

A Modern Approach to Heart Failure Rehab

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Professor of Health Services Research, NIHR Senior Investigator,
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University
of Glasgow



**Edinburgh Napier University 1st Cardiovascular Health Conference:
A focus on physical activity interventions, 7th Nov 2019**

Declaration of interest

- Chief investigator for number of rehab clinical trials & Academic lead Cochrane Cardiac Rehabilitation consortium



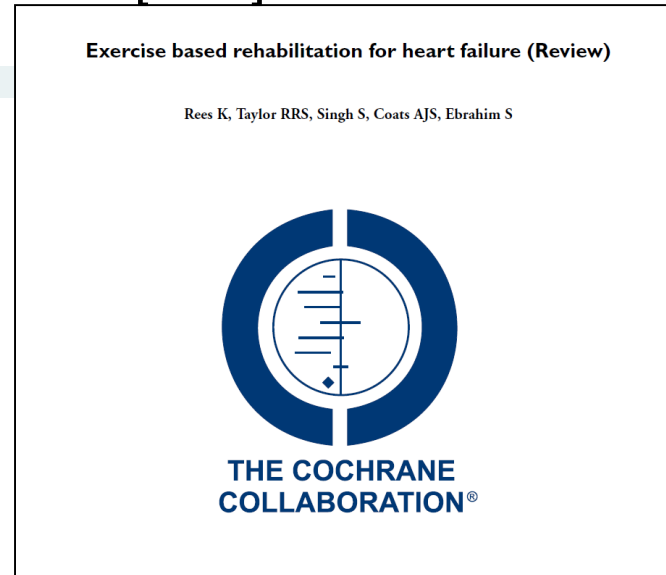
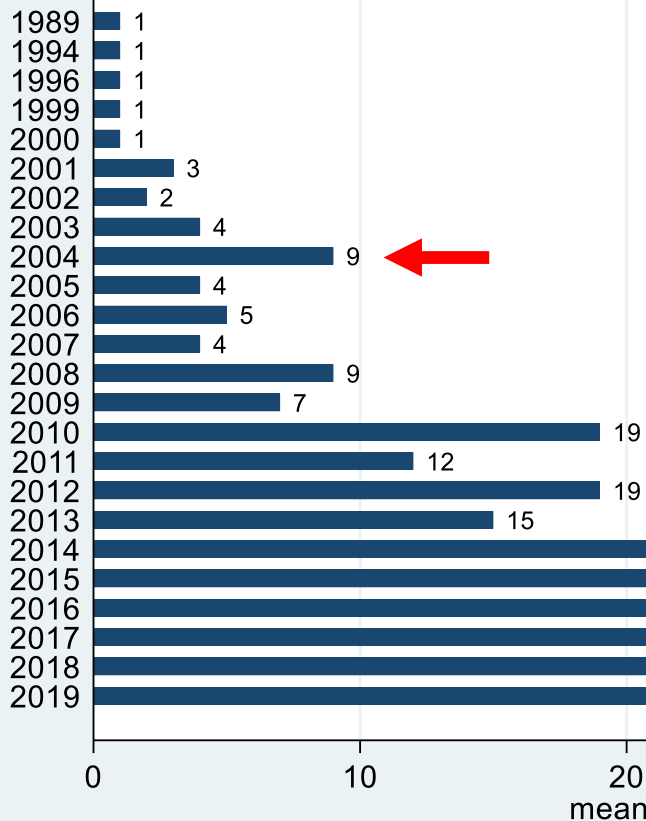
Presentation

- What is the current evidence base?
- What do the guidelines say?
- Challenges to provision?
 - access
 - multimorbidity
- Innovative (modern) approaches to delivery
 - REACH-HF
 - Digital solutions?



Meta-Analyses Exercise/Rehabilitation for Heart Failure

Pubmed (((exercise OR rehabilitation) AND (meta-analysis OR systematic review))) AND heart failure [Title]



JACC: HEART FAILURE VOL. 7, NO. 8, 2019

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Exercise-Based Rehabilitation for Heart Failure

Cochrane Systematic Review, Meta-Analysis, and Trial Sequential Analysis

Rod S. Taylor, PhD,^a Linda Long, PhD,^b Ify R. Mordi, MD,^c Michael Tvilling Madsen, PhD,^d Edward J. Davies, MD,^e Hasnain Dalal, MD,^{f,g} Karen Rees, PhD,^h Sally J. Singh, PhD,ⁱ Christian Gluud, DrMedSci,^j Ann-Dorthe Zwisler, PhD^k

