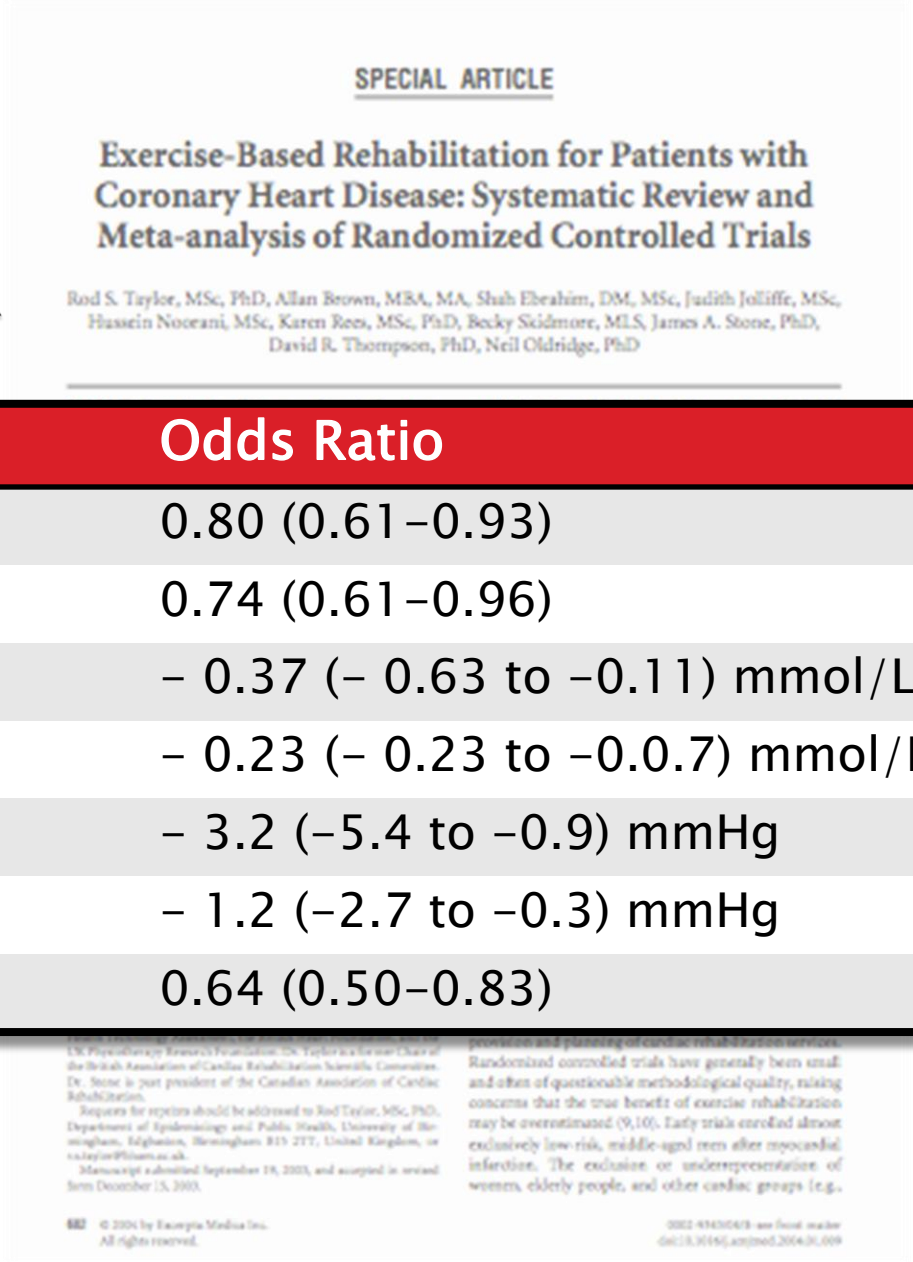
Cardiac Rehab Workshop

May 24, 2018
Thang Nguyen MD FRCPC
University of Manitoba
Section of Cardiology, Department of Internal Medicine
WRHA Medical Advisor Cardiac Rehabilitation

Objectives

- Review benefits of cardiac rehab (CR) for ACS patients
- Understand current process of CR in Manitoba
- Have an open discussion about CR case management, exercise prescriptions, and limitations

Benefits of CR



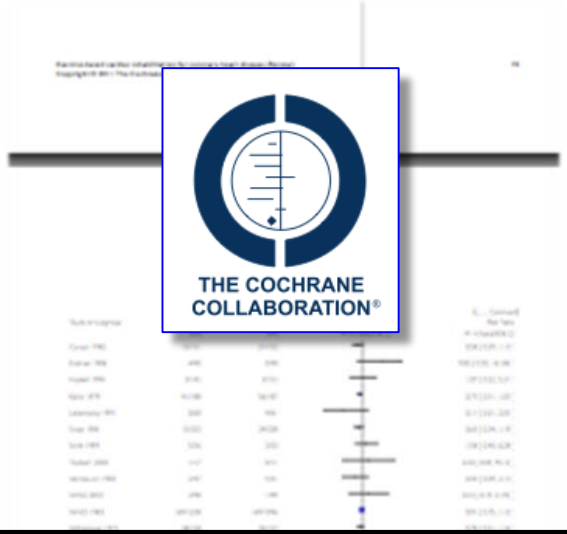
SPECIAL ARTICLE

Exercise-Based Rehabilitation for Patients with Coronary Heart Disease: Systematic Review and Meta-analysis of Randomized Controlled Trials

