

# **Perspective of Clinician About Cardiac Rehabilitation ; Rationale and Insurance Coverage**

대구 가톨릭의대  
김기식

## 심뇌혈관질환 질병부담 및 현황

사망원인 순위 추이, 1998-2008

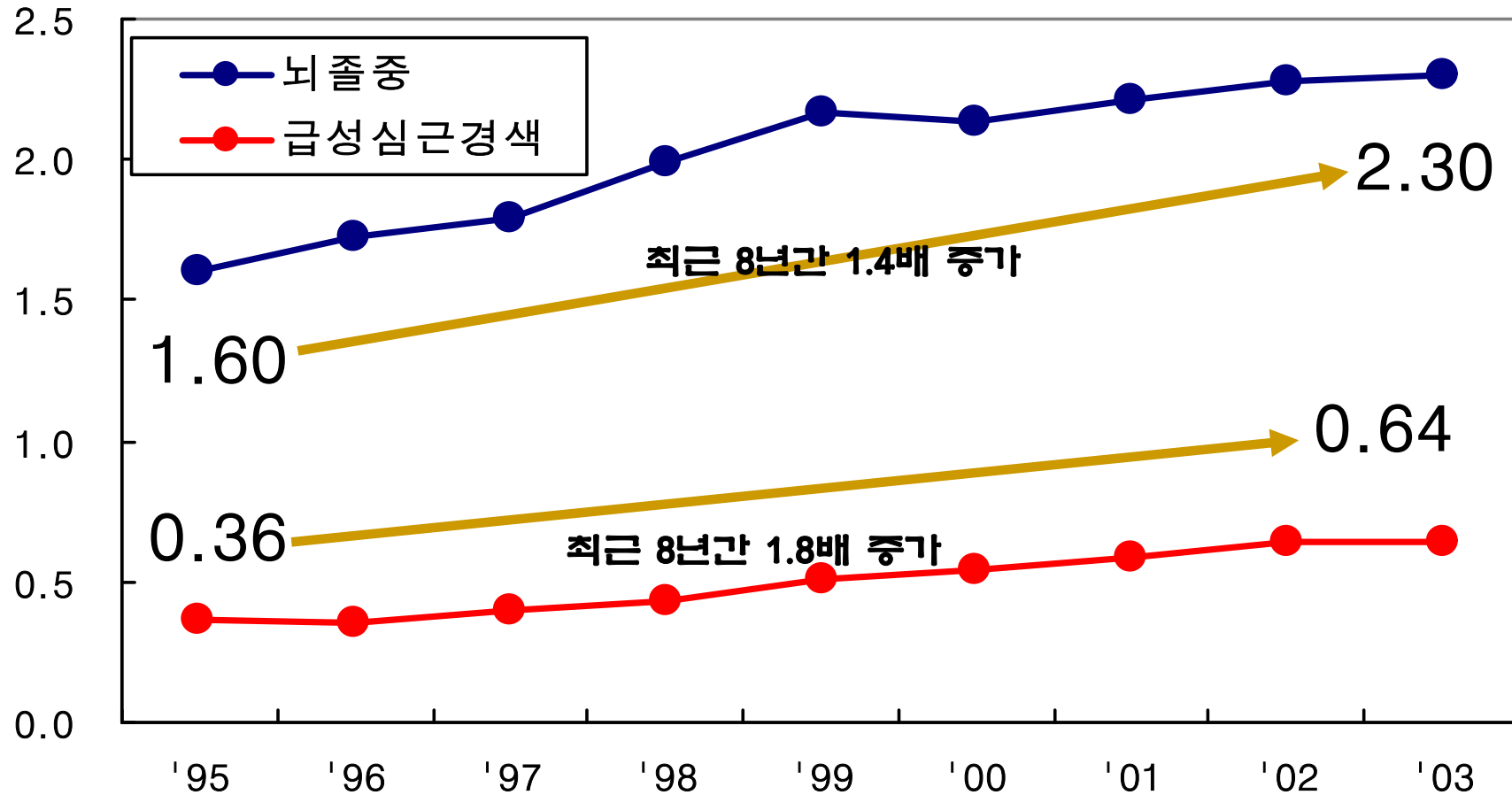
(단위: 인구 10만명당, 명, %)

순 위	1998		2007		2008			
	사망원인	사망률	사망원인	사망률	사망원인	사망자수	구성비	사망률
1	악성신생물(암)	108.6	악성신생물(암)	137.5	악성신생물(암)	68,912	28.0	139.5
2	뇌혈관 질환	73.6	뇌혈관 질환	59.6	뇌혈관 질환	27,932	11.3	56.5
3	심장 질환 <sup>1)</sup>	38.4	심장 질환 <sup>1)</sup>	43.7	심장 질환 <sup>1)</sup>	21,429	8.7	43.4
4	운수사고	25.6	고의적 자해(자살)	24.8	고의적 자해(자살)	12,858	5.2	26.0
5	간질환	24.6	당뇨병	22.9	당뇨병	10,234	4.2	20.7
6	당뇨병	21.0	운수사고	15.5	만성하기도 질환	7,338	3.0	14.9
7	고의적 자해(자살)	18.4	만성하기도 질환	15.3	운수사고	7,287	3.0	14.7
8	만성하기도 질환	12.7	간 질환	14.9	간 질환	7,164	2.9	14.5
9	고혈압성 질환	8.4	고혈압성 질환	11.0	폐렴	5,461	2.2	11.1
10	호흡기결핵	7.1	폐렴	9.3	고혈압성 질환	4,724	1.9	9.6

1) 심장 질환에는 허혈성 심장 질환 및 기타 심장 질환이 포함

## 뇌졸중, 심근경색증의 발생률 추이

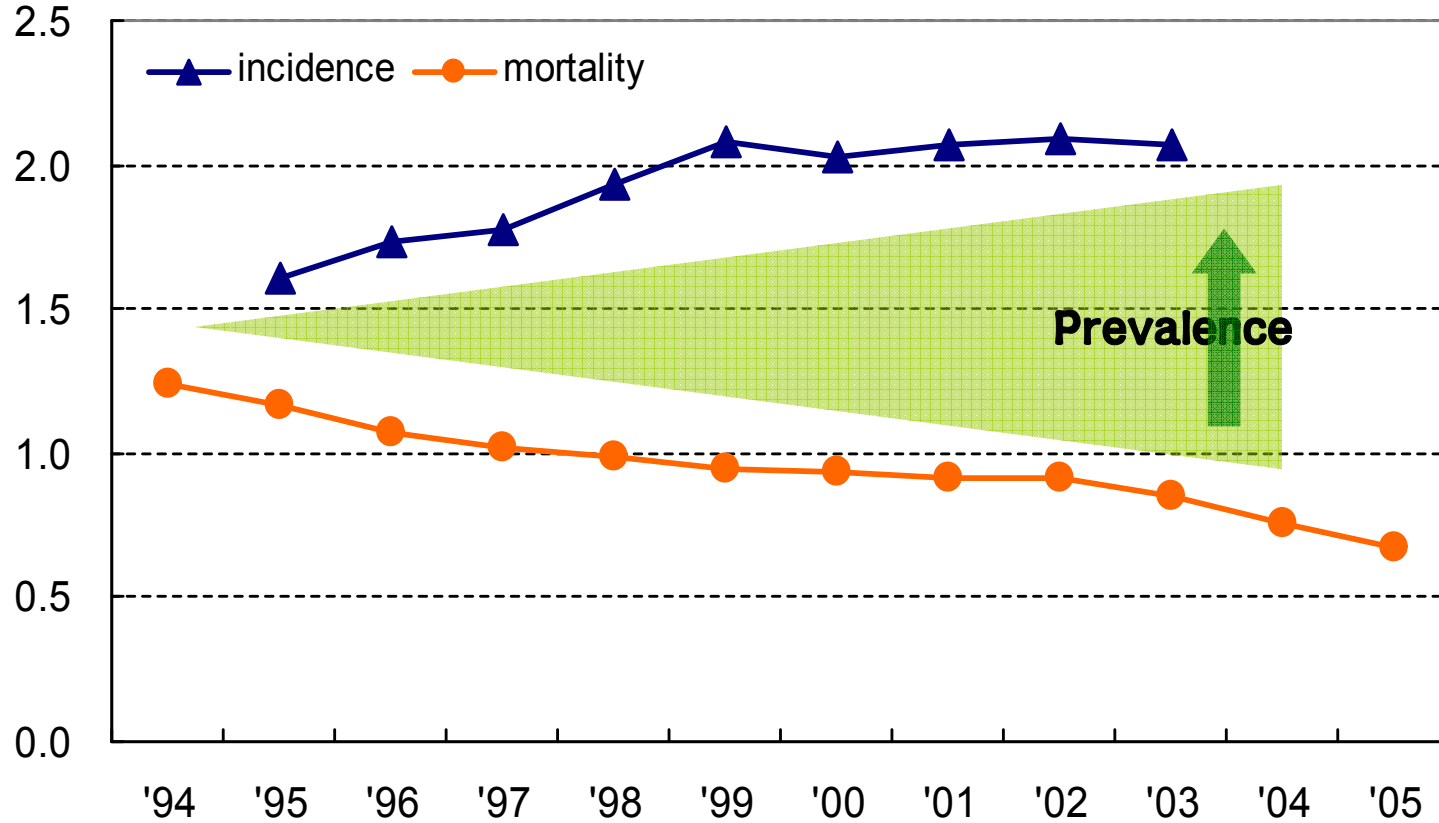
발생률(천명당)



자료원 : 순환기질환 등 주요만성질환 국가 중점관리를 위한 중장기 전략목표수립 및 사업체계 개발, 질병관리본부, 2004

## 대부분 장애 동반한 유병의 증가

(per 100,000 population)



Source : 1) incidence : KCDC(2004), 2) mortality : KNSO mortality data(1994~2005)

# Definition and Goals of CR

- Cardiac rehabilitation (CR) is an interdisciplinary team approach to patients with functional limitations secondary to heart disease (HD).
- The **focus** is on restoring patients to their optimal medical, physical, mental, psychologic, social, emotional, sexual, vocational, and economic status compatible with the severity of their HD.
- **Primary prevention of HD** involves screening healthy people to identify and treat risk factors before these illnesses develop.
- **Secondary prevention** is initiated during CR to improve HD risk factors and limit further morbidity and mortality.