Cochrane Meta-analyses

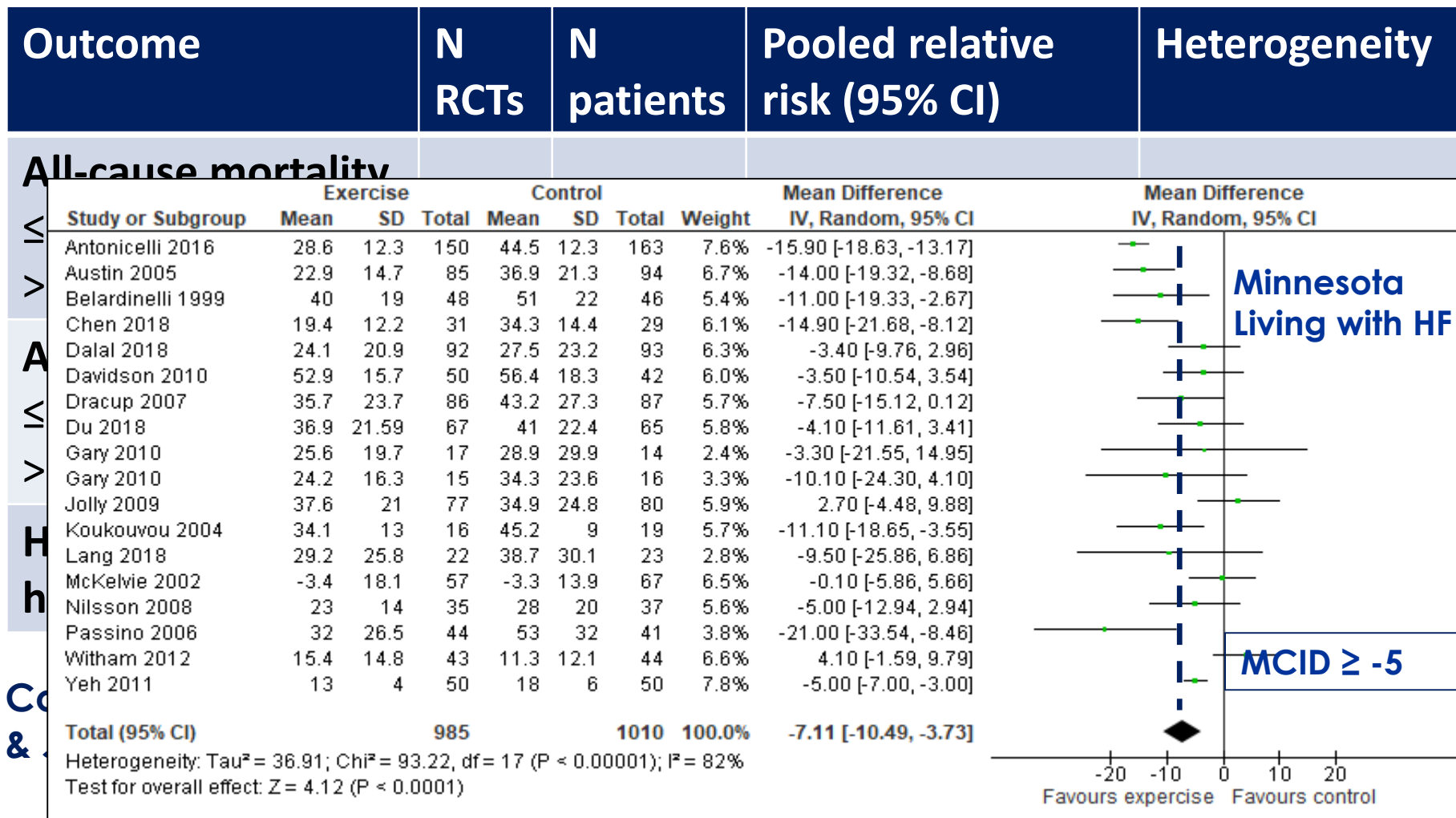
Participant Characteristics



	Cochrane v1 Rees et al (2004)	Cochrane v2 Davies et al (2010)	Cochrane v3 Sagar et al (2014)	Cochrane v4 Long et al (2019)
N trials	29 RCTs	19 RCTs	33 RCTs	44 RCTs
N patients	1,126	3,647	4,740	5,783
Age in years: median	60 yrs	56 yrs	60.5 yrs	62.5 yrs
% male: median	91%	95%	87%	81%
Ejection fraction (%): median	NR [all <40%]	28%	29%	32.5%
Included HFpEF	0/29	0/19	5/33	7/44
Included NHYA IV	0/29	4/19	6/33	8/44
Follow up in months: median [range]	4 [1 to 26]	6 [6 to 60]	6 [6 to 120]	6 [6 to 120]

Impact of Exercise-based CR for HF

2019 Cochrane Review



Cochrane Meta-analyses

Intervention Characteristics



	Cochrane v1 Rees et al (2004)	Cochrane v2 Davies et al (2010)	Cochrane v3 Sagar et al (2014)	Cochrane v4 Long et al (2019)
Overall duration: median [range]	6 months [1 to 30]			
Frequency: median [range]	3 sessions/wk [1 to 7]			
Length, min/session: median [range]	30 mins/session [8 to 60]			
Intensity <i>Maximal heart rate</i> <i>VO₂max</i> <i>Borg rating</i>	40 to 80% 50 to 85% 11 to 18			
Exercise-only programmes	28/29	16/19	25/33	31/44
Aerobic & resistance interventions	8/29	5/19	12/33	12/44
Exclusively home- based programmes	0/29	2/19	6/33	9/44

