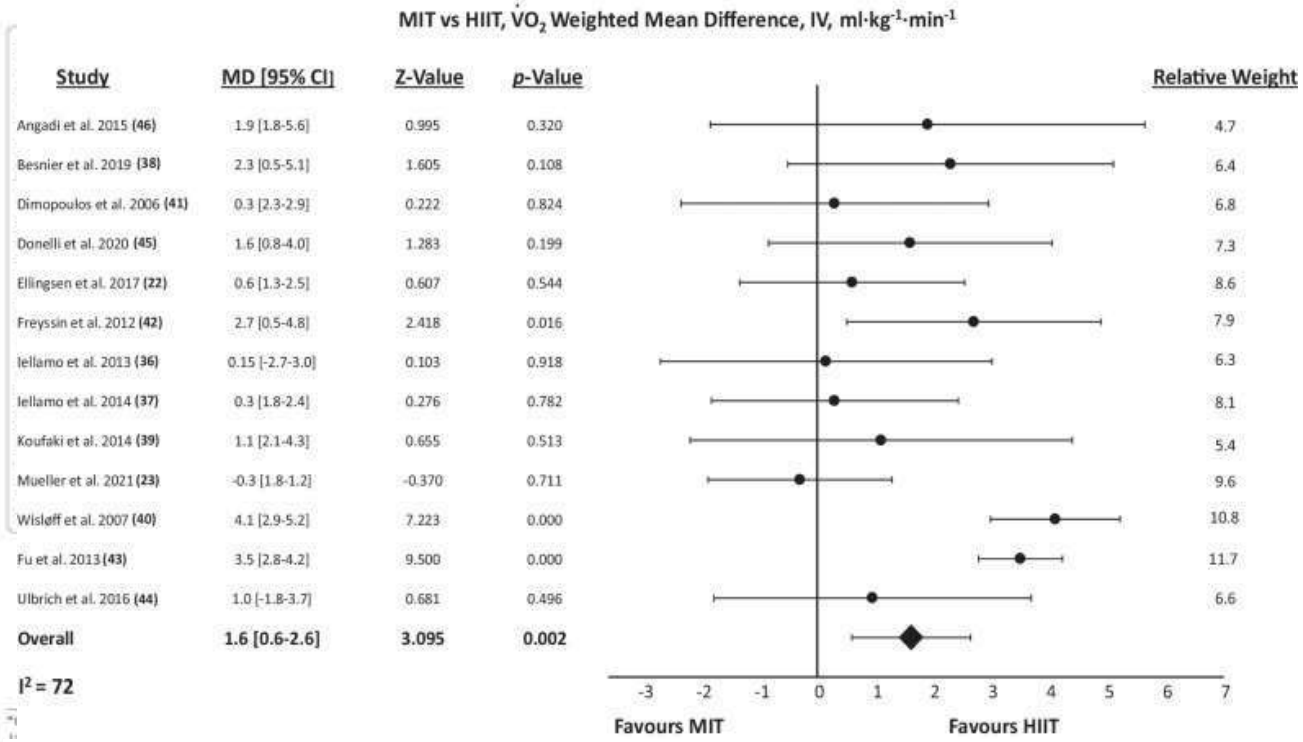
J. Clin. Med. 2025, *14*(2), 359; https://doi.org/10.3390/jcm14020359

Edwards et al. Sports Medicine - Open (2023) 9:3
https://doi.org/10.1186/s40798-022-00549-1