# Goals of exercise-based cardiac rehabilitation

- To stabilize existing atherosclerotic plaques
- To improve endothelial function
- To lessen arterial inflammation by modulating lipid/lipoprotein levels and blood pressure
- To achieve smoking cessation
- To increase functional capacity
- To decrease symptoms
- To reduce body weight and fat stores
- To promote psychosocial well-being, and improve the ability of the patient to return to work

## Differences between Cardiac and Brain Rehab

- 뇌혈관질에 비해 입원기간이 현저히 짧다.
- 재활전문병동으로 전원되는 경우가 드물다.
- 뇌혈관질환에 비해 심각한 기능장애가 없다.
- 뇌혈관질환에 비해 기능회복이 쉽게 일어난다.
- 대다수에서 건강정상인으로 복귀가 가능하다.
- 이차예방의 효과가 보다 명백하게 나타난다

## Indications of Cardiac Rehabilitation Program

1. 안정형협심증 및 심근경색증 환자
2. 관상동맥중재술(PTCA) 시술을 받은 환자
3. 관상동맥우회로이식술(CABG) 받은 환자
4. 보상된허혈성심부 환자
5. 말초동맥질환(PAD) 환자
6. 당뇨, 고지혈증, 고혈압, 대사증후군



## Contraindications of Cardiac Rehabilitation Program

불안정한 협심증 및 심근경색증	보상되지 않는 울혈성 심부전증
안정 시 혈압 > 200/110mmHg	3도 이상의 방실 전도장애
체위성 저혈압 (혈압 하강 > 20mmHg)	활동성 심낭염 또는 심근병증
대동맥판막협착증 (판막구경 < 0.75cm <sup>2</sup> , 최대 수축기혈압 차 > 50mmHg)	안정 시 ST 파 전위 > 2mm
급성 전신질환 및 고열	부적절한 혈당 > 400mg/dl
조절되지 않는 심방/심실 부정맥	기타의 급성 대사장애
조절되지 않는 빈맥	혈전증 및 색전증

# Contents of Cardiac Rehabilitation Program

1. 처방에 따른 운동 프로그램
2. 영양평가 및 식이요법
3. 금연 프로그램
4. 고혈압 및 당뇨 자가관리 프로그램
5. 체중조절 및 sedentary lifestyle 변경
6. 심리-사회적 적응프로그램

# Graded Exercise Test (GXT)

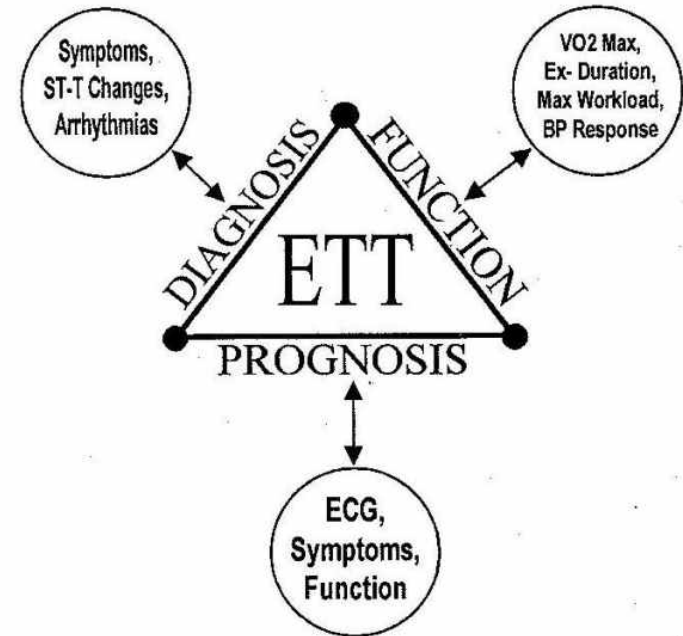
## 심장내과에서 운동부하검사의목적

- 1) 진단
- 2) 기능평가
- 3) 추적조사및 예후추정

## 심장재활에서 운동부하 검사목적

- 1) 운동에 따른 혈액동학적 반응 관찰
- 2) 운동에 따른 심장발작 위험도 분류
- 3) 최대 심폐운동 능력평가, 운동처방 근거자료

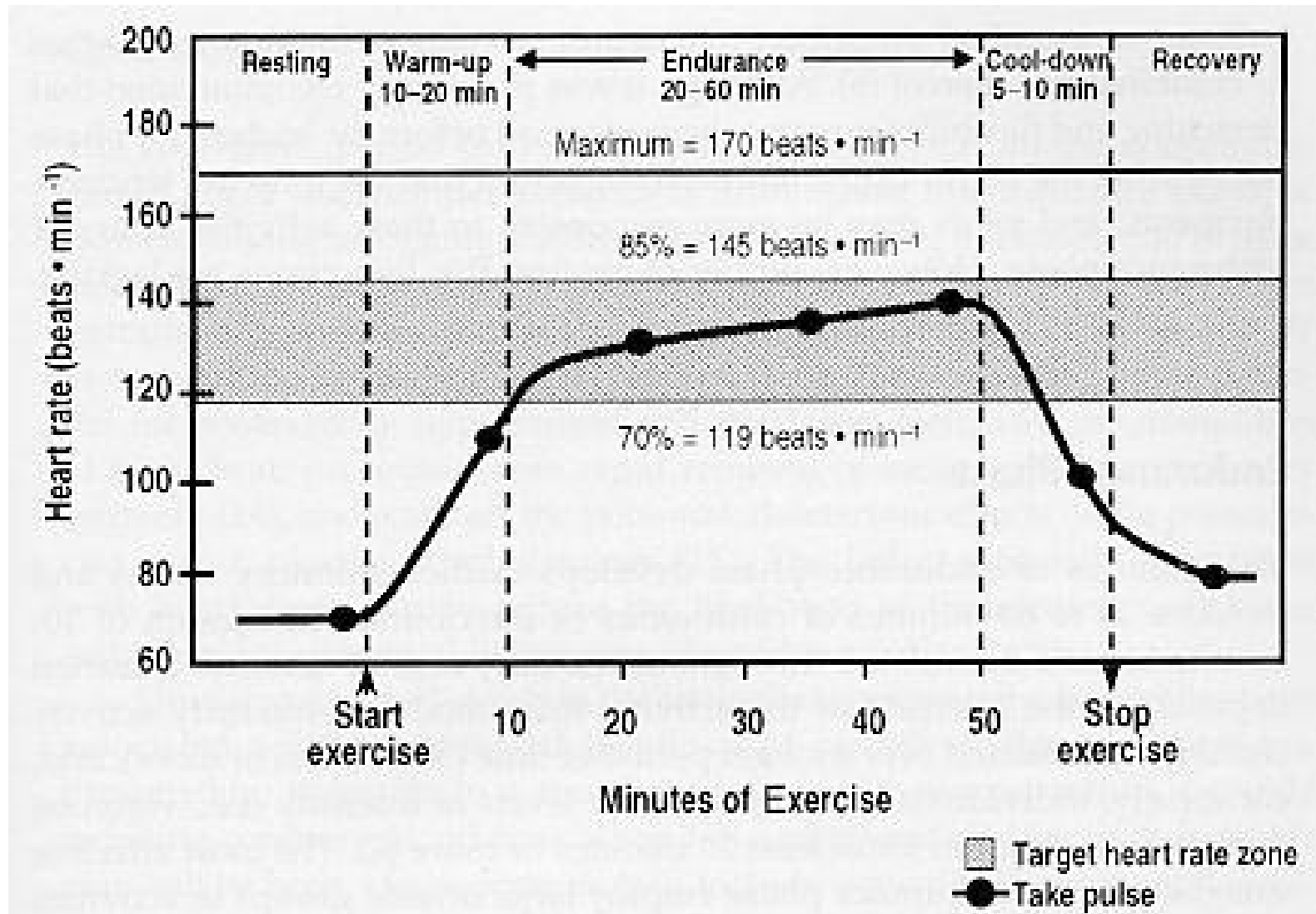
방법:1) 최대하(submaximal) 2) 증상제한 (symptom limited)



# Exercise Risk Stratification

Risk factor	Risk		
	Low	Moderate	High
Left ventricular systolic function	No significant dysfunction EF > 50%	Moderate dysfunction EF = 40–49%	Significant dysfunction EF < 40%
Complex ventricular arrhythmia	Absent at rest and during exercise		Resting and exercise-induced
Exercise-induced cardiac ischemia	No	Yes	Yes
Exercise capacity	≥ 7 METs	5–6.9 METs	< 5 METs
Hemodynamic response to exercise	Normal		No increase or decrease in SBP or HR with increasing load
Clinical data	Uncomplicated infarction/CABG/PTCA NYHA class I	NYHA class II	Infarction or invasive procedure complicated by cardiogenic shock and/or pulmonary edema. Persistent ischemia following invasive treatment. NYHA class III–IV

# Exercise Protocol for Outpatient Cardiac Rehab



## Exercise Protocol for Outpatient Cardiac Rehab

Recommendation of exercise	Low risk group	Moderate risk group	High risk group
Supervised exercise	+	+ or ++	+++
ECG monitoring	-	+ or ++	+++
Mode of exercise	aerobic + resistive	mainly aerobic	aerobic only
Initial intensity	70% of HR <sub>reserve</sub>	50% of HR <sub>reserve</sub>	30% of HR <sub>reserve</sub>
Exercise frequency	5-6/week	4-5/week	3-4/week
Self exercise at home	unlimited	limited	very limited
Exercise at hospital	0-1/week	2-3/week	3-4/week

# Eligible patients

- **MI/acute coronary syndrome**
- **CABG**
- **PCI**
- **Stable angina**
- **Heart valve surgical repair or replacement**
- **Heart or heart/lung transplantation**
  