Explaining outcome variation

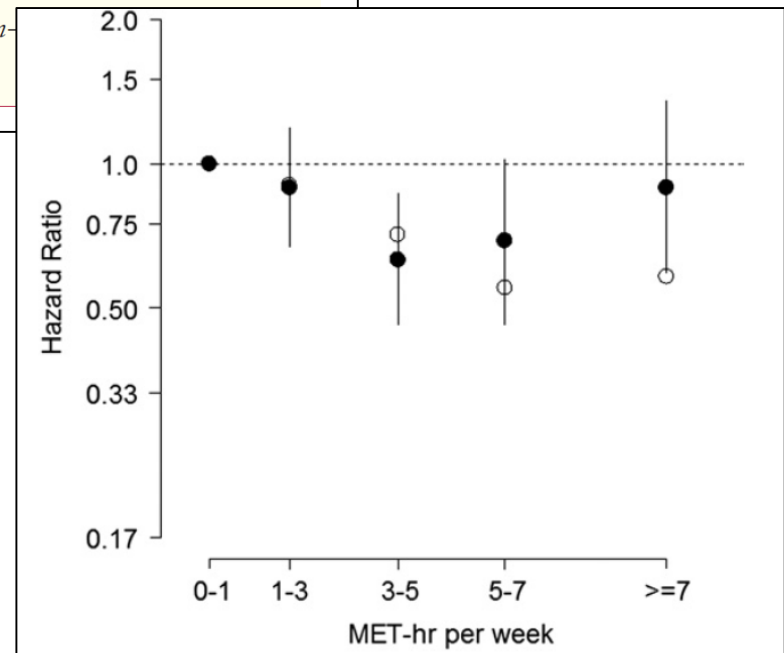
Trial level characteristics

	All-cause mortality P value	All hospitalisations P value	MLWHF P value	All HRQoL outcomes P value
Type of rehabilitation (exercise only vs comprehensive)	0.72	0.55	0.22	0.49
Type of exercise (aerobic training alone vs aerobic plus resistance training)	0.93	0.06	0.15	0.66
Exercise dose (number of weeks × number of sessions/week × average duration of session in hours)	0.10	0.44	0.89	0.71
Exercise setting (hospital only, home only, both hospital and home)	0.09	0.60	0.62	0.08
Single vs multi-centre	0.46	0.60	0.09	0.06
Publication date	0.20	0.78	0.67	0.74
Risk of bias	0.28	0.05	0.01	0.01

Relation Between Volume of Exercise and Clinical Outcomes in Patients With Heart Failure

Steven J. Keteyian, PhD,* Eric S. Leifer, PhD,† Nancy Houston-Miller, BSN,‡
William E. Kraus, MD,§ Clinton A. Brawner, MS,* Christopher M. O'Connor, MD,§||
David J. Whellan, MD,||¶ Lawton S. Cooper, MD,† Jerome L. Fleg, MD,† Dalane W. Kitzman, MD,#
Alain Cohen-Solal, MD,** James A. Blumenthal, PhD,†† David S. Rendall, PA-C,§
Ileana L. Piña, MD, MPH,‡‡ for the HF-ACTION Investigators

Detroit, Michigan; Bethesda, Maryland; Stanford, California; Durham and Winston-Philadelphia, Pennsylvania; Paris, France; and Bronx, New York



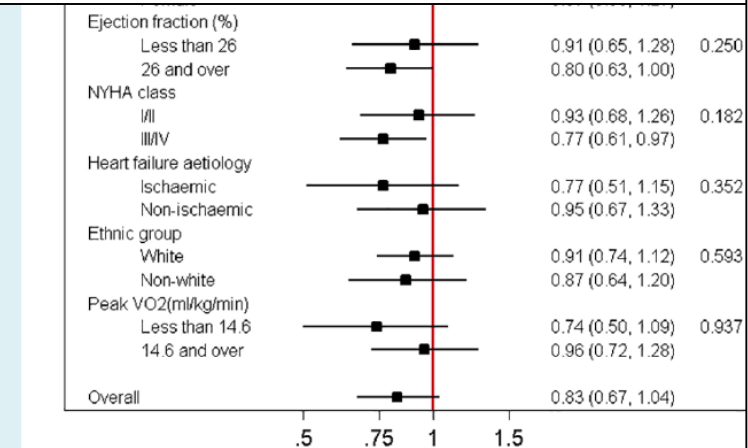
Impact of exercise-based cardiac rehabilitation in patients with heart failure (ExTraMATCH II)