Rod S. Taylor, MSc, PhD, Allan Brown, MBA, MA, Shah Ebrahim, DM, MSc, Judith Jolliffe, MSc, Hussein Noorani, MSc, Karen Rees, MSc, PhD, Becky Skidmore, MLS, James A. Stone, PhD, David R. Thompson, PhD, Neil Oldridge, PhD

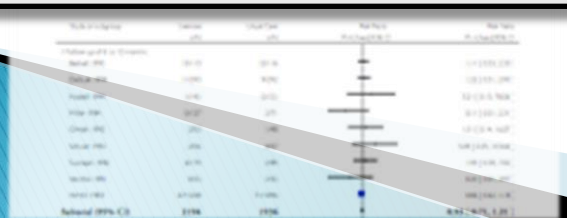
Outcome	Odds Ratio
Total Mortality	0.80 (0.61–0.93)
Cardiac Mortality	0.74 (0.61–0.96)
Total Cholesterol	– 0.37 (– 0.63 to –0.11) mmol/L
Triglycerides	– 0.23 (– 0.23 to –0.0.7) mmol/L
Systolic Blood Pressure	– 3.2 (–5.4 to –0.9) mmHg
Diastolic Blood Pressure	– 1.2 (–2.7 to –0.3) mmHg
Smoking Cessation	0.64 (0.50–0.83)

Taylor et al. AmJMed2004;116:682



- 47 studies CR vs no-CR
- (Up to December 2009)
- 10 794 patients with CAD

	Patients	Risk Ratio (95% CI)
Total Mortality (>12mo)	5790	0.87 (0.75, 0.99)
CV Mortality (>12 mo)	4757	0.74 (0.63, 0.87)
Fatal/nonfatal MI (>12 mo)	5682	0.97 (0.82, 1.15)
CABG (>12 mo)	2189	0.93 (0.68, 1.27)
PTCA (>12 mo)	1322	0.89 (0.66, 1.19)
Hospitalizations (6-12 mo)	463	0.69 (0.51, 0.93)
Hospitalizations (>12 mo)	2009	0.98 (0.87, 1.11)



Heran et al. Cochrane Database Sys Rev 2011:CD001800

Cochrane Library

Cochrane Database of Systematic Reviews

Exercise-based cardiac rehabilitation for coronary heart disease (Review)

Anderson L, Thompson DR, Oldridge N, Zwisler AD, Rees K, Martin N, Taylor RS

2016;Issue 1.Art.No.CD001800

Exercise-based cardiac rehabilitation for coronary heart disease (Review)

Anderson L, Thompson DR, Oldridge N, Zwisler AD, Rees K, Martin N, Taylor RS

- 63 RCT's of CR vs no-CR
- Dec 2009-July 2014
- 14 486 patients
- post-MI and post-revascularization
- Mean age 47.5-71.0 years
- 15% women

Exercise-based cardiac rehabilitation for coronary heart disease (Review)

Anderson L, Thompson DR, Oldridge N, Zwisler AD, Rees K, Martin N, Taylor RS

	Risk Ratio	95% CI
Total Mortality	0.96	0.88 – 1.04
Cardiovascular Mortality	**0.74**	**0.64 – 0.86**
Hospitalizations	**0.82**	**0.70 – 0.96**
Myocardial Infarctions	0.90	0.79 – 1.04
CABG	0.96	0.80 – 1.16
PCI	0.85	0.70 – 1.04

2016;Issue 1.Art.No.CD001800

Case #1

- Mr. A – 58 year old male
- PMHx – HTN, smoker, depression
- Admitted for ACS
- hsTnT 60, EF normal
- Revascularized with mLAD PCI