- **1 or more of the above conditions within the previous year**

**환자/보호자를 위한 위험인자 교육이 필요하다.**

**1)심장혈관질환에 대하여**

**2)여러치료방법들과 약물에대하여**

**3)식이요법에 대하여**

**4)금연, 금주에 대하여**

**5)지속적인운동의 필요성 및 방법**

**6)사회 생활로의 복귀 및 여가선용**



# 심장재활의 효과

## 운동능력의 향상

- 일상생활중 협심증 증상의 감소
- 운동자각 지수의 향상
- 지구력의 증가, 피로도의 감소
- 최대 산소소모량의 증가(20 ~ 30% 증가)

## 효과적인 위험인자 관리

심리적안정(불안, 스트레스 감소)

심장혈관질환의 진행 및 재발 억제(심장보호효과)

심장혈관질환 관련 사망률감소(20 ~ 25% 감소)

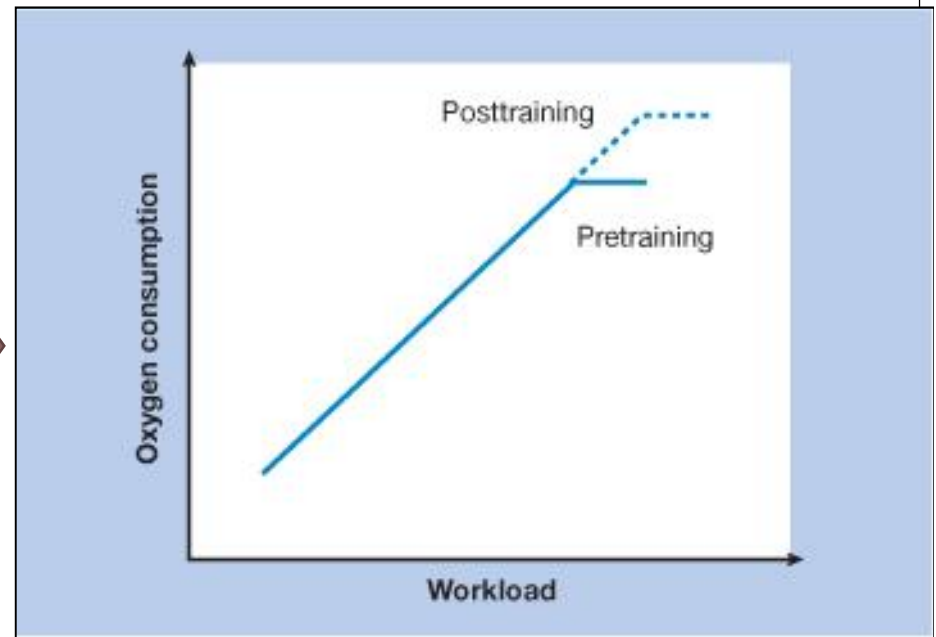
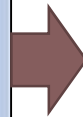
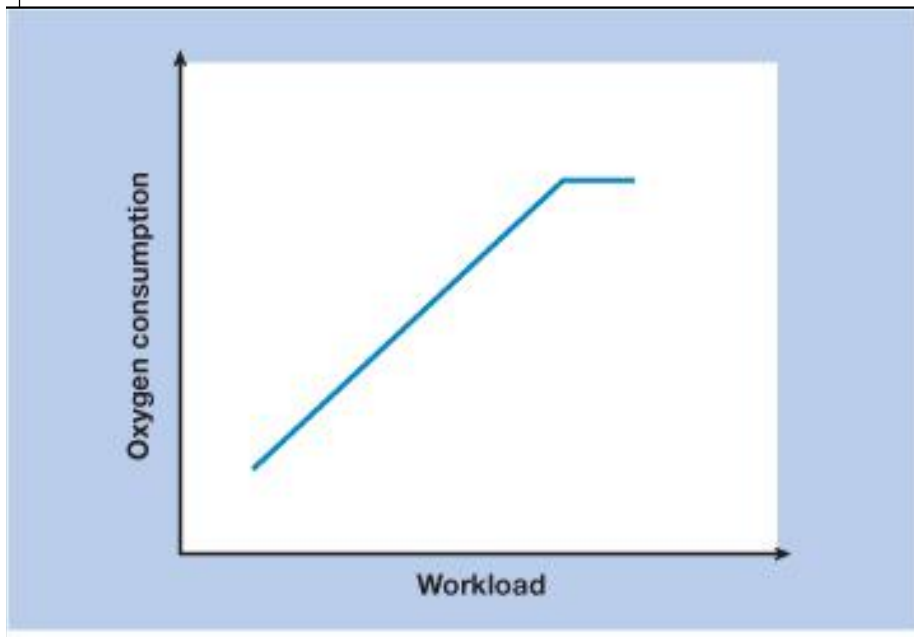
# Mechanisms

- **Antiatherosclerotic**
- **Anti-ischemic**
- **Antiarrhythmic**
- **Antithrombotic effect**

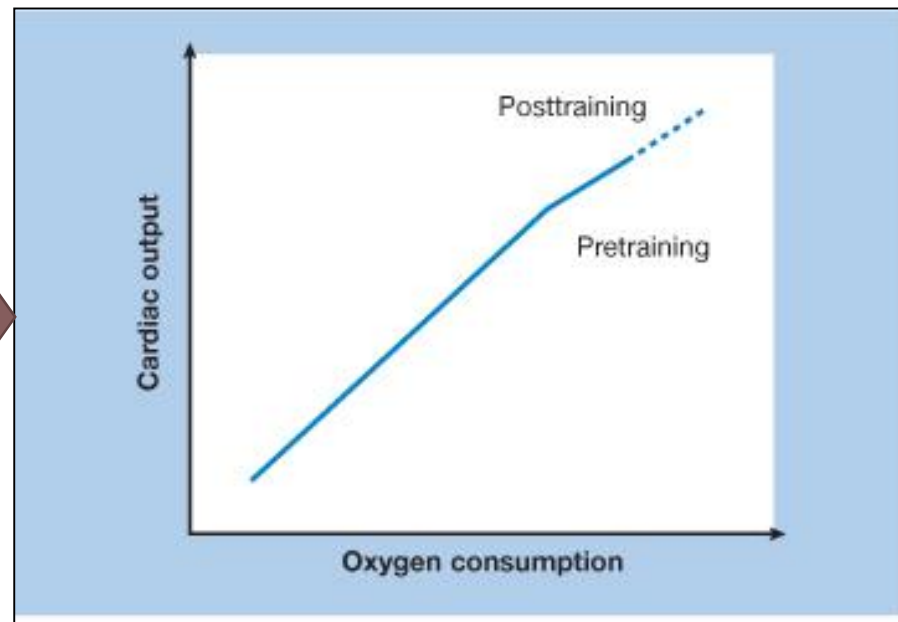
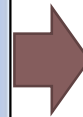
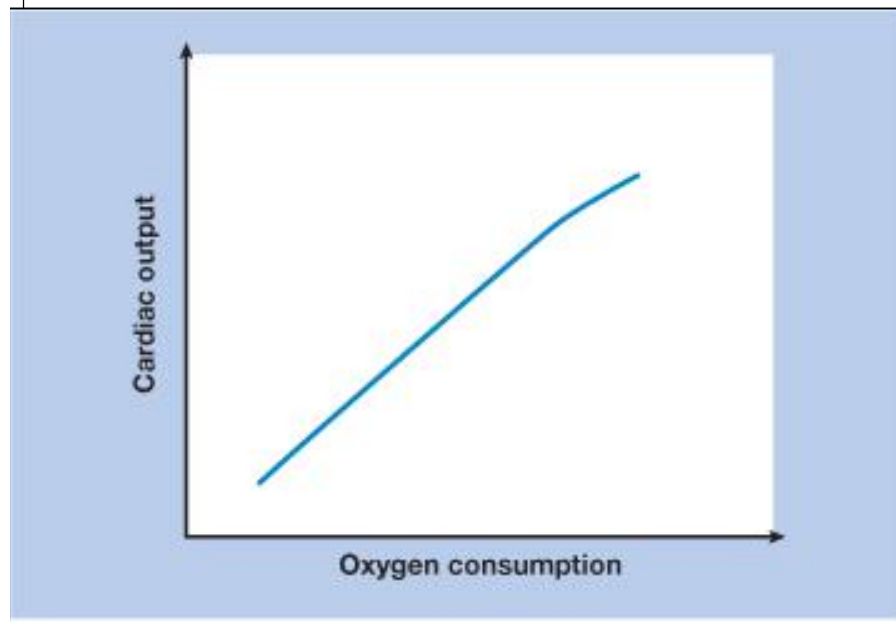
# Exercise physiology

- **Oxygen consumption**
  - $\dot{V}O_2$  is measured using a metabolic cart, and is the volume of oxygen consumed at any level of activity.
  - Under controlled conditions, at rest, an average 70-kg man consumes 3.5 ml/min/kg of oxygen
    - 1 MET (metabolic equivalent)=The unit of oxygen consumption at resting, or 'basal metabolic rate', equivalent
    - Each 1 metabolic equivalent (MET, 1MET=3.5ml O<sub>2</sub>/kg/min) increase in exercise capacity → 8%-17% reduction in mortality