JOURNAL OF THE AMERICAN COLLEGE OF CARDIOLOGY
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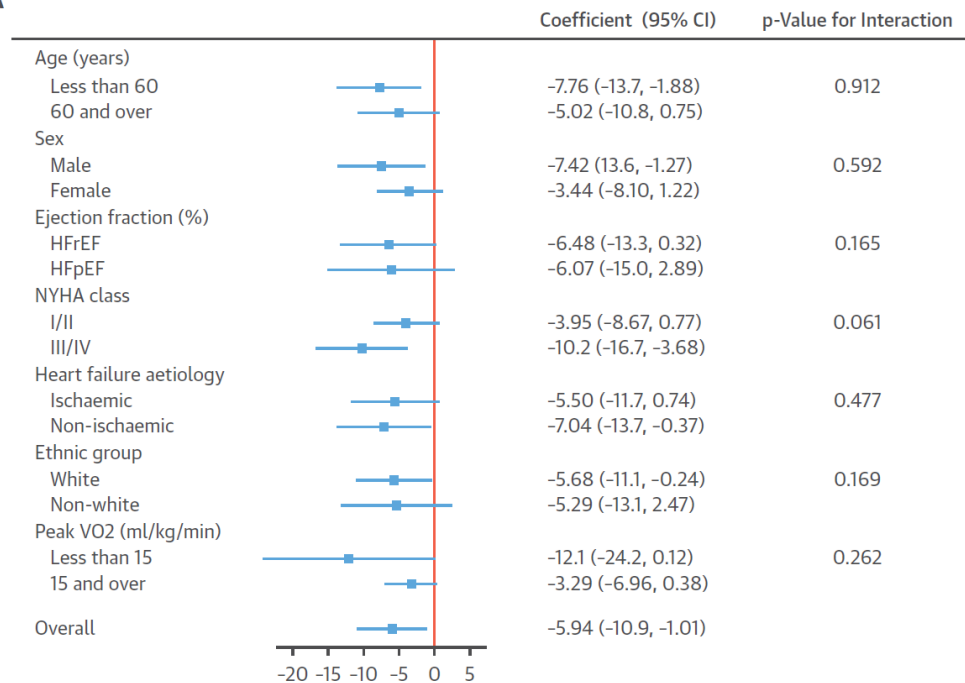
VOL. 73, NO. 12, 2019

Impact of Rehabilitative Exercise on Functional Capacity and Quality-of-Life in Patients With Heart Failure

Rod S. Taylor, PhD,^a Sarah Walker, PhD,^b Neil A. Smart, PhD,^c Massimo F. Piepoli, MD,^d Oriana Ciani, PhD,^{b,f} David Whellan, MD, MHS,^g Christopher O'Connor, MD,^h Steven J. Andrew Coats, DM,^j Constantinos H. Davos, MD,^k Hasnain M. Dalal, MD,^{b,j} Kathleen D. Lorraine S. Evangelista, PhD,ⁿ Kate Jolly, PhD,^o Jonathan Myers, PhD,^p Birgitta B. Nilsson, MD,^r Claudio Passino, MD,^r Miles D. Witham, PhD,^s Gloria Y. Yeh, MD,^t on behalf of the ExTraMATCH II Investigators