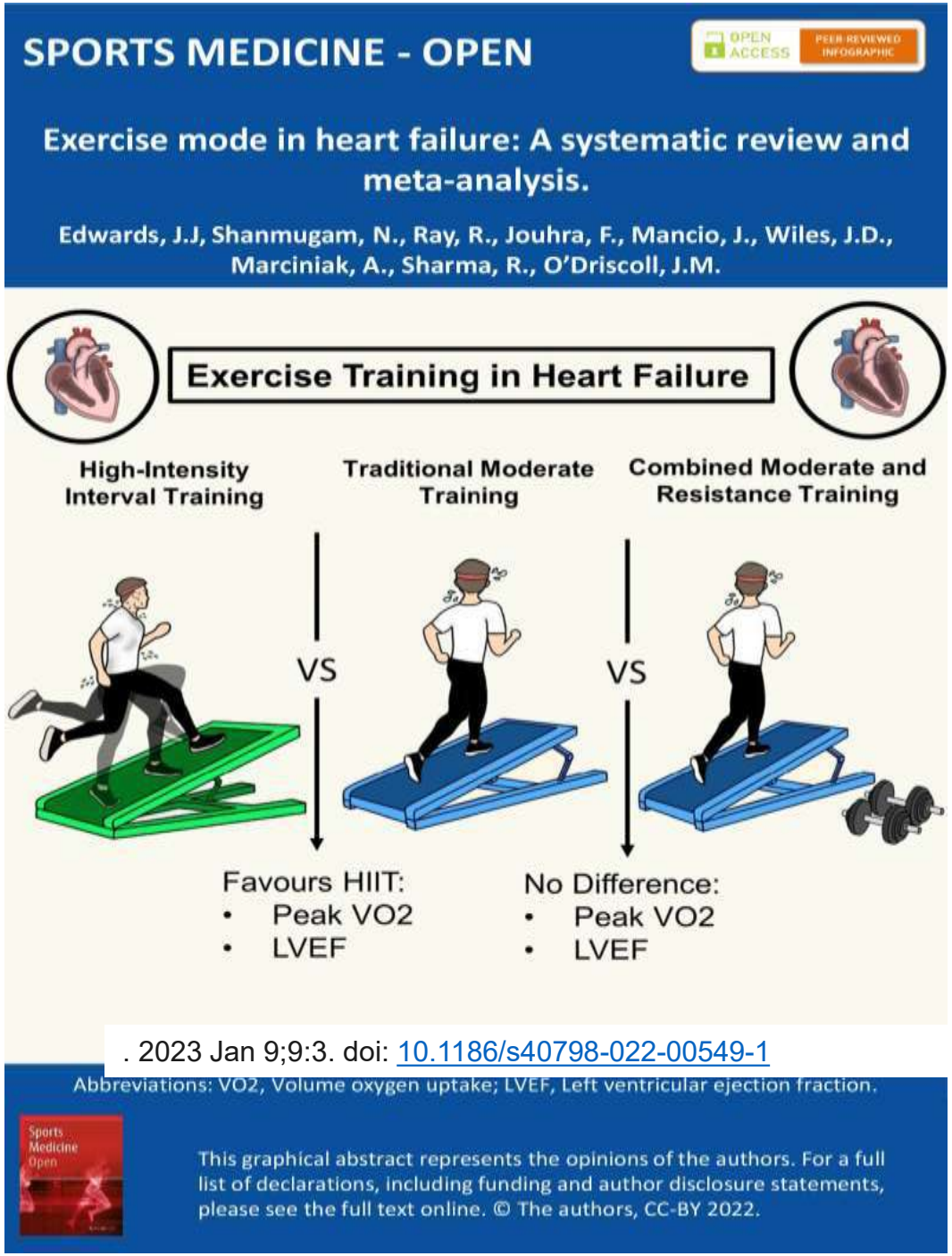
SYSTEMATIC REVIEW Open Access

Exercise Mode in Heart Failure: A Systematic Review and Meta-Analysis

Jamie Edwards[1], Nesan Shanmugam[2], Robin Ray[2], Fadi Jouhra[2], Jennifer Mancio[2], Jonathan Wiles[1], Anna Marciniak[2], Rajan Sharma[2] and Jamie O'Driscoll[1,2*]



•High-intensity interval training (HIIT) is more effective than moderate intensity training (MIT) for improving cardiorespiratory fitness and cardiac function in heart failure patients.



Cochrane Library

Cochrane Database of Systematic Reviews

Exercise-based cardiac rehabilitation for adults with heart failure (Review)

Molloy C, Long L, Mordi IR, Bridges C, Sagar VA, Davies EJ, Coats AJS, Dalal H, Rees K, Singh SJ, Taylor RS

Update of the Cochrane review randomized trial evidence for ExCR for adults with HF

compare different delivery modes: centre-based, home-based (including digital support), and both (hybrid)

- Study: 60 RCTs, 8,728 participants
- Findings:
  - 31% reduction in all-cause hospitalization (RR 0.69; NNT=13)
  - Clinically meaningful improvement in HRQoL (MLWHF score: -7.4 points)
  - Benefits observed across center-based, home-based, and hybrid programs
  - significant impact on all-cause mortality

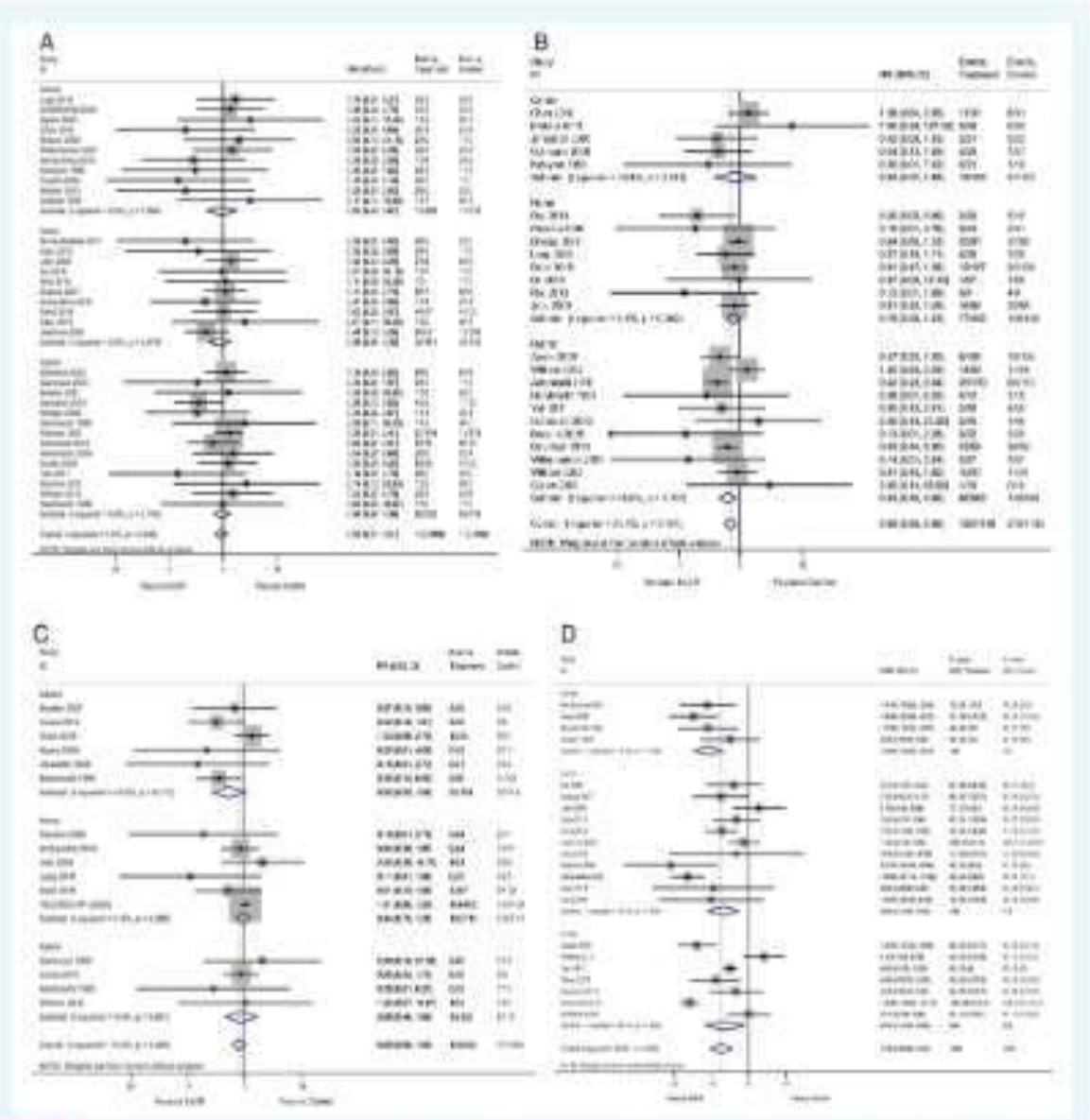


Figure 3 Forest plot of exercise-based cardiac rehabilitation (ExCR) versus control for (A) overall mortality in the short-term (≤12-month follow-up), (B) overall hospitalizations in the short-term (≤12-month follow-up), (C) HF hospitalizations in the short-term (≤12-month follow-up), (D) overall Minnesota Living with Heart Failure Questionnaire (MLWHF) score in the short-term (≤12-month follow up), and (E) all HRQoL outcomes in the short-term (≤12-month follow-up). CI, confidence interval; RR, relative risk; SD, standard deviation; SMD, standardized mean difference; WMD, weighted mean difference.