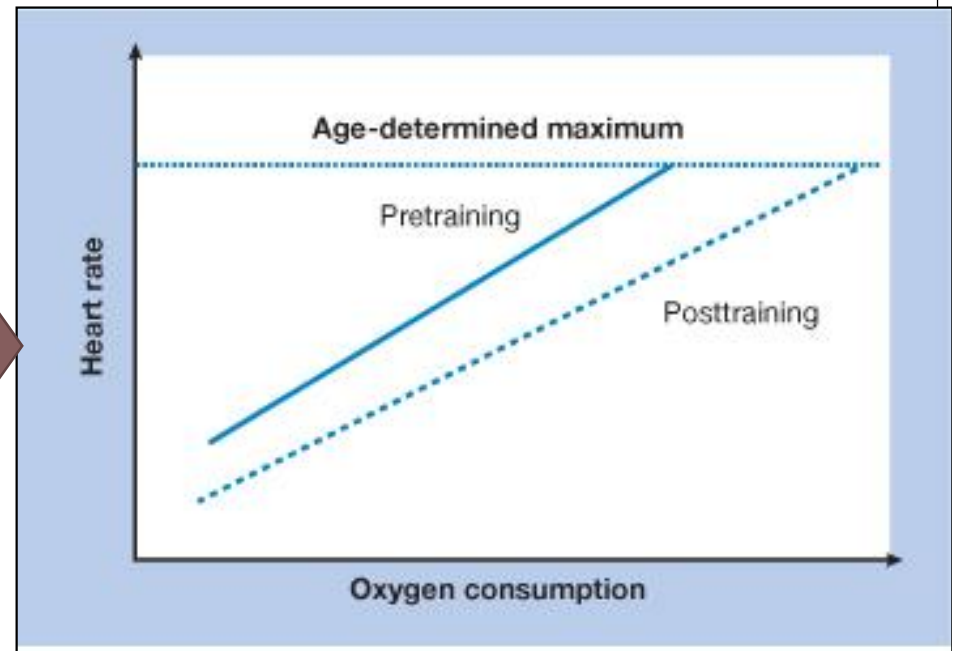
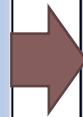
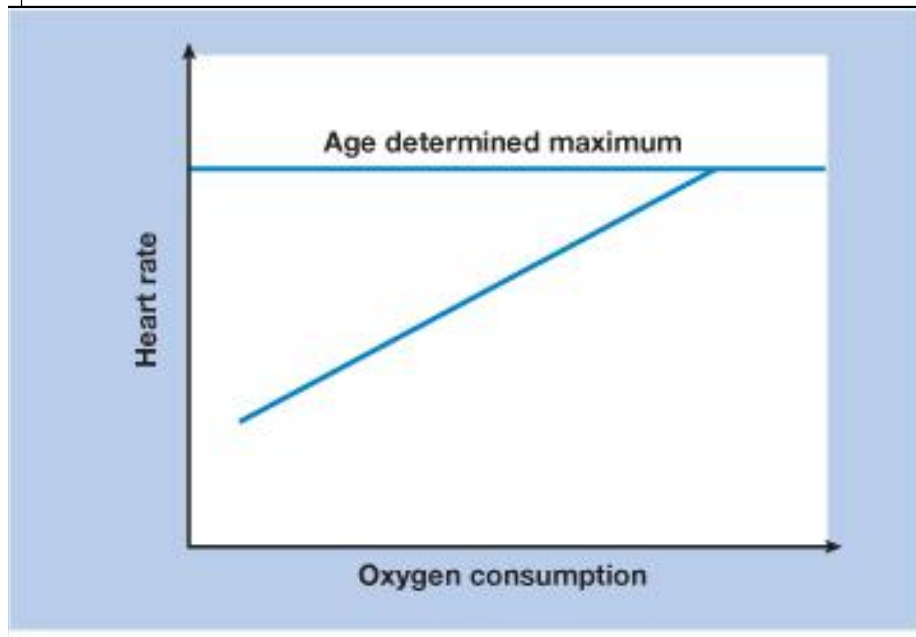
# Oxygen consumption and intensity of work being performed.



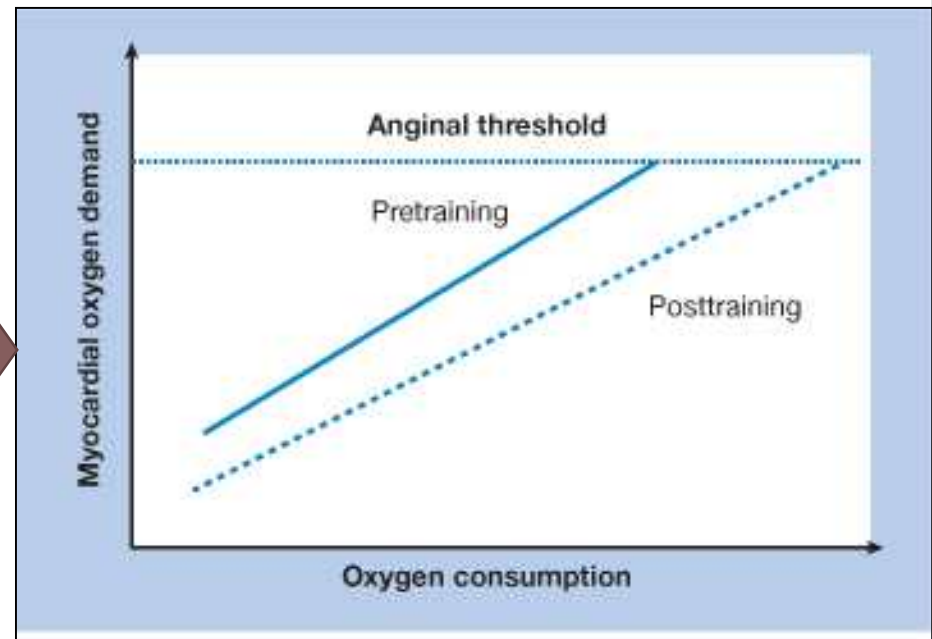
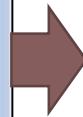
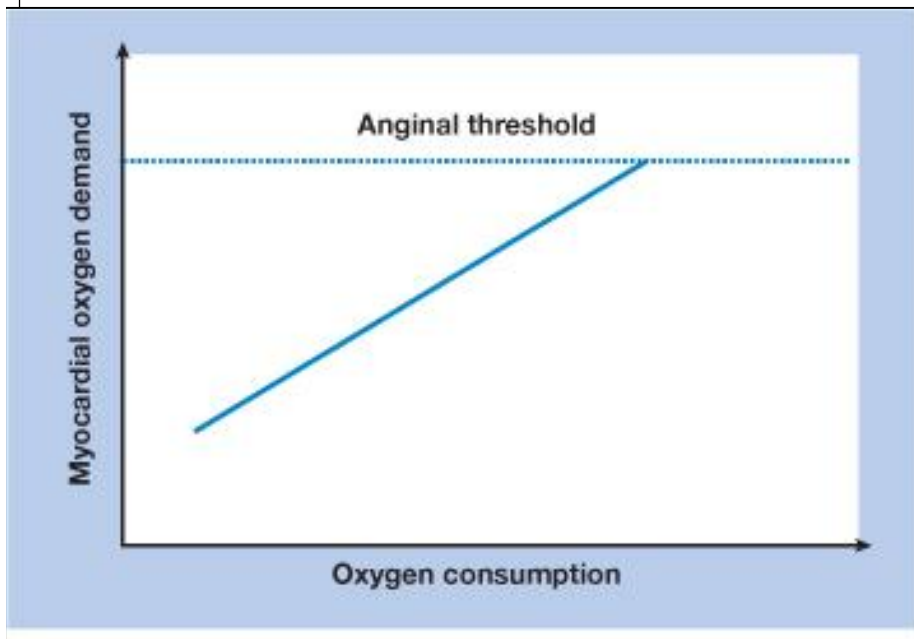
# Cardiac output and oxygen consumption



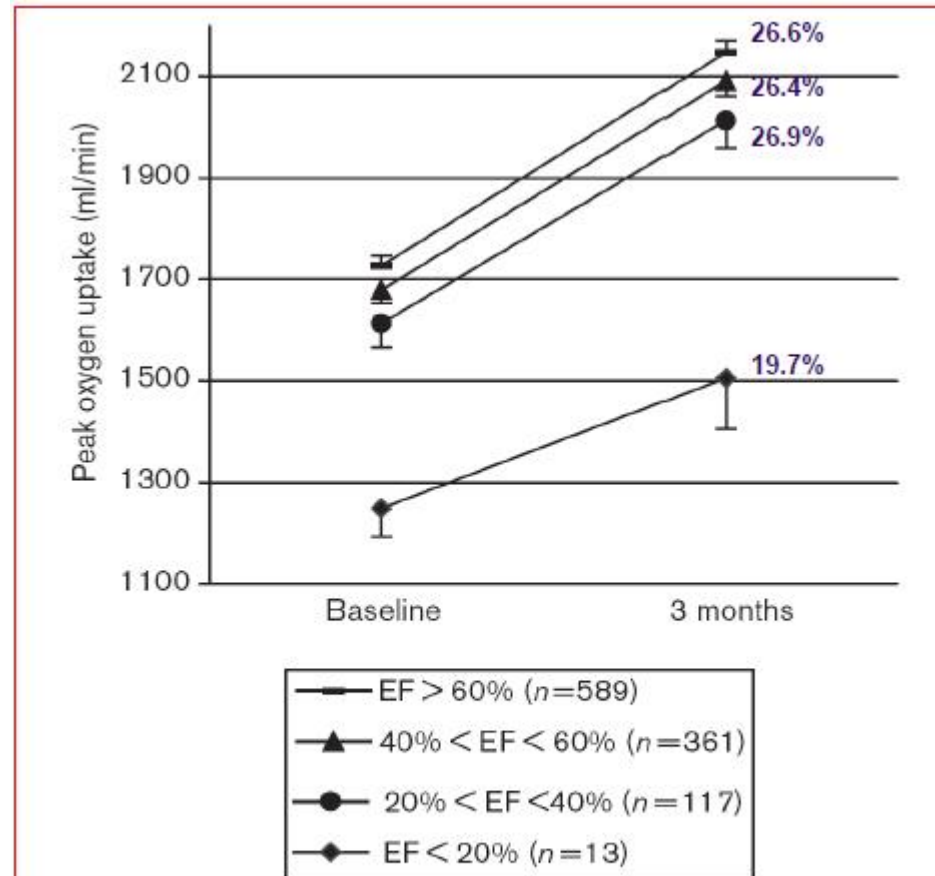
# Heart rate and oxygen consumption



# Myocardial oxygen demand and total body oxygen consumption



# Comparison of Training Effects for Peak VO<sub>2</sub>



Comparison of training effects for peak VO<sub>2</sub> according to left ventricular function. The difference in relative improvements between groups was not statistically significant ( $F=0.42$ ;  $P<0.74$ ). Data are presented as

*(Vanhees et al; Eur J Cardiovasc Prev Rehabil, 2004)*



# 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

Am J Med. 2004;116:682–692.