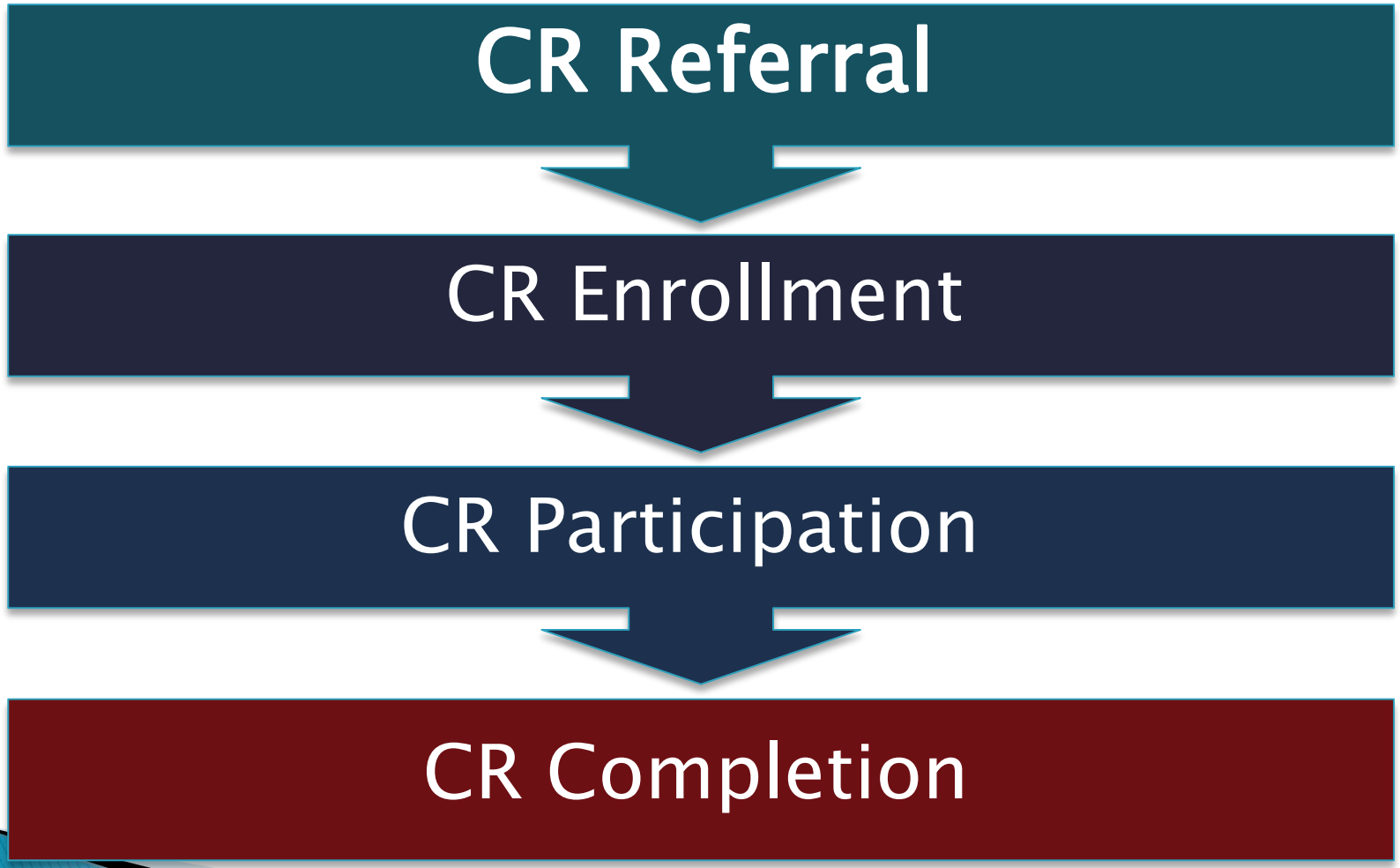
- Discharge meds: ASA, ticagrelor, rosuvastatin, ramipril, bisoprolol, citalopram

- Now what?

Pre-discharge Planning

- How does your facility initiate CR referral?
- Does your facility have an automatic CR referral process?

Referral: First Step of Cascade



Wellness Institute and Rehfit

- Once referral received…

- Triage and appropriateness
- Patient contact
- Information gathering

Wellness Institute and Rehfit

- First visit or class…

Exercise Prescription

- Mr.A needs guidance for exercise

- Pre-ACS, active with golfing, tennis
- Occupation – office work

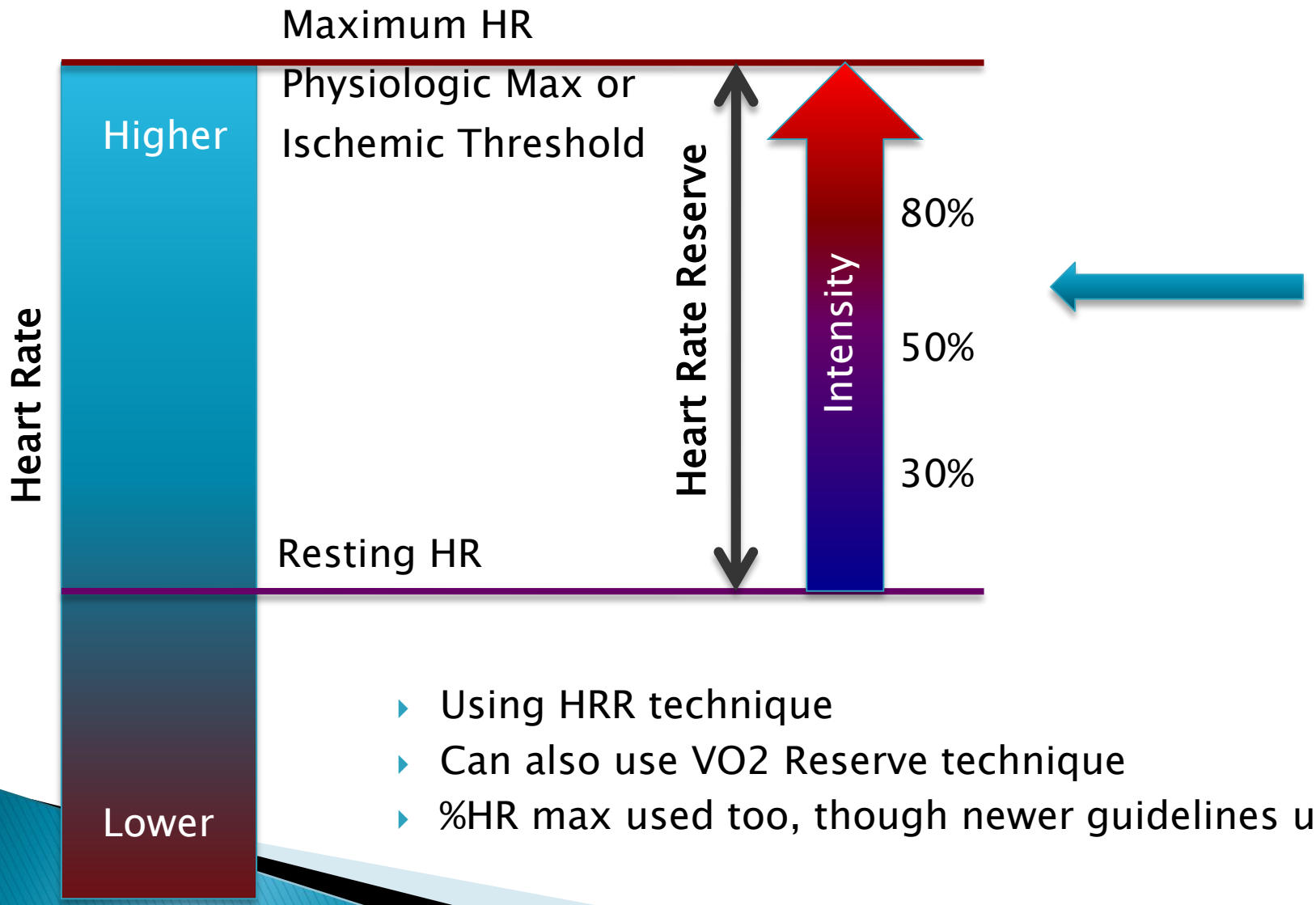
- Pre-CR stress test:
- Rest HR 60, peak HR 120 bpm
- No symptoms
- 9 METs