https://pubmed.ncbi.nlm.nih.gov/37850321/

JACC: Heart Failure
Volume 13, Issue 5, May 2025, Pages 695-706

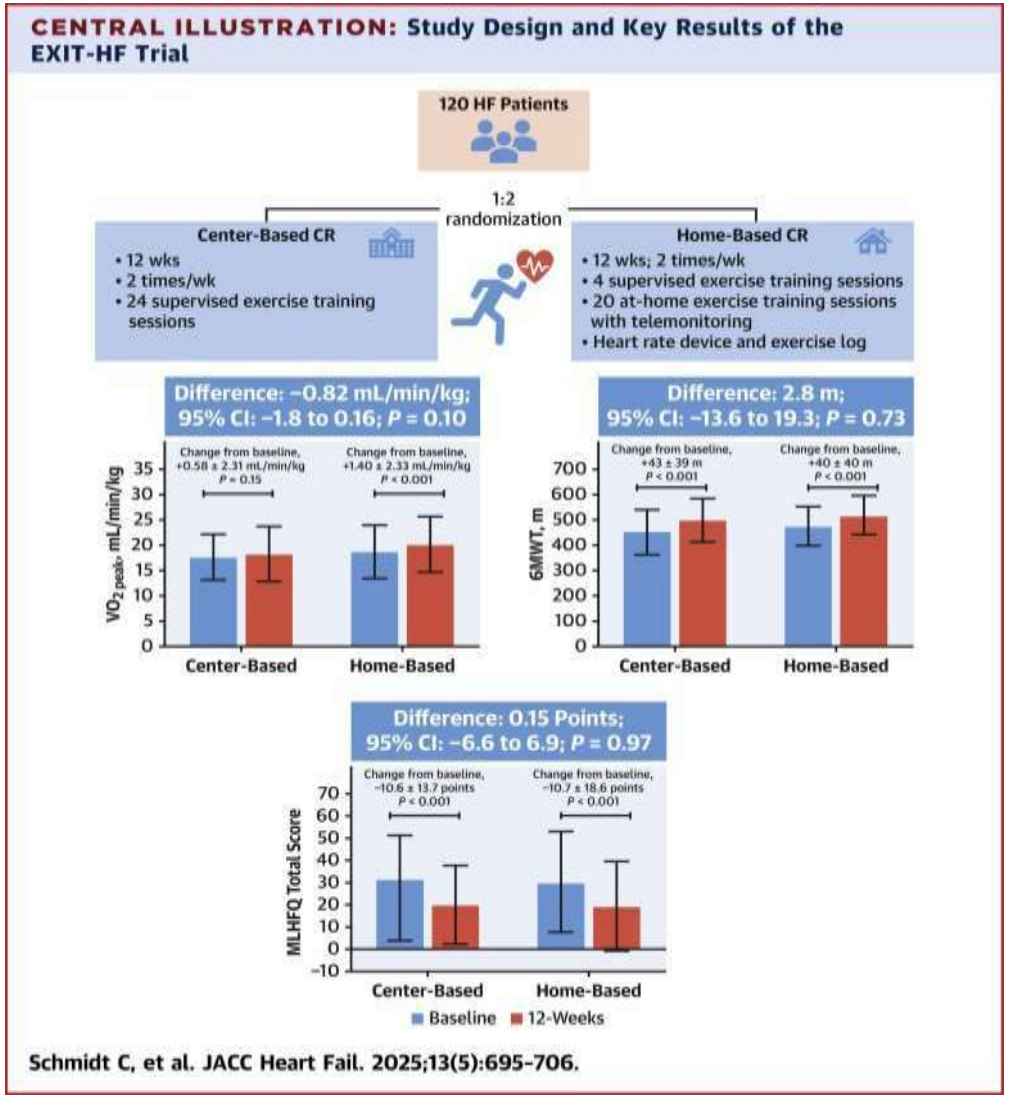
Original Research

Heart Failure

Center- vs Home-Based Cardiac Rehabilitation in Patients With HeartFailure: EXIT-HF Randomized Controlled Trial

Conclusions

The home-based CR program as an effective and feasible alternative to center-based programs in contemporary and optimally treated HF patients.



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Open Access Editorial

Resistance Exercise in Treating Heart Failure with Preserved Ejection Fraction (HFpEF) and Obesity: Targeting Skeletal Muscle Abnormalities and Ectopic Adipose Depots

by Daniel J. McDonough [1,2]

1 Division of Epidemiology and Community Health, School of Public Health, University of Minnesota-Twin Cities, Minneapolis, MN 55455, USA

2 K99/R00 Postdoctoral Research Fellowship Program, National Heart, Lung and Blood Institute, National Institutes of Health, Bethesda, MD 20892, USA

Physiologia **2025**, *5*(1), 10; **https://doi.org/10.3390/physiologia5010010**

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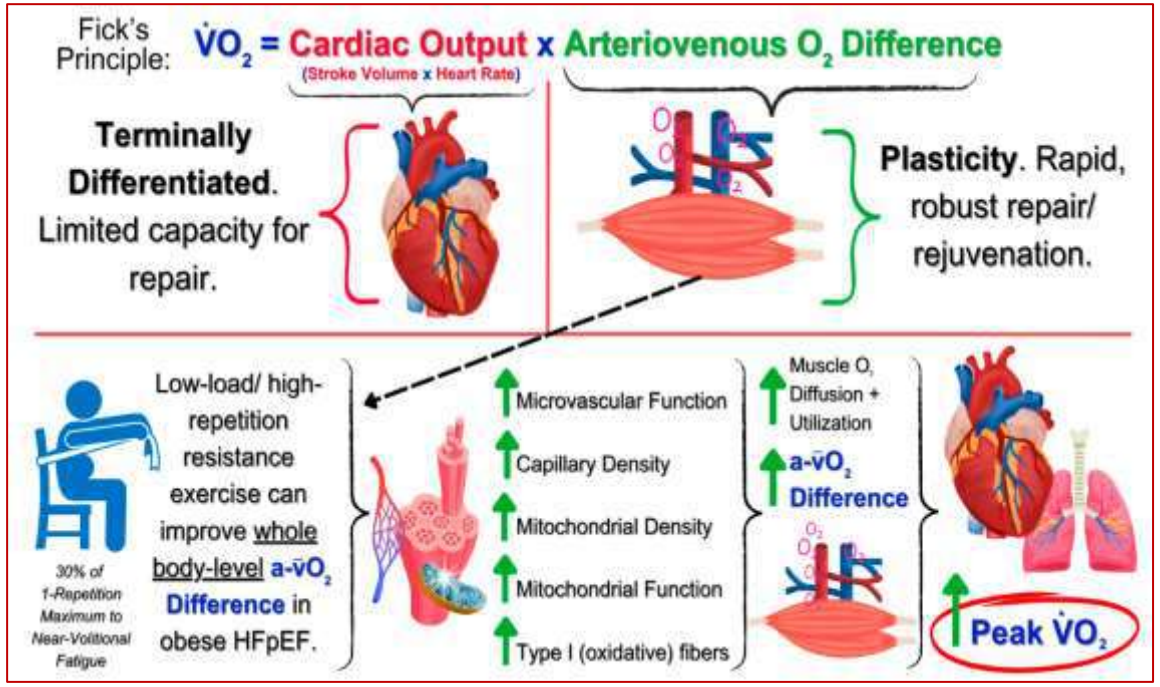