- A systematic review and meta-analysis of randomized controlled trials
- Trials with 6 or more months of follow-up which assessed the effects of exercise training alone or in combination with psychological or educational interventions.

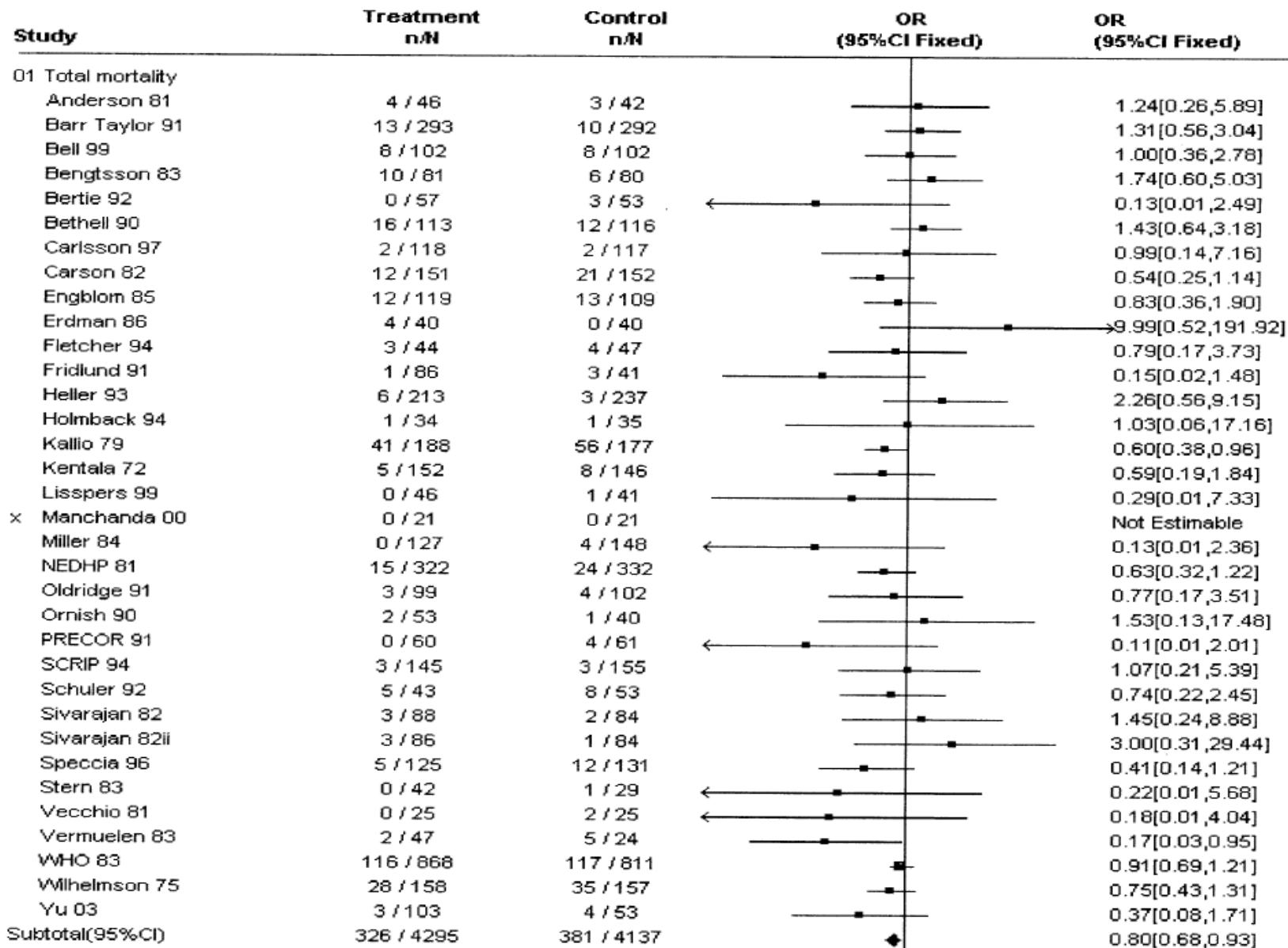
Table. Selected Characteristics of the 48 Trials

Characteristic	Number (%) or Median* (Range)
Exercise-only trials	19 (39) <sup>†</sup>
Sample size	112 (37–1479)
Publication date	
1970–1979	2 (4)
1980–1989	17 (35.5)
1990–1999	21 (44)
2000–2003	8 (6.5)
Study location	
Europe	30 (63)
North America	13 (27)
Asia/Australia	5 (10)
Sex	
Men only	21 (44)
Women only	1 (2)
Both	26 (52)
Unspecified	1 (2)
Age (years)	55 (48–71)
Diagnosis	
Post-myocardial infarction only	32 (67)
Revascularization only	8 (6.5)
Both	8 (6.5)

\* Median of study means:

<sup>†</sup> Forty-nine trials, of which one trial included both exercise-only rehabilitation and comprehensive cardiac rehabilitation arms.