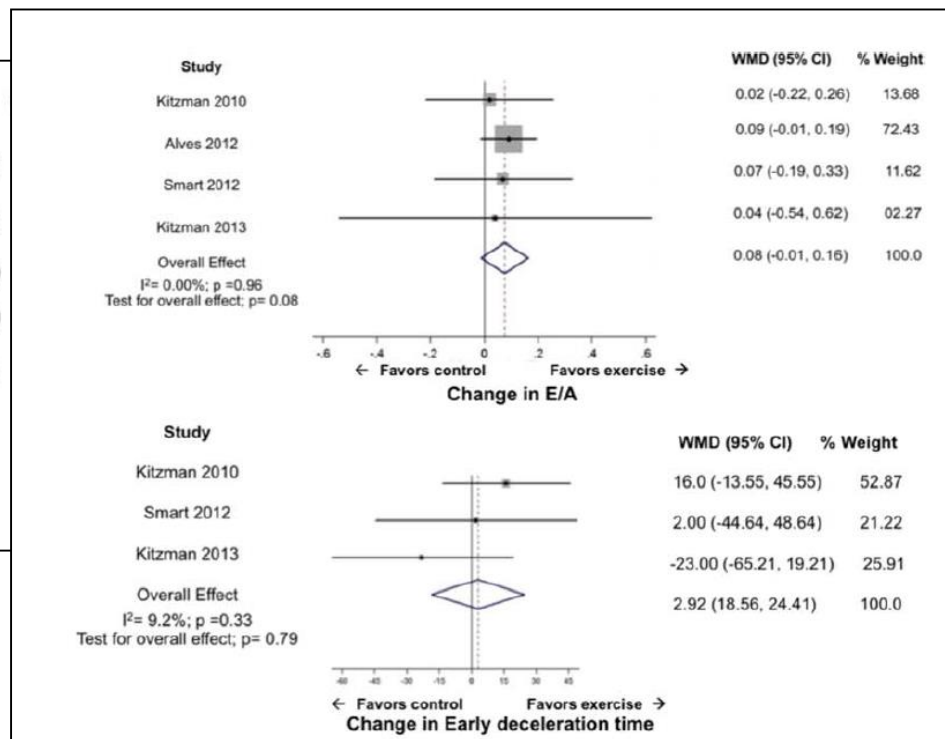
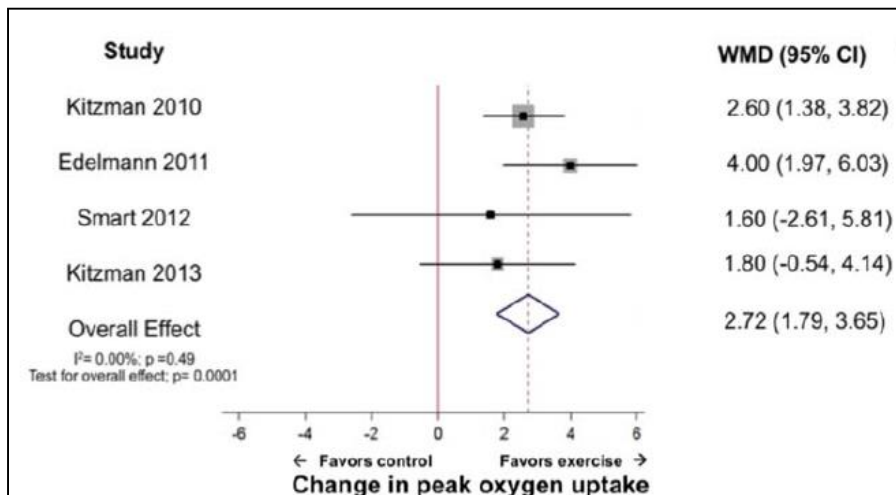
A



Exercise Training in Patients with Heart Failure and Preserved Ejection Fraction: A Meta-analysis of Randomized Control Trials

Ambarish Pandey, Akhil Parashar, Dharam Kumbhani, Sunil Agarwal, Jalaj Garg, Dalane Kitzman, Benjamin Levine, Mark Drazner and Jarett D. Berry

Circ Heart Fail. published online November 16, 2014;



ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure 2012

The Task Force for the Diagnosis and Treatment of Acute and Chronic Heart Failure 2012 of the European Society of Cardiology. Developed in collaboration with the Heart Failure Association of the ESC

Recommendations for exercise prescription and multidisciplinary management

Recommendations	Class ^a	Level ^b	Ref ^c
It is recommended that regular aerobic exercise is encouraged in patients with heart failure to improve functional capacity and symptoms.	I	A	262, 263
It is recommended that patients with heart failure are enrolled in a multidisciplinary-care management programme to reduce the risk of heart failure hospitalization.	I	A	236, 259, 264

ACC/AHA Practice Guidelines

ACC/AHA 2005 Guideline Update for the Diagnosis and Management of Chronic Heart Failure in the Adult

A Report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Writing Committee to Update the 2001 Guidelines for the Evaluation and

Class I

7. Exercise training is beneficial as an adjunctive approach to improve clinical status in ambulatory patients with current or prior symptoms of HF and reduced LVEF. (Level of Evidence: B)

But access remains a problem...

BMJ
open
accessible medical research

Why do so few patients
failure participate in cardiac
rehabilitation? A cross-
from England, Wales and
Ireland



ESC

European Society
of Cardiology

European Journal of Heart Failure
doi:10.1002/ejhf.1538

Regional differences in implementation in heart failure the Exercise Training (ExTraHF) survey