Conclusion - Considering that HFpEF patients are generally older, more frail, and have greater functional limitations than HF*r*EF patients

resistance exercise, alone, may be sufficient to target the cardiac and extracardiac contributors of exercise intolerance in patients with HFpEF and obesity

the potential for low-load/high-repetition resistance exercise to satisfy Fick's Principle (equation) by targeting the peripheral (non-cardiac), skeletal muscle-specific contributors of exercise intolerance in patients with HFpEF and obesity to improve exercise capacity (peak oxygen consumption).

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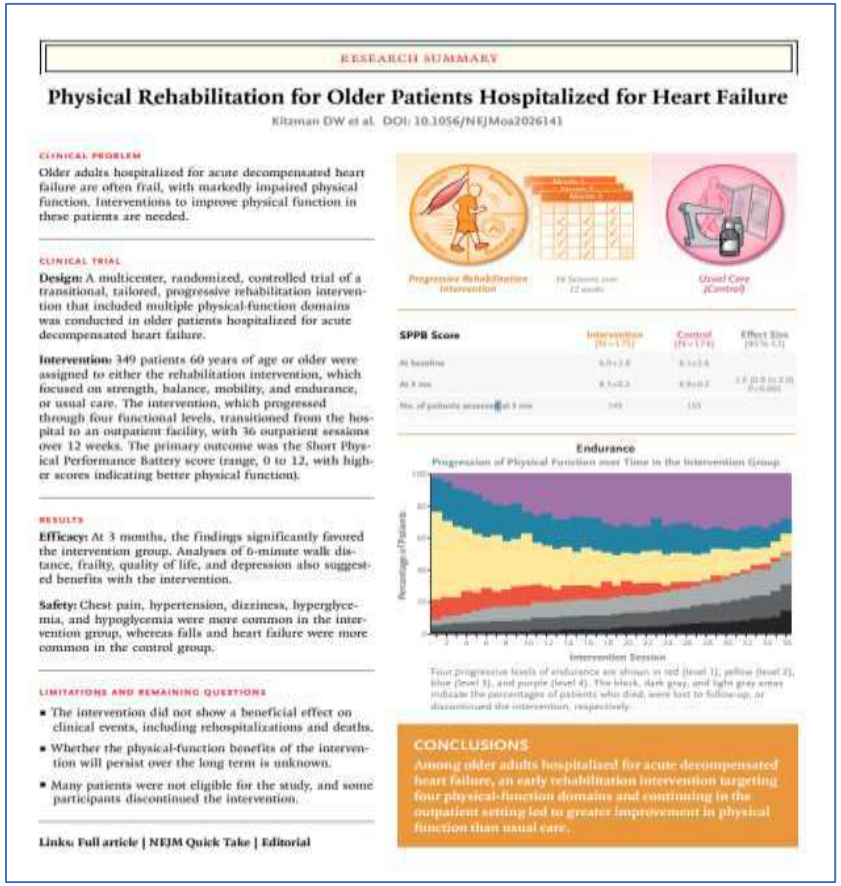
REHAB-HF Trial (2021): Early Rehabilitation in Older ADHF Patients
Multicenter, randomized, single-blind, controlled trial

- Population: 349 older patients (mean age 72.7 yrs); 97% frail/pre-frail
- An early, individualized, and multi-domain rehabilitation program (Strength, Balance, Mobility, Endurance) Initiated during/after hospitalization + 36 outpatient sessions in frail, older patients hospitalized for acute decompensated heart failure (ADHF).
- The intervention led to significantly greater improvements in physical function (as measured by the Short Physical Performance Battery at 3 months) compared to usual care. Adherence: 76 ± 3%

Additional analyses showed clinical benefits in:

- 6-minute walk distance/Frailty status/Quality of life/Depressive symptoms

Despite these gains, the 6-month rates of rehospitalization and death remained high in both groups.



RESEARCH SUMMARY

Physical Rehabilitation for Older Patients Hospitalized for Heart Failure

Kitzman DW et al. DOI: 10.1056/NEJMoa2026141

CLINICAL PROBLEM

Older adults hospitalized for acute decompensated heart failure are often frail, with markedly impaired physical function. Interventions to improve physical function in these patients are needed.

CLINICAL TRIAL

Design: A multicenter, randomized, controlled trial of a transitional, tailored, progressive rehabilitation intervention that included multiple physical-function domains was conducted in older patients hospitalized for acute decompensated heart failure.

Intervention: 349 patients 60 years of age or older were assigned to either the rehabilitation intervention, which focused on strength, balance, mobility, and endurance, or usual care. The intervention, which progressed through four functional levels, transitioned from the hospital to an outpatient facility, with 36 outpatient sessions over 12 weeks. The primary outcome was the Short Physical Performance Battery score (range, 0 to 12, with higher scores indicating better physical function).

RESULTS

Efficacy: At 3 months, the findings significantly favored the intervention group. Analyses of 6-minute walk distance, frailty, quality of life, and depression also suggested benefits with the intervention.

Safety: Chest pain, hypertension, dizziness, hyperglycemia, and hypoglycemia were more common in the intervention group, whereas falls and heart failure were more common in the control group.

LIMITATIONS AND REMAINING QUESTIONS

- The intervention did not show a beneficial effect on clinical events, including rehospitalizations and deaths.
- Whether the physical-function benefits of the intervention will persist over the long term is unknown.
- Many patients were not eligible for the study, and some participants discontinued the intervention.