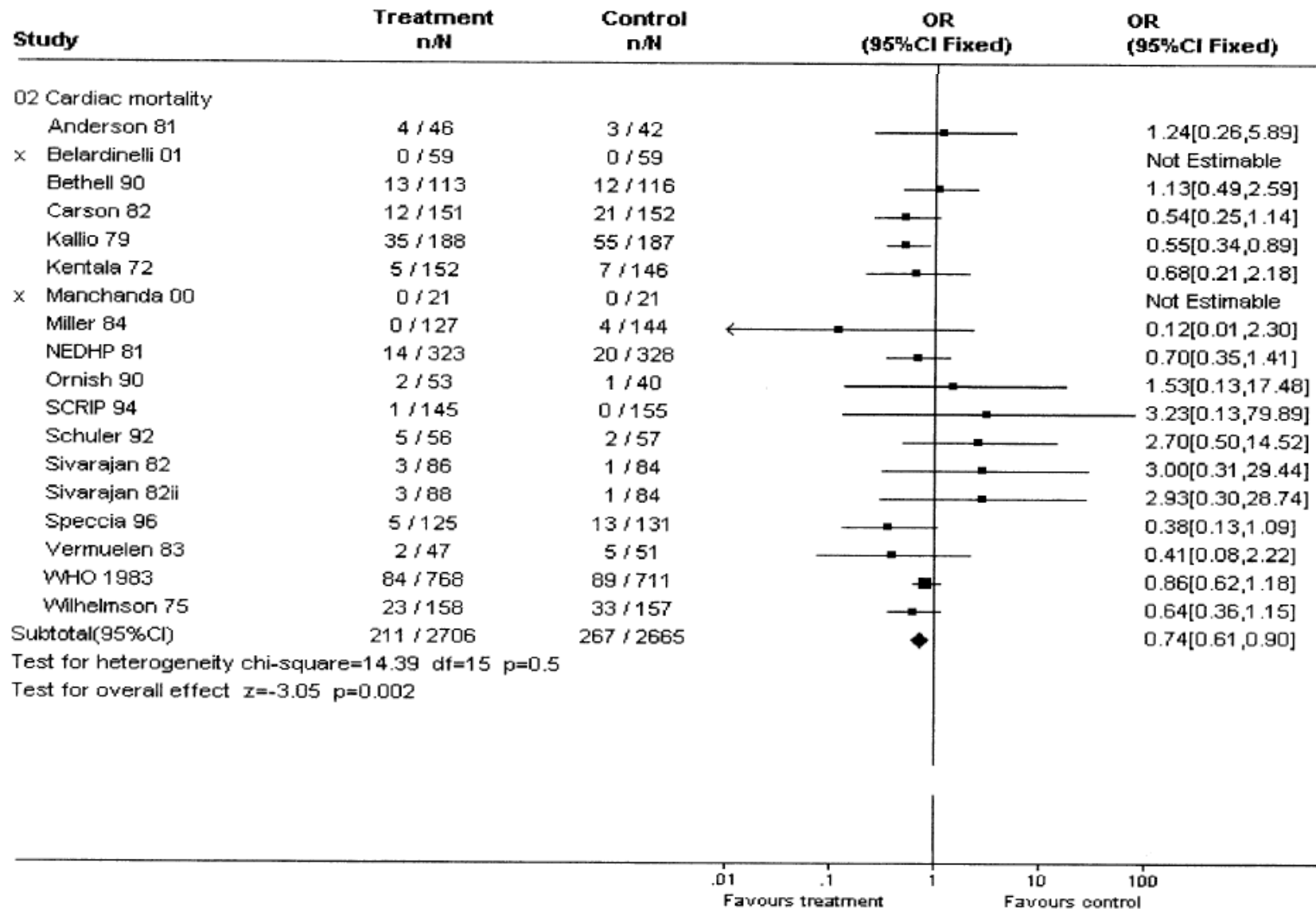
# Total mortality



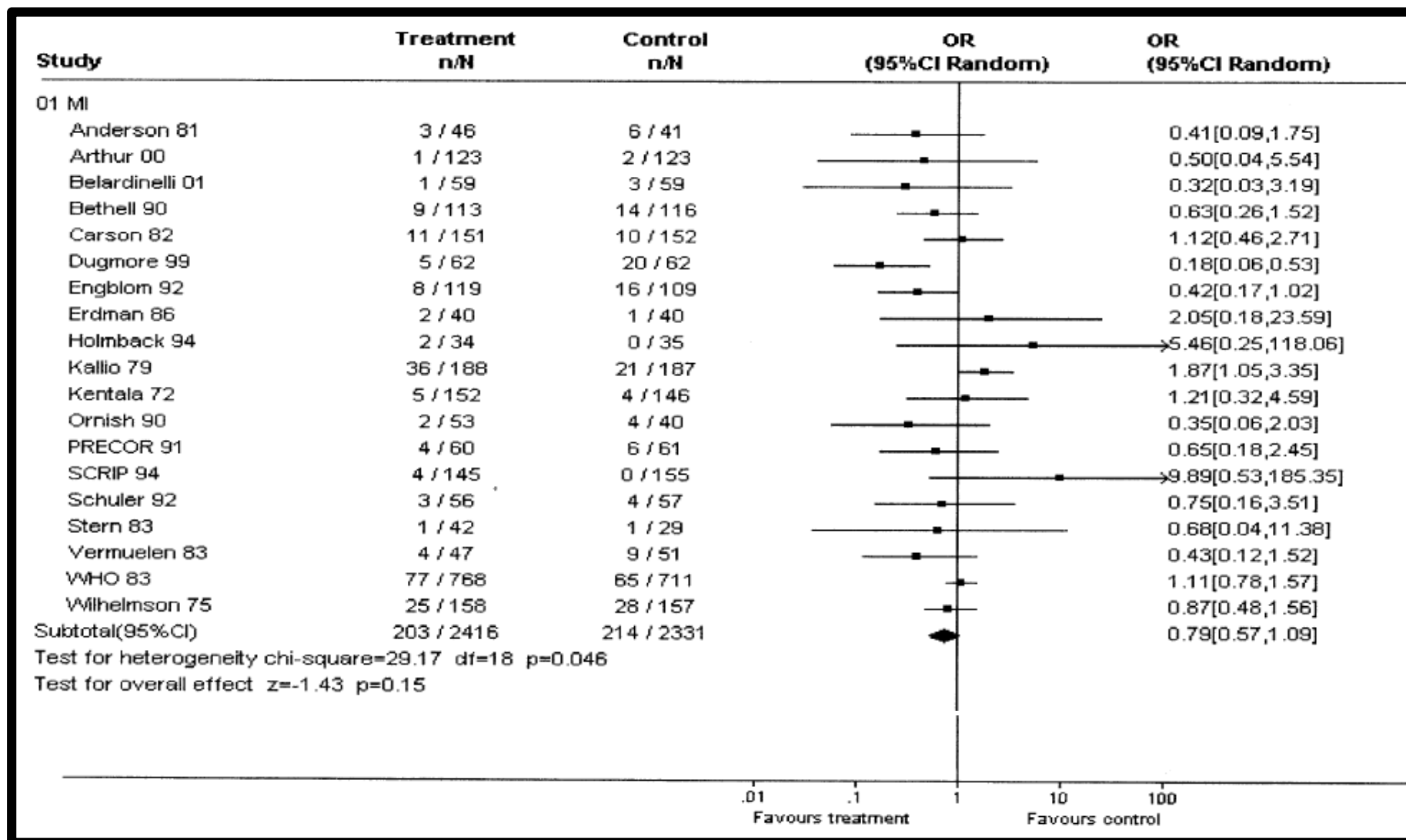
Test for heterogeneity chi-square=31.53 df=32 p=0.49

Test for overall effect z= 2.83 p=0.005

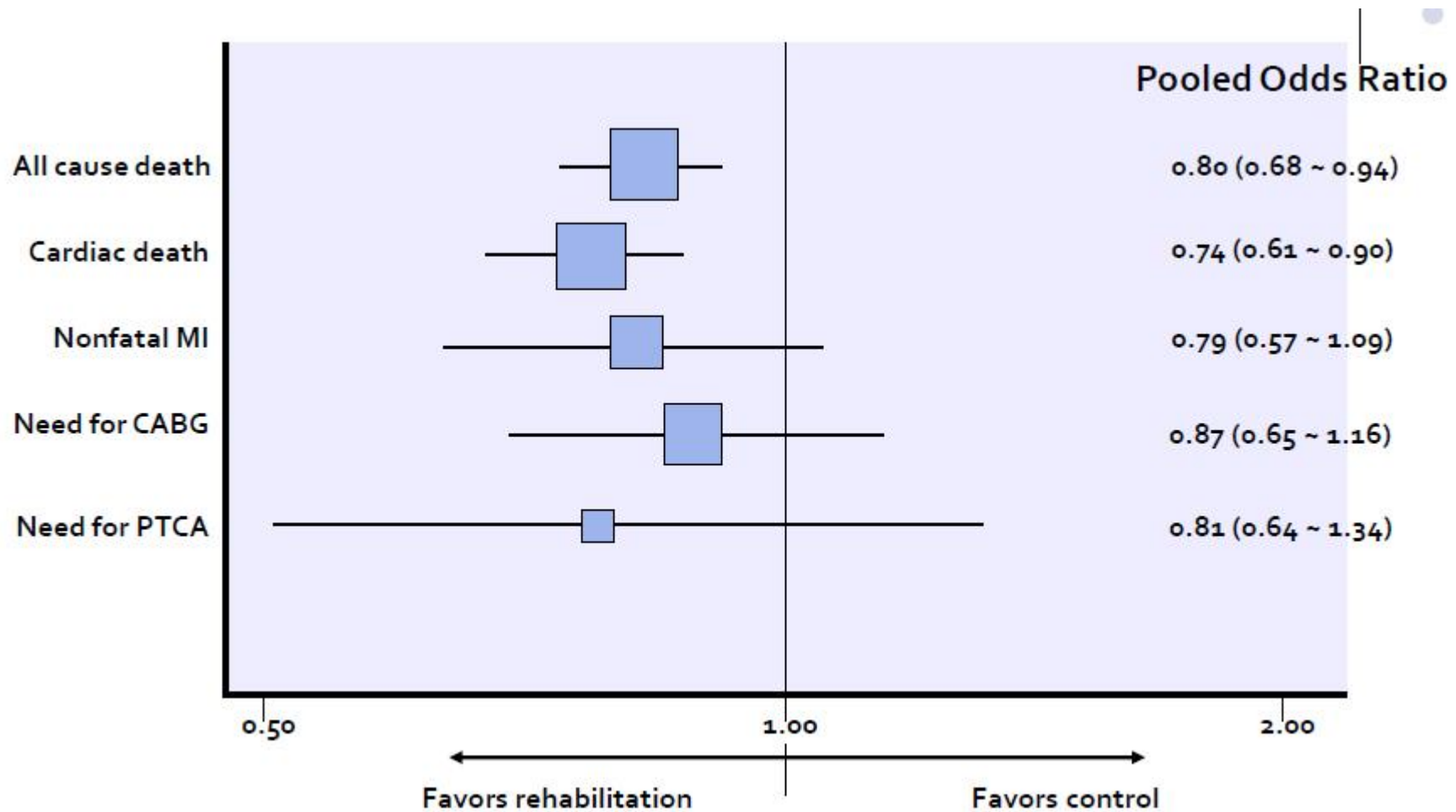
# Cardiac mortality



# Recurrent MI



## Summary of Impact of Exercised-Based CR on Clinical Events in Patients with IHD



- **Compared with usual care, cardiac rehabilitation was associated with reduced**
  - 1) all-cause mortality (OR 0.80; 95% CI: 0.68 to 0.93)
  - 2) and cardiac mortality (OR 0.74; 95% CI: 0.61 to 0.96)
  - 3) total cholesterol level
  - 4) triglyceride level
  - 5) systolic blood pressure
  - 6) lower rates of self-reported smoking
- **There were no significant differences in**
  - 1) the rates of nonfatal myocardial infarction and revascularization
  - 2) changes in high- and low-density lipoprotein cholesterol levels
  - 3) diastolic pressure.
  - 4) Health-related quality of life

## Exercise Training and Cardiac Rehabilitation in Primary and Secondary Prevention of Coronary Heart Disease

CARL J. LAVIE, MD; RANDAL J. THOMAS, MD; RAY W. SQUIRES, PHD; THOMAS G. ALLISON, PHD;  
AND RICHARD V. MILANI, MD

*Mayo Clin Proc.* 2009;84(4):373-383

TABLE 2. Rate of Death Due to CHD by Fitness Level:  
The Aerobic Center Study

	Men	Women
No. of participants	10,224	3120
Age (y), mean	41.5	40.8
Follow-up (y)	8	8
Cardiopulmonary fitness level <sup>b</sup>		
Low	24.6 <sup>c</sup>	7.4 <sup>c</sup>
Moderate	7.8 <sup>c</sup>	2.9 <sup>c</sup>
High	3.1 <sup>c</sup>	0.8 <sup>c</sup>

<sup>a</sup> CHD = coronary heart disease.

<sup>b</sup> Based on age- and sex-specific cutoffs.

<sup>c</sup> Rate of death due to CHD per 10,000 person-years.

Data from *JAMA*.<sup>23</sup>

TABLE 3. Benefits of Cardiac Rehabilitation and Exercise Training Programs<sup>a</sup>

---

Improvement in exercise capacity
Estimated METs: +35%
Peak $\dot{V}O_2$ : +15%
Peak anaerobic threshold: +11%
Improvements in lipid profile
Total cholesterol: -5%
Triglycerides: -15%
HDL-C: +6% (13%-16% increase in subgroups with low HDL-C levels)
LDL-C: -2%
LDL-C/HDL-C: -5% (higher in some subgroups)
Reduction in obesity indices
Body mass index: -1.5%
Percent fat: -5%
Metabolic syndrome: -37%
Reduction in inflammation (hs-CRP level: -40%)
Improvement in autonomic tone
Improvement in blood rheology and viscosity
Reduction in homocysteine levels
Improvements in behavioral characteristics (depression, anxiety, somatization, and hostility)
Improvements in overall quality of life and its components
Reduction in hospitalization costs
Reduction in overall morbidity and mortality (especially that associated with depression and psychological distress)

---

<sup>a</sup> HDL-C = high-density lipoprotein cholesterol; hs-CRP = high-sensitivity C-reactive protein; LDL-C = low-density lipoprotein cholesterol; MET = metabolic equivalent;  $\dot{V}O_2$  = oxygen consumption.

Adapted from *Vasc Dis Prev*,<sup>41</sup> with permission.