F.I.T.T.

Warm Up	5-10 min to hit THR of 20-35% HRR	
Conditioning	**F**requency	5 x (ideally 7 x) / week
	Intensity	40 – 80% of HRR
	Time	30 – 60 minutes
	Type	Aerobic and Resistance
Cool Down	5-10 min at a THR of <60% of max HR	

CACR Guidelines 3rd Ed.

Prescribing Intensity



- Using HRR technique
- Can also use VO2 Reserve technique
- %HR max used too, though newer guidelines use HRR

Table 3: Relative intensities for aerobic exercise prescription (for activities lasting up to 60 minutes)*

Intensity		% HRR	% HR_{max}	15-category RPE scale†	Category-ratio RPE scale†	Breathing rate	Body temperature	Example of activity
Very light effort		< 20	< 35	< 10	< 2	Normal	Normal	Dusting
Light effort	Range required for health	20-39	35-54	10-11	2-3	Slight increase	Start to feel warm	Light gardening
Moderate effort		40-59	55-69	12-13	4-6	Greater increase	Warm	Brisk walking
Vigorous effort		60-84	70-89	14-16	7-8	More out of breath	Quite warm	Jogging
Very hard effort		> 84	> 89	17-19	9	Greater increase	Hot	Running fast
Maximal effort		100	100	20	10	Completely out of breath	Very hot, perspiring heavily	Sprinting all-out

Note: HRR = heart rate reserve, HR_{max} = maximum heart rate, RPE = patient's rating of perceived exertion.
*Created from information provided in the handbook for *Canada's Physical Activity Guide to Healthy Active Living*,[26] and the American College of Sports Medicine's guidelines for exercise testing and prescription.[9]
†See Table 4 for details about the RPE scales.

Waburton et al. CMAJ 2006;174:961

Resistance Training

- Not Mr. Universe type weight training
- Light weights, 12-15 repetitions

Frequency	2-3 x / week
Intensity	Upper body: 30-40% of 1 RM Lower body: 40-50% of 1 RM
Time	1-3 sets, 12-15 repetitions
Type	Resistance

RM = repetition maximum

CACR Guidelines 3rd Ed.

Smoking Cessation?

- What options are available for extra smoking cessation support?

Post ACS Depression

- Mr. A states he is sleeping less, has more fatigue and feels his mood has worsened
- How does this alter his CR program?

- Questions?

Case #2

- Mrs. C – 69 year old female
- PMHx – DM, HTN, ACSx2 prior
- Now admitted anterior STE-ACS
- hsTnT 1500, EF 20%
- NYHA II