Links: Full article | NEJM Quick Take | Editorial

Progressive Rehabilitation Intervention

Usual Care (Control)

SPPB Score

Endurance

Progression of Physical Function over Time in the Intervention Group

Intervention Session

CONCLUSIONS

Among older adults hospitalized for acute decompensated heart failure, an early rehabilitation intervention targeting four physical-function domains and continuing in the outpatient setting led to greater improvement in physical function than usual care.

DOI: 10.1056/NEJMoa2026141

Dietary recommendations in HF

Open Access Editorial

Resistance Exercise in Treating Heart Failure with Preserved Ejection Fraction (HFpEF) and Obesity: Targeting Skeletal Muscle Abnormalities and Ectopic Adipose Depots

by Daniel J. McDonough [1,2]

1 Division of Epidemiology and Community Health, School of Public Health, University of Minnesota-Twin Cities, Minneapolis, MN 55455, USA

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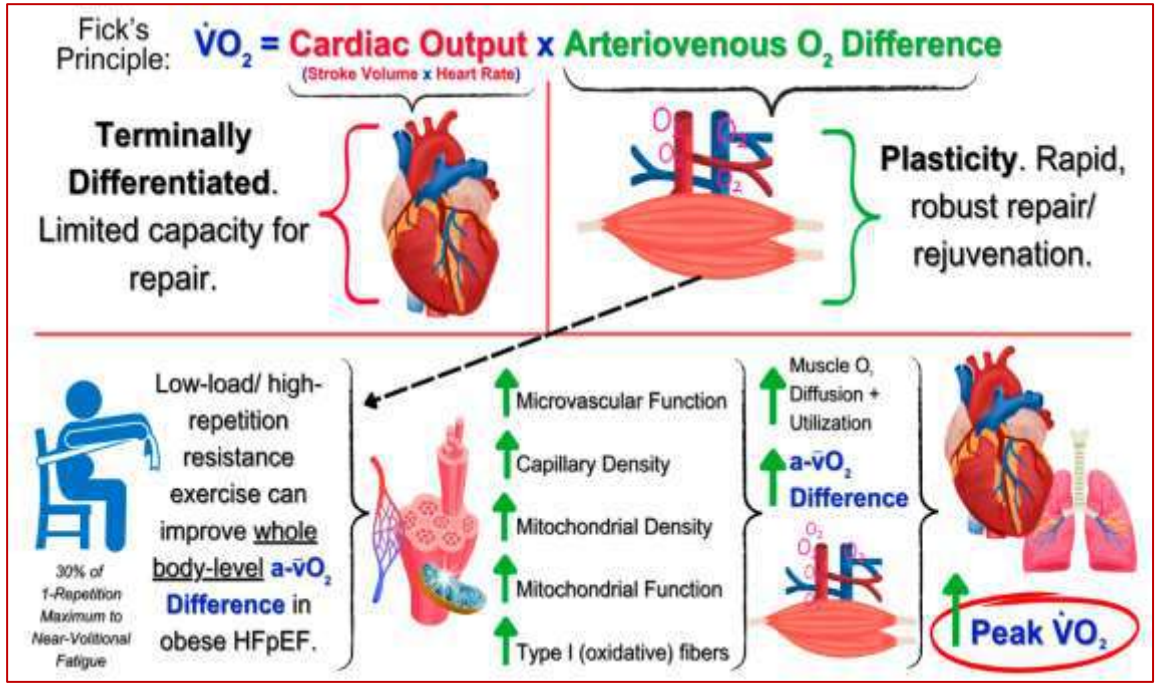

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Major Heart Failure Nutrition Domains and Challenges to Implementation