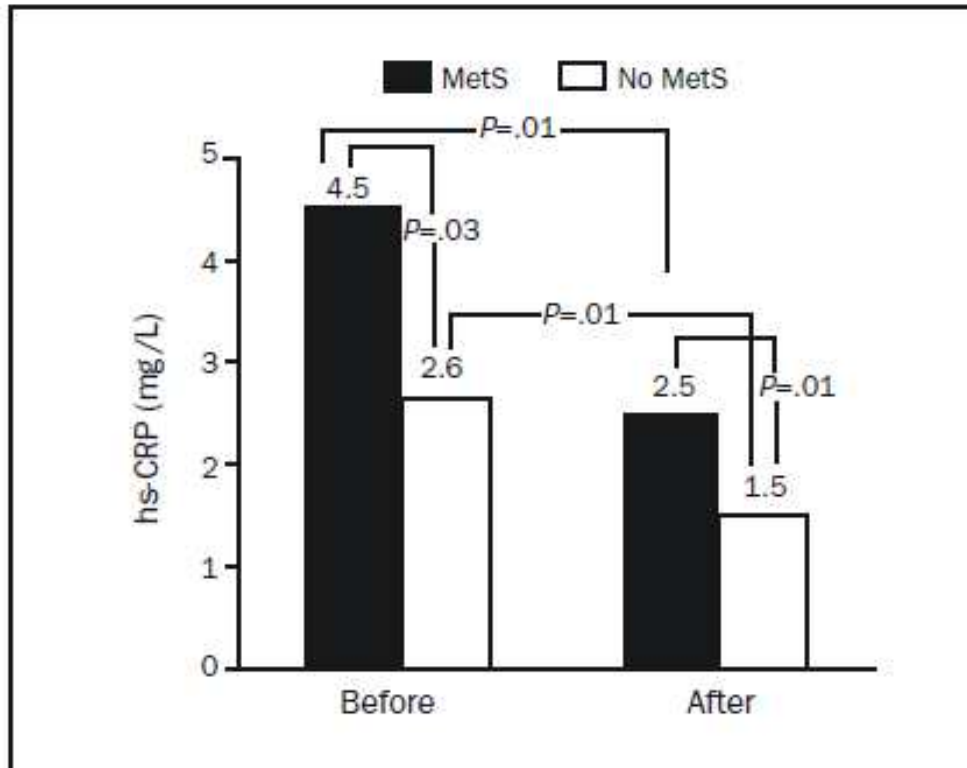


FIGURE 1. Median levels of high-sensitivity C-reactive protein (hs-CRP) before and after cardiac rehabilitation and exercise training in patients with and without the metabolic syndrome (MetS). From *Am J Cardiol*,<sup>55</sup> with permission.

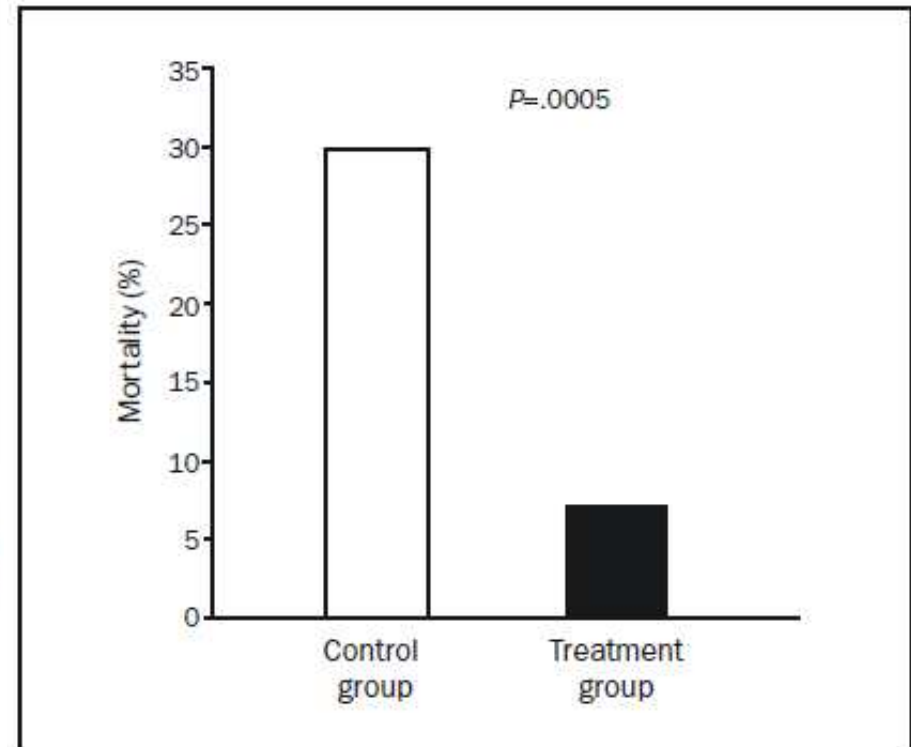


FIGURE 3. Effect of cardiac rehabilitation and exercise training on mortality rates in 139 patients with baseline depression. From *Am J Med*,<sup>85</sup> with permission.

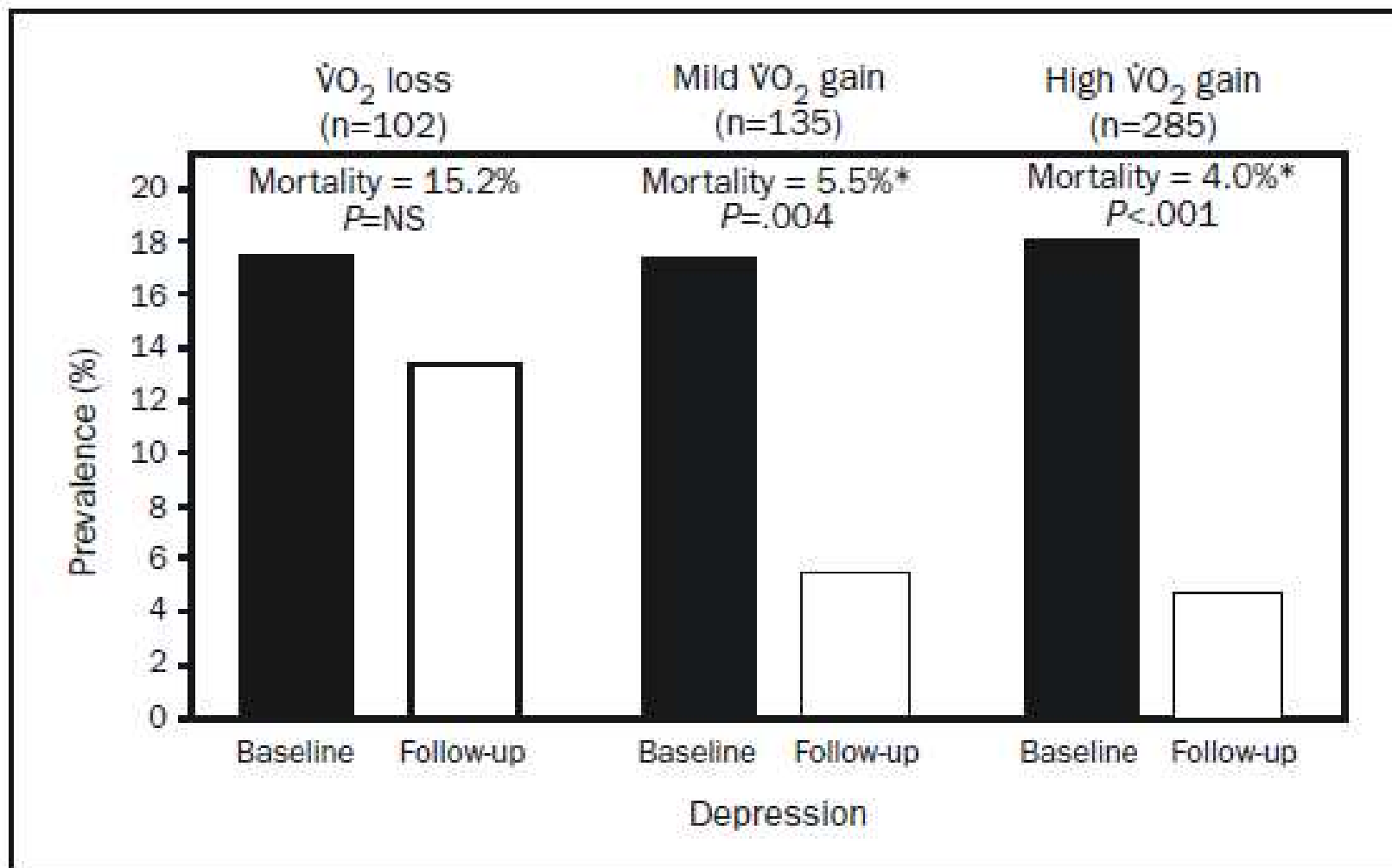


FIGURE 4. Prevalence of depression and subsequent mortality based on changes in peak oxygen consumption ( $\dot{V}O_2$ ) during cardiac rehabilitation and exercise training. \* $P<.001$  compared with  $\dot{V}O_2$  loss. From *Am J Med*,<sup>85</sup> with permission.