- Euvolemic now as outpatient
- Referred to CR

HF with Reduced EF

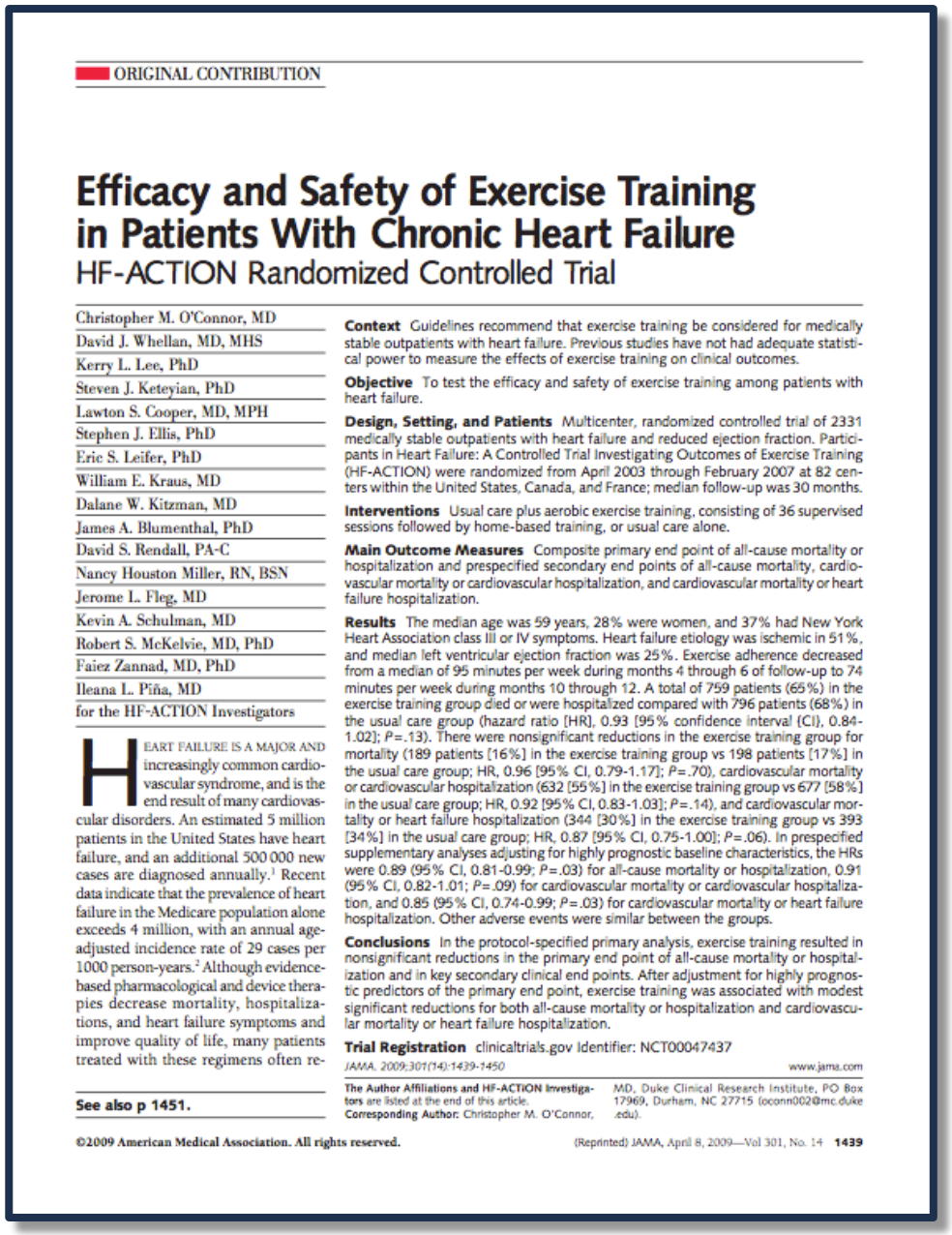
- What are some added CR issues with HF with reduced EF?

- Safety?
- Exercise prescription adjustments?
- Impact of devices?

HF-ACTION

O'connor et al. JAMA 2009;301:1439

- RCT
- 2331 stable HF pts
- LVEF <35%
- NYHA II-IV
- CR vs. Usual Care
  - 36 sessions moderate intensity training (60-70% HRR)



ORIGINAL CONTRIBUTION

Efficacy and Safety of Exercise Training in Patients With Chronic Heart Failure

HF-ACTION Randomized Controlled Trial

Christopher M. O'Connor, MD
David J. Whellan, MD, MHS
Kerry L. Lee, PhD
Steven J. Keteyian, PhD
Lawton S. Cooper, MD, MPH
Stephen J. Ellis, PhD
Eric S. Leifer, PhD
William E. Kraus, MD
Dalane W. Kitzman, MD
James A. Blumenthal, PhD
David S. Rendall, PA-C
Nancy Houston Miller, RN, BSN
Jerome L. Fleg, MD
Kevin A. Schulman, MD
Robert S. McKelvie, MD, PhD
Faiez Zannad, MD, PhD
Ileana L. Piña, MD
for the HF-ACTION Investigators

Context Guidelines recommend that exercise training be considered for medically stable outpatients with heart failure. Previous studies have not had adequate statistical power to measure the effects of exercise training on clinical outcomes.

Objective To test the efficacy and safety of exercise training among patients with heart failure.

Design, Setting, and Patients Multicenter, randomized controlled trial of 2331 medically stable outpatients with heart failure and reduced ejection fraction. Participants in Heart Failure: A Controlled Trial Investigating Outcomes of Exercise Training (HF-ACTION) were randomized from April 2003 through February 2007 at 82 centers within the United States, Canada, and France; median follow-up was 30 months.

Interventions Usual care plus aerobic exercise training, consisting of 36 supervised sessions followed by home-based training, or usual care alone.