JACC REVIEW TOPIC OF THE WEEK

Nutrition Assessment and Dietary Interventions in Heart Failure

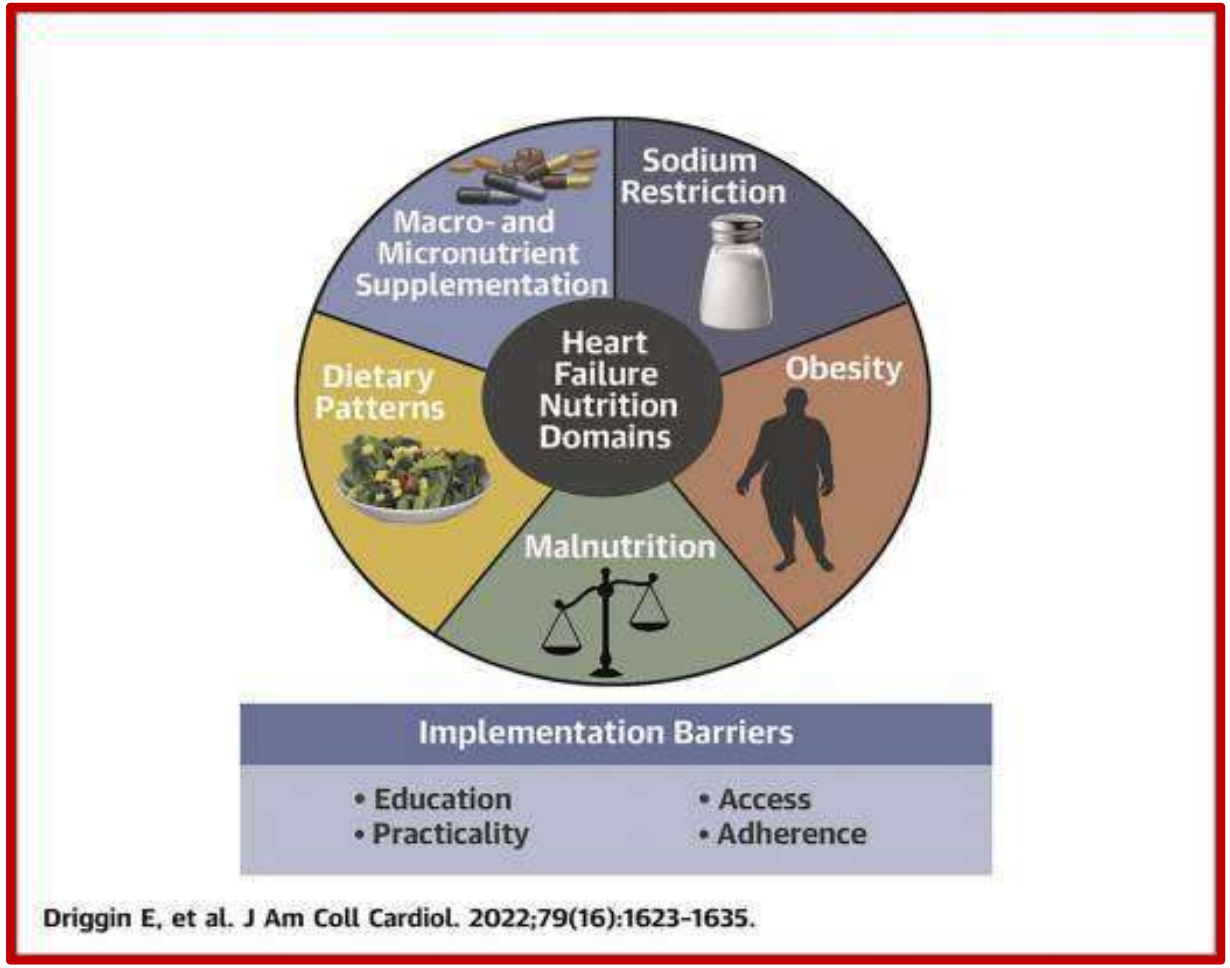
JACC Review Topic of the Week

Elissa Driggin, MD,[a] Laura P. Cohen, MD, MPP,[a] Dympna Gallagher, EdD,[b]
Wahida Karmally, DrPH, MS, RDN, CDCES, CLS,[c] Thomas Maddox, MD, MSc,[d] Scott L. Hummel, MD, MS,[e]
Salvatore Carbone, PhD, MS,[f,g] Mathew S. Maurer, MD[a]

ABSTRACT

Comprehensive dietary interventions integrating heart failure, nutrition, metabolism, and implementation science to more effectively address nutritional disorders and reduce the morbidity and mortality in pts with HF

with HF. (J Am Coll Cardiol 2022;79:1623-1635) © 2022 by the American College of Cardiology Foundation.



Driggin E, et al. J Am Coll Cardiol. 2022;79(16):1623-1635.

https://pmc.ncbi.nlm.nih.gov/articles/PMC9388228/

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Sodium Restriction – Controversial?

- In a nonrandomized study (>2.5 g/d versus <2.5 g/d), lower dietary sodium was associated with worse all-cause mortality in patients with HFrEF (Doukky R., 2016)
- SODIUM-HF Trial 806 patients, aggressive sodium restriction (1,500 mg/d): No significant difference in death or HF hospitalization, (Ezekowitz et al., Lancet 2022)
- Individualized sodium targets advised (per guidelines)

2022 AHA/ACC/HFSA Guideline for the Management of Heart Failure

Circulation: Heart Failure
Volume 16, Issue 1, January 2023; Page e009879
https://doi.org/10.1161/CIRCHEARTFAILURE.122.009879

ORIGINAL ARTICLE

Sodium Restriction in Patients With Heart Failure: A Systematic Review and Meta-Analysis of Randomized Clinical Trials

Eloisa Colin-Ramirez, PhD *, Nariman Sepehrvand, MD, PhD *, Sarah Rathwell, MSc, Heather Ross, MD, MHSc, Jorge Escobedo, MD, Peter Macdonald, MD, Richard Troughton, MBChB, Clara Saldarriaga, MD, Fernando Lanas, MD, Robert Doughty, MD, Finlay A. McAlister, MD, MSc, and Justin A. Ezekowitz, MBBCh, MSc

Background: Sodium restriction is a nonpharmacologic treatment suggested by practice guidelines for the management of patients with heart failure (HF). In this study, we synthesized the data from randomized controlled trials (RCTs) evaluating the effects of sodium restriction on clinical outcomes in patients with HF.

Methods: In this aggregate data meta-analysis, Cochrane Central, MEDLINE (Medical Literature Analysis and Retrieval System Online), Embase Ovid, and CINAHL (Cumulative Index to Nursing and Allied Health Literature) Plus databases were searched up to April 2, 2022. RCTs were included if they investigated the effects of sodium/salt restriction as compared to no restriction on clinical outcomes in patients with HF. Outcomes of interest included mortality, hospitalization, change in New York Heart Association functional class, and quality of life (QoL).

17 randomized controlled trials

the effects of dietary sodium restriction /a less salt-restrictive intake /or no sodium restriction on clinical outcomes in patients with HF.

Conclusion

Sodium restriction did not reduce the risk of all-cause death, hospitalization, composite of death/hospitalization in patients with HF.

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Home > Clinical Research in Cardiology > Article

Role of dietary sodium restriction in chronic heart failure: systematic review and meta-analysis

Original Paper | Open access | Published: 30 June 2023
Volume 113, pages 1331–1342, (2024) Cite this article

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Szymon Urban, Michał Fułek, Mikołaj Błaziak, Katarzyna Fułek, Gracjan Iwanek, Maksym Jura, Magdalena Grzesiak, Oskar Szymański, Bartłomiej Stańczykiewicz, Kuba Ptaszkowski, Robert Zymlinski, Piotr Ponikowski & Jan Biegus

Conclusions

sodium restriction in CHF patients worsened the prognosis in terms of a composite of mortality and hospitalizations and did not influence all-cause mortality and HF hospitalisation rate.

Risk related to sodium restricted diet:

All-cause mortality: OR 1.38 [95% CI, 0.76 - 2.49]

HF hospitalizations: OR 1.63 [95% CI, 0.69 - 3.88]

Composite endpoint: OR 4.12 [95% CI, 1.23 - 13.82]

Serum creatinine level: MD 0.34 [95% CI, -0.10 - 0.78]

Sodium restriction seems not to be effective in outcome improvement in HF.

Clinical Research in Cardiology (2024) 113:1331–1342
https://doi.org/10.1007/s00392-023-02256-7 ORIGINAL PAPER

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Sodium intake recommendations