Massimo F. Piepoli^{1,2*}, Simone Binno

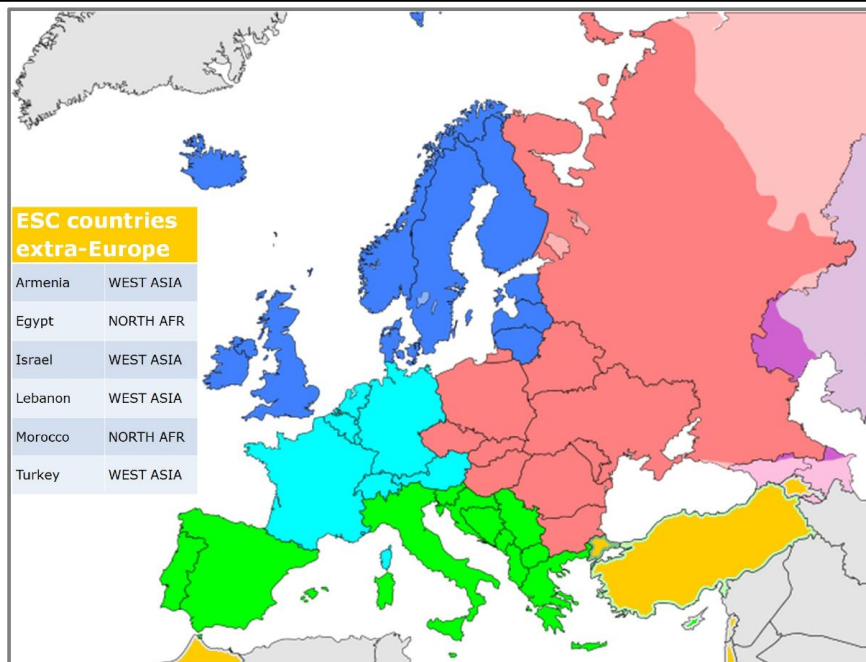
Ugo Corrà⁵, Costas

Francesco Orso¹⁰, G

Maurizio Volterrani

Exercise Physiology

Society of Cardiology



ESC countries extra-Europe

Armenia	WEST ASIA
Egypt	NORTH AFR
Israel	WEST ASIA
Lebanon	WEST ASIA
Morocco	NORTH AFR
Turkey	WEST ASIA

	Northern	Southern	Western	Eastern	Extra-Europe
Centres	52	48	34	24	14
Patients	15 040	27 127	11 769	12 748	11 830

	Northern	Southern	Western
Centres	19 (36%)	20 (41%)	8 (23%)
Patients	6677 (44%)	13 743 (50%)	4350 (37%)



順 路
THIS WAY

Chronic heart failure in adults: diagnosis and management

NICE guideline

Published: 12 September 2018

nice.org.uk/guidance/ng106

Offer exercise based cardiac rehabilitation therapy to people with stable heart failure in a format and setting that is easily accessible.

Healthcare
Improvement
Scotland

 SIGN

R Cardiac rehabilitation services should offer individualised exercise assessments, tailor the exercise component of their programmes to individual choice and deliver them in a range of settings.

SIGN 150 • Cardiac rehabilitation

A national clinical guideline

July 2017



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AACVPR/AHA/ACC SCIENTIFIC STATEMENT

Home-Based Cardiac Rehabilitation



A Scientific Statement From the American Association of Cardiovascular and Pulmonary Rehabilitation, the American Heart Association, and the American College of Cardiology

openheart Home-based versus centre-based cardiac rehabilitation: abridged Cochrane systematic review and meta-analysis

S A Buckingham,¹ R S Taylor,² K Jolly,³ A Zawada,⁴ S G Dean,² A Cowie,⁵
R J Norton,⁶ H M Dalal^{1,2}

Open Heart 2016;3:e000463. doi:10.1136/openhrt-2016-000463

Outcome or subgroup	Number of studies	Number of participants	Summary estimate and model	Effect estimate (95% CI) with p values where significant
Exercise capacity				
≤12-month follow-up	19	1876	Standard mean difference, random-effects model	-0.10 (-0.29 to 0.08)
12–24-month follow-up	3	1074	Standard mean difference, fixed-effects model	0.11 (-0.01 to 0.23)
Blood pressure (mm Hg) at 3–12-month follow-up				
Systolic	9	1117	Mean difference, random-effects model	0.19 (-3.37 to 3.75)
Diastolic	8	991	Mean difference, fixed-effects model	-1.86 (-2.95 to -0.76) lower in centre-based group (p=0.009)
Cholesterol (mmol/L) at 3–12-month follow-up				
Total	9	1109	Mean difference, random-effects model	-0.07 (-0.24 to 0.11)
HDL	7	883	Mean difference, fixed-effects model	-0.07 (-0.11 to -0.03) lower in centre-based group (p=0.001)
LDL	5	388	Mean difference, random-effects model	-0.06 (-0.27 to 0.15)
Triglycerides	5	354	Mean difference, random-effects model	-0.16 (-0.38 to 0.07)
Smoking (3–12 months)	6	986	Relative risk, fixed-effects model	0.98 (0.79 to 1.21)
Completers	18	1984	Risk ratio, fixed-effects model	1.04 (1.01 to 1.07) higher completion in home-based group (p=0.009)
Mortality	7	1166	Relative risk, fixed-effects model	0.79 (0.43 to 1.47)

The REACH-HF Intervention



Pilot and Feasibility Studies

Open Access

Key features

- Delivered at the patient's home via a mix of F2F & telephone contacts over 12 weeks (typically 4 to 6 contacts)
- Facilitation: trained health professional - HF-specialist nurse; physio, CR staff
- Optimise self-management: (1) understanding HF, (2) change of lifestyle key self-care targets (physical activity, managing fluids, managing medications and managing stress/anxiety/low mood), and (3) living with the uncertainty of HF
- Structured exercise programme - chair based exercise DVD &/or walking programme

Colin J. Greaves^{1*}, Jennifer Wingham^{1,2}, Carolyn Michelle Clark³, Jackie Austin⁶, Charles Abraham⁴, Sarah Buckingham², Russell Davis¹⁰, Hasnain D