Main Outcome Measures Composite primary end point of all-cause mortality or hospitalization and prespecified secondary end points of all-cause mortality, cardiovascular mortality or cardiovascular hospitalization, and cardiovascular mortality or heart failure hospitalization.

Results The median age was 59 years, 28% were women, and 37% had New York Heart Association class III or IV symptoms. Heart failure etiology was ischemic in 51%, and median left ventricular ejection fraction was 25%. Exercise adherence decreased from a median of 95 minutes per week during months 4 through 6 of follow-up to 74 minutes per week during months 10 through 12. A total of 759 patients (65%) in the exercise training group died or were hospitalized compared with 796 patients (68%) in the usual care group (hazard ratio [HR], 0.93 [95% confidence interval {CI}, 0.84-1.02]; $P=.13$). There were nonsignificant reductions in the exercise training group for mortality (189 patients [16%] in the exercise training group vs 198 patients [17%] in the usual care group; HR, 0.96 [95% CI, 0.79-1.17]; $P=.70$), cardiovascular mortality or cardiovascular hospitalization (632 [55%] in the exercise training group vs 677 [58%] in the usual care group; HR, 0.92 [95% CI, 0.83-1.03]; $P=.14$), and cardiovascular mortality or heart failure hospitalization (344 [30%] in the exercise training group vs 393 [34%] in the usual care group; HR, 0.87 [95% CI, 0.75-1.00]; $P=.06$). In prespecified supplementary analyses adjusting for highly prognostic baseline characteristics, the HRs were 0.89 (95% CI, 0.81-0.99; $P=.03$) for all-cause mortality or hospitalization, 0.91 (95% CI, 0.82-1.01; $P=.09$) for cardiovascular mortality or cardiovascular hospitalization, and 0.85 (95% CI, 0.74-0.99; $P=.03$) for cardiovascular mortality or heart failure hospitalization. Other adverse events were similar between the groups.

Conclusions In the protocol-specified primary analysis, exercise training resulted in nonsignificant reductions in the primary end point of all-cause mortality or hospitalization and in key secondary clinical end points. After adjustment for highly prognostic predictors of the primary end point, exercise training was associated with modest significant reductions for both all-cause mortality or hospitalization and cardiovascular mortality or heart failure hospitalization.

Trial Registration clinicaltrials.gov Identifier: NCT00047437

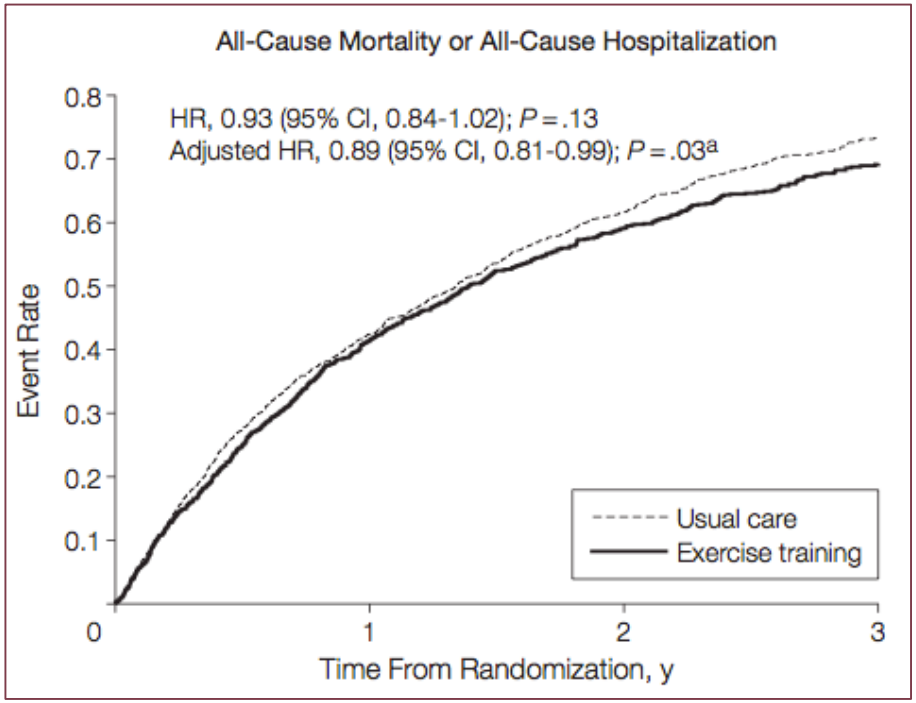
JAMA. 2009;301(14):1439-1450 www.jama.com

HEART FAILURE IS A MAJOR AND increasingly common cardiovascular syndrome, and is the end result of many cardiovascular disorders. An estimated 5 million patients in the United States have heart failure, and an additional 500 000 new cases are diagnosed annually.[1] Recent data indicate that the prevalence of heart failure in the Medicare population alone exceeds 4 million, with an annual age-adjusted incidence rate of 29 cases per 1000 person-years.[2] Although evidence-based pharmacological and device therapies decrease mortality, hospitalizations, and heart failure symptoms and improve quality of life, many patients treated with these regimens often re-

See also p 1451.

The Author Affiliations and HF-ACTION Investigators are listed at the end of this article.
Corresponding Author: Christopher M. O'Connor, MD, Duke Clinical Research Institute, PO Box 17969, Durham, NC 27715 (oconn002@mc.duke.edu).