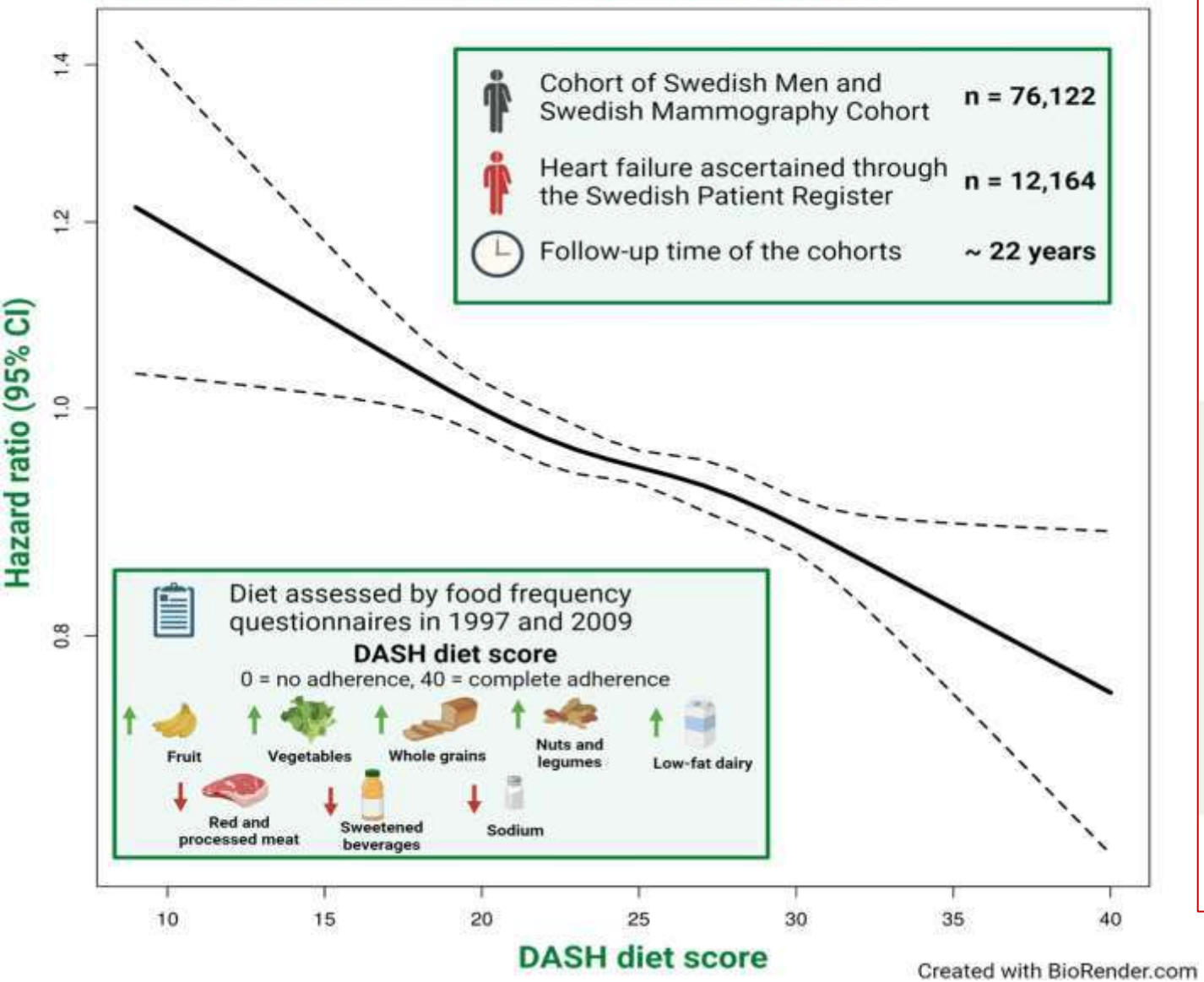
Guideline	Year	Sodium intake recommendation	Level of evidence
National Heart Foundation of Australia and Cardiac Society of Australia and New Zealand[4]	2018	<2 g/d	Not stated
Canadian Cardiovascular Society[5]	2017	2–3 g/d	Weak recommendation; low-quality evidence
American College of Cardiology/American Heart Association/Heart Failure Society of America[6]	2022	For patients with stage C HF, avoiding excessive sodium intake is reasonable to reduce congestive symptoms.	C
Academy of Nutrition and Dietetics[7]	2018	2–3 g/d	Fair
Heart Failure Society of America[8]	2010	2–3 g/d; <2 g/d in severe HF	C
European Society of Cardiology[9]	2021	Avoiding excessive salt intake (>5 g/d)	Not stated
National Institute for Health and Care Excellence[10]	2018	Do not routinely advise people with HF to restrict their sodium consumption.	Not stated

The 2021 European Society of Cardiology (ESC) HF guidelines recommend

✓avoiding excessive salt intake (>5g/day) in all patients with HF, irrespective of ejection fraction.

✓for patients with severe or advanced HF, restricted fluid intake (<1.5–2L/day) may be considered to alleviate symptoms.

Adherence to the DASH diet is associated with a lower risk of heart failure



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ESC European Society of Cardiology

European Journal of Preventive Cardiology (2022) **29**, 1114–1123
https://doi.org/10.1093/eurjpc/zwac003

FULL RESEARCH PAPER
Cardiovascular Disease

The DASH diet is associated with a lower risk of heart failure: a cohort study

Daniel B. Ibsen [1,2*], Emily B. Levitan[3], Agneta Åkesson [1], Bruna Gigante[4], and Alicja Wolk[1,5]

[1]Unit of Cardiovascular and Nutritional Epidemiology, Institute of Environmental Medicine, Karolinska Institutet, Nobels Väg 13, Stockholm 171 77, Sweden; [2]Research Unit for Epidemiology, Department of Public Health, Aarhus University, Bartholins Allé 2, 8000 Aarhus C, Denmark; [3]Department of Epidemiology, University of Alabama at Birmingham, Ryals Public Health Building (RPHB), 1665 University Boulevard, Birmingham, Alabama 35233, USA; [4]Division of Cardiovascular Medicine, Department of Medicine, Karolinska Institutet, Solna Karolinska University Hospital D1:04, 171 76 Stockholm, Sweden; and [5]Unit of Medical Epidemiology, Department of Surgical Sciences, Uppsala University, Akademiska sjukhuset ingång 78, 751 85 Uppsala, Sweden

Received 17 September 2021; revised 13 December 2021; editorial decision 31 December 2021; accepted 3 January 2022; online publish-ahead-of-print 4 January 2022

Aims Trials demonstrate that following the DASH diet lowers blood pressure, which may prevent the development of heart failure (HF). We investigated the association between long-term adherence to the DASH diet and food substitutions within the DASH diet on the risk of HF.