Abstract

Background: We aimed to establish the suppo

REACH multicentre UK Trial

Full research paper

European Journal of Preventive Cardiology

ESC
European Society of Cardiology

European Journal of Preventive Cardiology
0(00) 1–11
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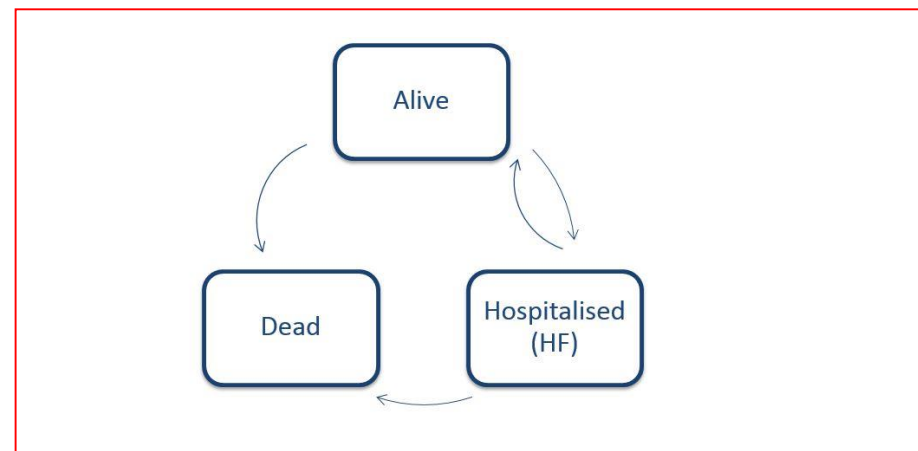
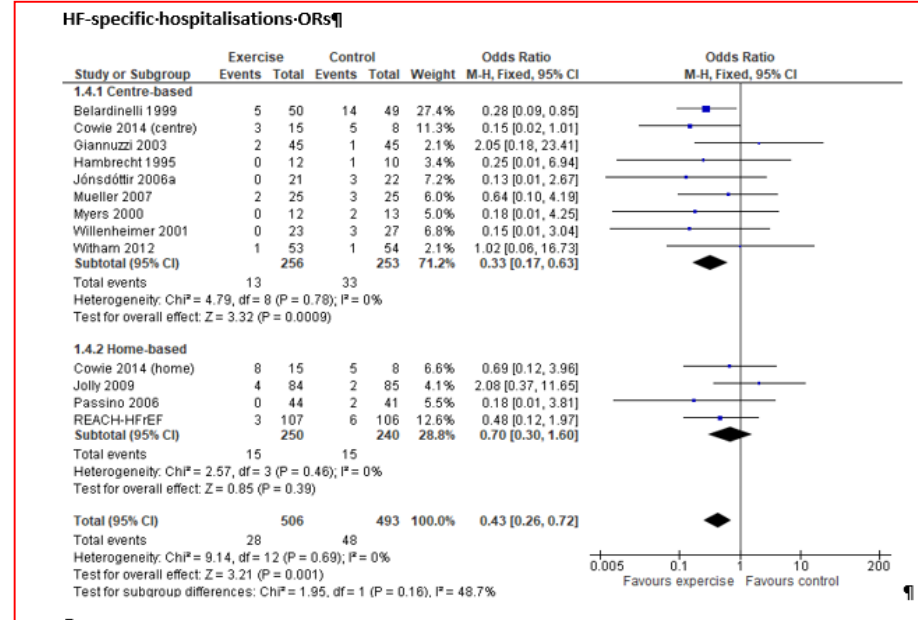
The effects and costs of home-based rehabilitation for heart failure with reduced ejection fraction: The REACH-HF multicentre randomized controlled trial

Hasnain M Dalal^{1,2}, Rod S Taylor¹, Kate Jolly³, Russell C Davis⁴, Patrick Doherty⁵, Jackie Miles⁶, Robin van Lingen⁷, Fiona C Warren¹, Colin Green¹, Jennifer Wingham¹, Colin Greaves⁸, Susannah Sadler¹, Melvyn Hillsdon⁹, Charles Abraham¹⁰, Nicky Britten¹, Julia Frost¹, Sally Singh¹¹, Christopher Hayward¹², Victoria Eyre¹³, Kevin Paul¹⁴, Chim C Lang¹⁵ and Karen Smith¹⁶; on behalf of the REACH-HF investigators

MLWHF	Mean Diff (95% CI) at 12mth	P-value
Total	-5.7 (-10.6 to -0.7)	0.025
Physical	-3.2 (-5.7 to -0.6)	0.02
Emotional	-0.8 (-2.2 to 0.6)	0.27