HF-ACTION



	HR	95% CI	P value
All cause mortality and hospitalization	0.89	0.81-0.99	0.03
CV mortality and HF hospitalization	0.85	0.74-0.99	0.03

O'conner et al. JAMA

HF-ACTION

Table 4. Change in 6-Minute Walk Test and Cardiopulmonary Exercise Test Results

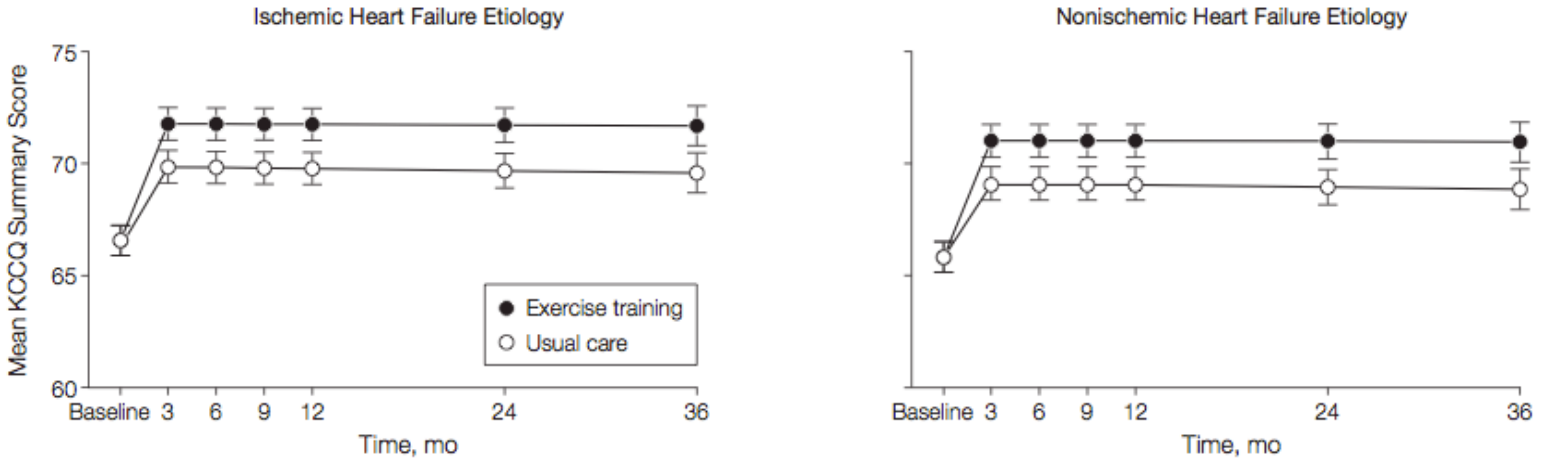
	Median (IQR)		
	Usual Care	Exercise Training	*P* Value
Baseline to 3 mo[a]			
Distance of 6-minute walk, m (n = 1835)	5 (–28 to 37)	20 (–15 to 57)	<.001
Cardiopulmonary exercise time, min (n = 1914)	0.3 (–0.6 to 1.4)	1.5 (0.3 to 3.0)	<.001
Peak oxygen consumption, mL/kg/min (n = 1870)	0.2 (–1.2 to 1.4)	0.6 (–0.7 to 2.3)	<.001
Baseline to 12 mo[b]			
Distance of 6-minute walk, m (n = 1444)	12 (–30 to 55)	13 (–28 to 61)	.26
Cardiopulmonary exercise time, min (n = 1476)	0.2 (–1.0 to 1.7)	1.5 (0 to 3.2)	<.001
Peak oxygen consumption, mL/kg/min (n = 1442)	0.1 (–1.5 to 1.8)	0.7 (–1.0 to 2.5)	<.001

Abbreviation: IQR, interquartile range.
[a] Complete case analysis. Expected 2284 patients at 3 months.
[b] Complete case analysis. Expected 2159 patients at 12 months.

O'conner et al. JAMA

HF-ACTION: Quality of Life

Figure 2. Predicted Mean Health Status Trajectories by Treatment Group



No. of participants

Exercise training	598	547	511	472	470	277	131	561	505	480	440	436	292	163
Usual care	599	514	481	471	431	285	151	572	472	436	430	419	267	129

P=.001 for treatment effect for both ischemic and nonischemic heart failure. Error bars indicate standard errors at each time point.

- Kansas City Cardiomyopathy Questionaire (KCCQ)
- 23 questions
- Score 0-100

Cochrane Review 2010

Exercise based rehabilitation for heart failure (Review)

Davies EJ, Moxham T, Rees K, Singh S, Coats AJS, Ebrahim S, Lough F, Taylor RS

- 19 trials
- 3647 systolic HF patients
- CR vs usual care
- Trend towards mortality benefit > 1yr
- Reduced hospitalization

Cochrane Review 2010

Exercise based rehabilitation for heart failure (Review)

Davies EJ, Moxham T, Rees K, Singh S, Coats AJS, Ebrahim S, Lough F, Taylor RS

THE COCHR
COLLABOR

Analysis 1.6. Comparison 1 All exercise interventions versus usual care, Outcome 6 Health related quality of life - MLWHF.