Methods and results Men and women aged 45–83 years without previous HF, ischaemic heart disease or cancer at baseline in 1998 from the Cohort of Swedish Men ($n = 41\,118$) and the Swedish Mammography Cohort ($n = 35\,004$) were studied. The DASH diet emphasizes intake of fruit, vegetables, whole grains, nuts and legumes, and low-fat dairy and deemphasizes red and processed meat, sugar-sweetened beverages, and sodium. DASH diet scores were calculated based on diet assessed by food frequency questionnaires in late 1997 and 2009. Incidence of HF was ascertained using the Swedish Patient Register. Multivariable Cox proportional hazards models were used to estimate hazard ratios (HRs) with 95% confidence intervals (CIs). During the median 22 years of follow-up (1998–2019), 12 164 participants developed HF. Those with the greatest adherence to the DASH diet had a lower risk of HF compared to those with the lowest adherence (HR 0.85, 95% CI: 0.80, 0.91 for baseline diet and HR 0.83, 95% CI: 0.78, 0.89 for long-term diet, comparing quintiles). Replacing 1 serving/day of red and processed meat with emphasized DASH diet foods was associated with an 8–12% lower risk of HF.

Conclusion Long-term adherence to the DASH diet and relevant food substitutions within the DASH diet were associated with a lower risk of HF.

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https://doi.org/10.1093/eurjpc/zwac003

life

MDPI

Article

High and Low Adherence to Mediterranean and DASH Diet Patterns and the Risk of Heart Failure: A Meta-Analysis of Observational Studies †

Mehmet Emin Arayici [1,2,*], Mustafa Eray Kilic [3] and Mehmet Birhan Yilmaz [3]

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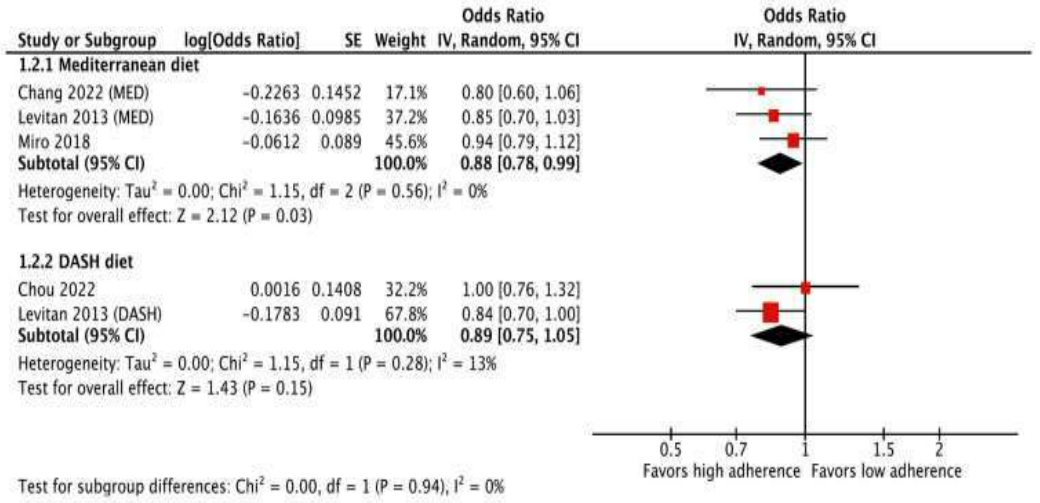
* Correspondence: mehmet.e.arayici@gmail.com; Tel.: +90-532-576-1965
† This study was presented as an oral presentation during the Plant-Based Diets: Health and Well-Being season at the 4th International Electronic Conference on Nutrients on 16–18 October 2024.

Abstract: Background. The relationship between heart failure (HF) and Mediterranean and



- High adherence to the Mediterranean and DASH diets is associated with a significant reduction in the incidence of heart failure (HF) compared to low adherence.
- High adherence to the Mediterranean diet has been linked to reduced all-cause mortality among patients with HF.

Life **2025**, *15*(1), 63; https://doi.org/10.3390/life15010063

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Potential dietary recommendations for patients with HF and common comorbid conditions: recent evidence from the past 5 years

Review

A Focus on Heart Failure Management through Diet and

Comorbidity	Proportion of HF Patients (%) [92]	Relationship to HF	Dietary Recommendation
DM	45	• Impaired beta cell function and insulin signalling [93].	• High protein (30% vs. 15%) and energy restriction (1200–1500 kcal/day) over 3 months improved glycaemic control [88]. • A short-term (16 week) low-carbohydrate diet (50–130 g/day) resulted in weight loss and decreased systolic and diastolic pressure in patients with diabetic cardiomyopathy [94].
Obesity	29	• Excessive adipose tissue accumulation results in an increase in CO, LV diastolic dysfunction and other changes [95].	• High protein [30% (110 g/day), 40% carbohydrates (150 g/day), 30% fat (50 g/day)] reduced weight, waist circumference, blood pressure, total cholesterol and triglycerides [88]. • Hypocaloric diet improved body weight, glucose control and cardiac structure and function [96,97]. • Essential amino acid supplementation (4–7.5 g/day) reduced triglycerides and increased maximum oxygen update and exercise capacity in CHF patients [98,99].

CAD	48	• Build-up of atherosclerotic plaques in the coronary arteries leading to ischaemia [100].	• Consumption of:
			  ○ whole grains (30 g/day) [101]
			  ○ fruits (<250 g/day) and vegetables (80 g/day) [90]
			  ○ legumes (<100 g/day) [90]
			  ○ fish (250 g/day) with long-chain omega-3 polyunsaturated fatty acids (PUFA) [90]
			• Co-administration of L-arginine, PUFA, albumin, folic acid, vitamins B_6, B_{12} and C and magnesium, with statins and aspirin stabilised CAD and HF [102].

CKD	60	• Reduced renal blood flow, impaired haemodynamics contributing to ischemic injury [103].	• A low protein diet (LPD) of 0.6 g/kg/day delays the need for dialysis [89]. • A KD slowed the decline of renal function by 57% in CKD patients compared to a LPD [104].

Hearts 2024, *5*(3), 293-307; https://doi.org/10.3390/hearts5030022

Key Takeaways

- Cardiac rehabilitation is a structured, multidisciplinary intervention that has been proven to improve functional capacity, reduce hospital readmissions, and enhance the quality of life in HF patients.
- Exercise training and dietary counseling are core components of a CR program in HF patients.
- Physical rehabilitation and dietary interventions should be tailored individually, considering the specific characteristics of patients with heart failure.

Future Directions for CR

- Personalized CR Programs: Tailoring exercise regimens and interventions to individual patient needs, including those with comorbidities or advanced HF.

- Telehealth and Home-Based CR: Increasing accessibility and convenience through remote monitoring and virtual programs, though further research on cost-effectiveness is needed.

- Integration of New Technologies and Medications: Wearable devices and AI-driven tools for real-time feedback and personalized exercise plans.

Thank you for the attention!

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