REACH-HF Economic modelling - Design

- **NICE reference case**
 - Perspective: NHS & PSS
 - Time horizon: lifetime
 - Utility measure: EQ-5D
 - Costs: Published UK costs 2015/16
 - Discounting: 3.5%/annum
- **Model inputs**
 - REACH-HFrEF trial, Cochrane 2014 review, CHARM trial, THIN d/base, Cowie cohort, & SHIFT
 - HF admissions
- **Comparisons**
 - REACH-HF + usual care vs usual care alone
 - Home-based CR + usual care vs usual care alone



REACH-HF cost-effectiveness

or updates

Full research paper

European Journal of
**Preventive
Cardiology**



European Journal of Preventive
Cardiology
0(00) 1–10
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Cardiology 2019

The cost effectiveness of REACH-HF and home-based cardiac rehabilitation compared with the usual medical care for heart failure with reduced ejection fraction: A decision model-based analysis

Rod S Taylor¹, Susannah Sadler¹, Hasnain M Dalal², Fiona C Warren¹, Kate Jolly³, Russell C Davis⁴, Patrick Doherty⁵, Jackie Miles⁶, Colin Greaves⁷, Jennifer Wingham¹, Melvyn Hillsdon⁸, Charles Abraham⁷, Julia Frost¹, Sally Singh⁹, Christopher Hayward¹⁰, Victoria Eyre¹¹, Kevin Paul¹², Chim C Lang¹³, Karen Smith¹⁴; on behalf of the REACH-HF investigators

REACH-HF costs	£15,452
Usual care costs	£15,051
Difference	+£400
CR QALYs	4.47
Usual care QALYs	4.24
Difference in QALYs	+0.23
Cost per QALY	£1720/QALY

REACH-HFpEF pilot

Open Access

Research

BMJ Open A randomised controlled trial of a facilitated home-based rehabilitation intervention in patients with heart failure with preserved ejection fraction and their caregivers: the REACH-HFpEF Pilot Study

Chim C Lang,¹ Karen Smith,^{1,2} Jennifer Wingham,^{3,4} Victoria Eyre,⁵ Colin J Greaves,³ Fiona C Warren,³ Colin Green,³ Kate Jolly,⁶ Russell C Davis,⁷ Patrick Joseph Doherty,⁸ Jackie Miles,⁹ Nicky Britten,³ Charles Abraham,³ Robin Van Lingen,¹⁰ Sally J Singh,¹¹ Kevin Paul,¹² Melvyn Hillsdon,¹³ Susannah Sadler,³ Christopher Hayward,¹⁴ Hayes M Dalal,^{3,4} Rod S Taylor,³ and on behalf of the REACH-HF investigators

MLWHF	Mean Diff (95% CI) at 6-months
Total	-11.5 (-22.8 to 0.3)
Physical	-4.7 (-0.1 to 0.8)
Emotional	-2.7 (-6.0 to 0.6)

Implementation: REACH-HF Beacon sites

Launched Summer 2019



SCOT:REACH-HF project

- *Implementation of an evidence-based cardiac rehabilitation home programme for heart failure patients and their caregivers in Scotland*
- **Methods**
 - 3 Health Boards – 45 HF patients per site
 - Assess patient outcomes pre and post REACH-HF e.g. MLWHF/ISWT/hospitalisation
 - Qualitative interviews with healthcare staff
 - Research funding: support training of staff/manuals/evaluation



REVIEW ARTICLE

Telerehabilitation for Cardiac Patients: Systematic Review

Danieli de Cristo,¹ Natan Pinto do Nascimento,¹ Alexandre Simões Dias,² Amanda Sachetti¹

Universidade de Passo Fundo (UPF),¹ Rio Grande do Sul, RS - Brazil

Hospital de Clínicas de Porto Alegre, Universidade Federal do Rio Grande do Sul,² Rio Grande do Sul, RS - Brazil

SYSTEMATIC REVIEW AND META-ANALYSIS



Home-Based Cardiac Rehabilitation Alone and Hybrid With Center-Based Cardiac Rehabilitation in Heart Failure: A Systematic Review and Meta-Analysis

Hafiz M. Imran, MD; Muhammad Baig, MD; Sebhath Erqou, MD; Tracey H. Taveira, Pharm D; Nishant R. Shah, MD, MPH, MSc; Alan Morrison, MD, PhD; Gaurav Choudhary, MD; Wen-Chih Wu, MD, MPH

Conclusions

Exercise-based intervention (rehabilitation)....

- **improves health-related quality of life** of HF patients and reduces their risk of unplanned hospitalisation admission
 - majority of evidence in HFrEF

- is a **Class 1 level A recommendation** of ESC and AHA/ACC

		All Diagnosis/Treatment Groups		
		%	Mean Age	% with two or more comorbidities
Male	Group-Based	76.6	64	52.7
	Home-Based	8.4	66	49.3
	Web-Based	0.2	56	41.9
Female	Group-Based	72.2	66	56.3
	Home-Based	9.9	70	55.9
	Web-Based	0.1	60	64.3



- **But only** America
- **Need for**

traditional outpatient hospital programmes – home/community and **digitally supported and consider comorbidity**

Thank you!

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