Review: Exercise based rehabilitation for heart failure

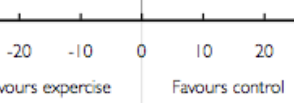
Comparison: 1 All exercise interventions versus usual care

Outcome: 6 Health related quality of life - MLWHF

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
Austin 2005	95	22.9 (14.7)	94	36.9 (21.3)		20.0 %	-14.00 [-19.22, -8.78]
Belardinelli 1999	48	39 (20)	46	52 (20)		16.1 %	-13.00 [-21.09, -4.91]
Dracup 2007	87	35.7 (23.7)	86	43.2 (26.5)		16.9 %	-7.50 [-14.99, -0.01]
Koukouvou 2004	16	34.1 (13)	19	45.2 (9)		16.8 %	-11.10 [-18.65, -3.55]
McKelvie 2002	57	-3.4 (18.1)	67	-3.3 (13.9)		19.3 %	-0.10 [-5.86, 5.66]
Passino 2006	44	32 (26.5)	41	53 (32)		10.9 %	-21.00 [-33.54, -8.46]
Total (95% CI)	**347**		**353**			**100.0 %**	**-10.33 [-15.89, -4.77]**

Heterogeneity: $Tau^2 = 33.04$; $Chi^2 = 17.49$, df = 5 (P = 0.004); $I^2 = 71\%$

Test for overall effect: Z = 3.64 (P = 0.00027)



HF-ACTION: Safety

Table 3 **Summary of Selected Adverse Events in the HF-ACTION Study***

Adverse Events	Usual Care (n = 1,171)†	Exercise Training (n = 1,159)
Pre-specified cardiovascular adverse events		
Worsening HF	340 (29.0)	303 (26.1)
Myocardial infarction	45 (3.8)	41 (3.5)
Unstable angina	88 (7.5)	86 (7.4)
Serious adverse arrhythmia‡	164 (14.0)	167 (14.4)
Stroke	28 (2.4)	33 (2.8)
Transient ischemic attack	23 (2.0)	20 (1.7)
Any of the above events	471 (40.2)	434 (37.4)
General adverse events		
Hospital stay for fracture of hip or pelvis	7 (0.6)	3 (0.3)
Outpatient fracture repair	20 (1.7)	13 (1.1)
ICD firing§	151/644 (23.4)	142/641 (22.2)
Hospital stay after exercise‖	22 (1.9)	37 (3.2)
Died after exercise¶	5 (0.4)	5 (0.4)

Case #3

- Mr. O, 83 year old male
- PMHx – Parkinson's disease, autonomic dysfunction
- Admitted with ACS. TnT 115. EF normal
- Declined angio due to preference/frailty
- Ambulates with 4WW

Wellness Institute and Rehfit

- Should this patient be referred to CR?
- What are some complicating factors in very elderly or frail when considering or delivering CR?

Case #4

- Mrs. F, 65 year old female
- PMHx – diabetes, HTN, PAD
- Lives in Peguis MB
- Admitted in Percy Moore Hospital for ACS. Transferred for angio, PCI RCA. EF 40%. Repatriated

Wellness Institute and Rehfit

- What are some options for CR in the rural patient?
- What are some barriers to delivering CR in this cohort?

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Home-based versus centre-based cardiac rehabilitation (Review)

Taylor RS, Dalal H, Jolly K, Zawada A, Dean SG, Cowie A, Norton RJ

2015;Issue 8.Art.No.CD007130

Home-based versus centre-based cardiac rehabilitation (Review)

Taylor RS, Dalal H, Jolly K, Zawada A, Dean SG, Cowie A, Norton RJ

- 17 RCT's home-based CR vs centre-based CR
- Year 2001 – 2014
- 2 172 patients
- Low risk
- Mostly excluded residual ischemia, arrhythmias and HF
- 345 NYHA II-III

Home-based versus centre-based cardiac rehabilitation (Review)

Taylor RS, Dalal H, Jolly K, Zawada A, Dean SG, Cowie A, Norton RJ

		95% CI
Total mortality	RR 0.79	0.43 – 1.47 (p=0.46)
Cardiac events	NP	NP
Exercise capacity	SMD −0.10	−0.29 – 0.08 (p=0.29)
Total cholesterol	MD +0.07	−0.24 – 0.11 (p=0.47)
Systolic blood pressure	MD +0.19	−3.37 – 3.75 (p=0.92)
Program completion	RR 1.04	1.01 – 1.07 (p=0.009)

Summary

- Cardiac rehab indicated for all ACS patients
- CR patients get a tailored exercised regimen
- Multifaceted approach to achieve healthy lifestyle behavior
- CR for HFrEF is safe and efficacious
- CR is possible for patients with low functional capacity
- There are alternative methods to deliver CR

Special Thanks

- Wellness Institute and Rehfit staff
- Gordon and Elizabeth for their time
- Michelle Meade

- Last questions?

- Extra slides

Resistance Training

- Concerns of high BP spikes no longer valid*
- CHEP guidelines 2013 approve resistance training

- Combination RT + aerobic training may further increase VO2max compared to aerobic training alone**

*Rossi et al. CJC 2013;29:622
**Marzolini et al. Med Sci Sports Exer 2008;40:1557