## AACVPR/ACC/AHA PERFORMANCE MEASURES

# AACVPR/ACC/AHA 2007 Performance Measures on Cardiac Rehabilitation for Referral to and Delivery of Cardiac Rehabilitation/Secondary Prevention Services

*Endorsed by the American College of Chest Physicians, American College of Sports Medicine, American Physical Therapy Association, Canadian Association of Cardiac Rehabilitation, European Association for Cardiovascular Prevention and Rehabilitation, Inter-American Heart Foundation, National Association of Clinical Nurse Specialists, Preventive Cardiovascular Nurses Association, and the Society of Thoracic Surgeons*

## COMPETENCE AND TRAINING STATEMENT

# ACCF/AHA/ACP 2009 Competence and Training Statement: A Curriculum on Prevention of Cardiovascular Disease

A Report of the American College of Cardiology Foundation/American Heart Association/  
American College of Physicians Task Force on Competence and Training (Writing Committee to  
Develop a Competence and Training Statement on Prevention of Cardiovascular Disease)

*Developed in Collaboration With the American Academy of Neurology; American Association of Cardiovascular and Pulmonary Rehabilitation; American College of Preventive Medicine; American Diabetes Association; American Society of Hypertension; Association of Black Cardiologists; National Lipid Association; and Preventive Cardiovascular Nurses Association*

# Three main phases

## Inpatient CR (Phase 1 CR)

- a program that delivers preventive and rehabilitative services to hospitalized patients following an index CVD event, such as an MI/acute coronary syndrome;

## Early outpatient CR (Phase 2 CR)

- a program that delivers preventive and rehabilitative services to patients in the outpatient setting early after a CVD event, generally within the first 3 to 6 months after the event but continuing for as much as 1 year after the event

## Long-term outpatient CR (Phase 3 or 4 CR)

- a program that provides longer term delivery of preventive and rehabilitative services for patients in the outpatient setting

# Phase 1

- **Initial phase — breathing exercise, relaxation exercise, dynamic exercise involving small muscle groups**
- **Continuation phase — dynamic exercise involving large muscle groups, sitting and standing up, walking**
- **At 4–6 days, the patient assisted by the physiotherapist is allowed to try climbing stairs.**

## Phase 2

- **Duration of stage II rehabilitation depends on the clinical condition of the patient and the form of rehabilitation (in-hospital: 2–4 weeks; ambulatory: 4–12 weeks; home rehabilitation monitored using transtelephonic ECG: up to 12 weeks).**
- **In-hospital stage II cardiac rehabilitation is indicated following stage I rehabilitation in case of:**
  - **clinical condition of the patient that precludes ambulatory stage II rehabilitation;**
  - **social and environmental barriers hindering ambulatory stage II rehabilitation**

# Phase 2

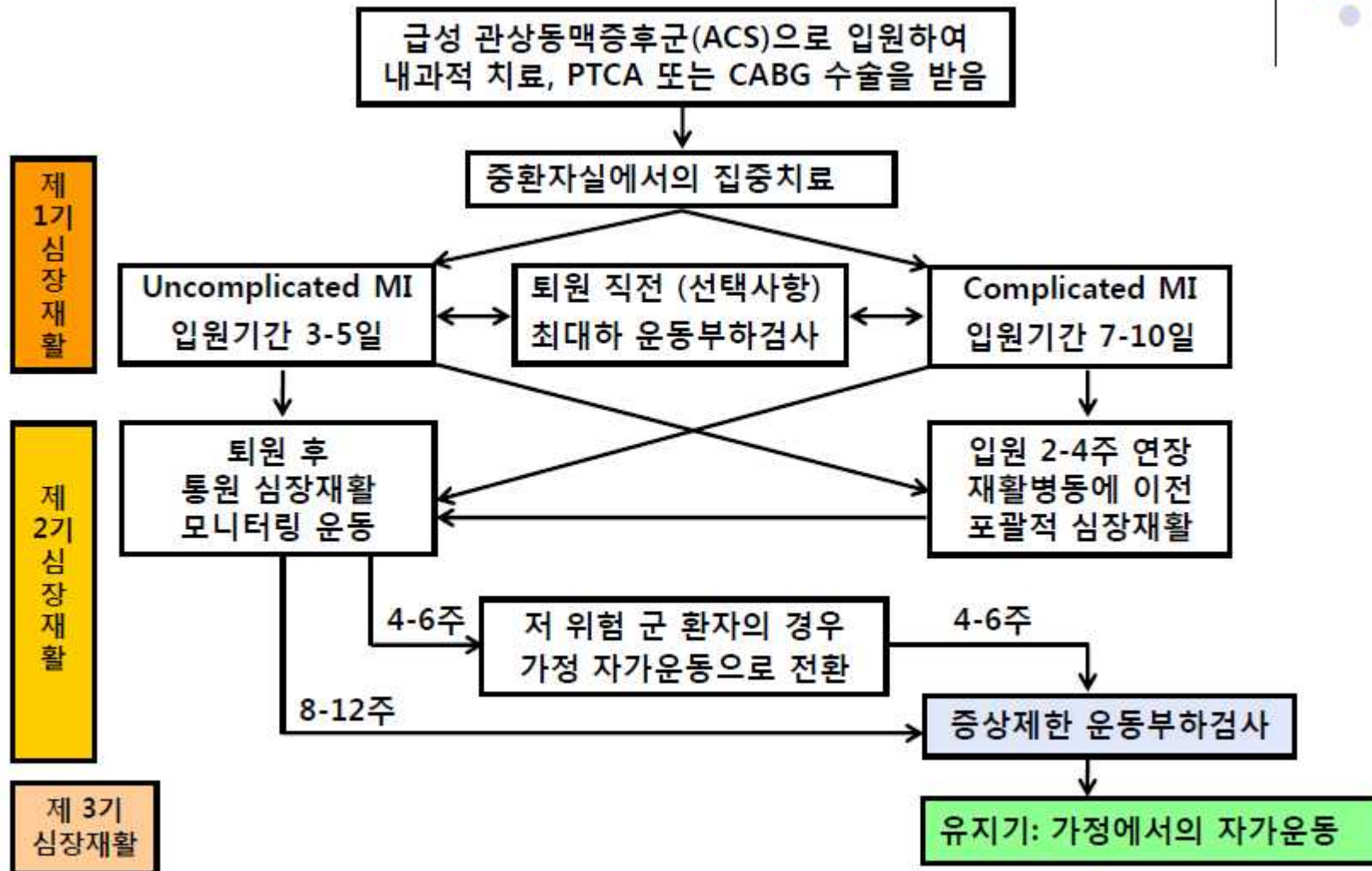
- **General fitness training**
  - Breathing gymnastics, stretching and relaxation exercise, water-based exercise – considered more attractive by the patients than other forms of rehabilitation, safe and resulting in similar improvement in fitness compared to bicycle ergometer training)
- **Endurance training:**
  - Interval training using bicycle ergometer or treadmill, lasting for 15–30 min with 3 min load periods alternating with 2–3 min periods of rest
  - Continuous training lasting for 15–30 min (bicycle ergometer or walking).
- **Resistance exercise**
  - Performed as part of stationary training (e.g. interval training using bicycle ergometer exercise alternating with rowing, stepping, and treadmill exercise) to supplement uniform bicycle ergometer exercise.

# Phase 3

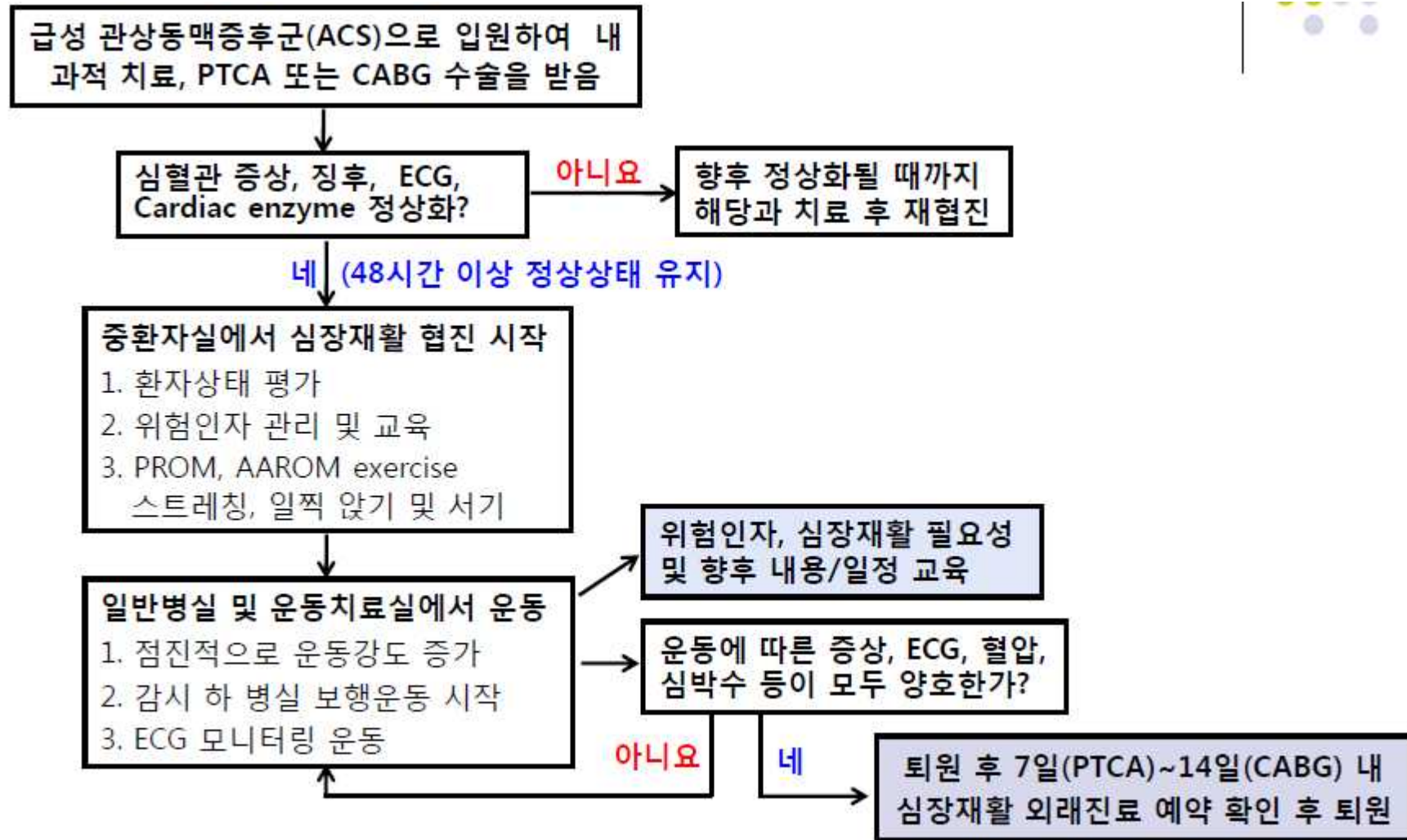
- **At 2–4 months after the onset of disease**
- **Goals**
  - **Control of pharmacotherapy;**
  - **Maintaining optimal mental and physical condition of the patient**
  - **Reduction of coronary artery disease risk factors;**
  - **Promotion of healthy lifestyle.**



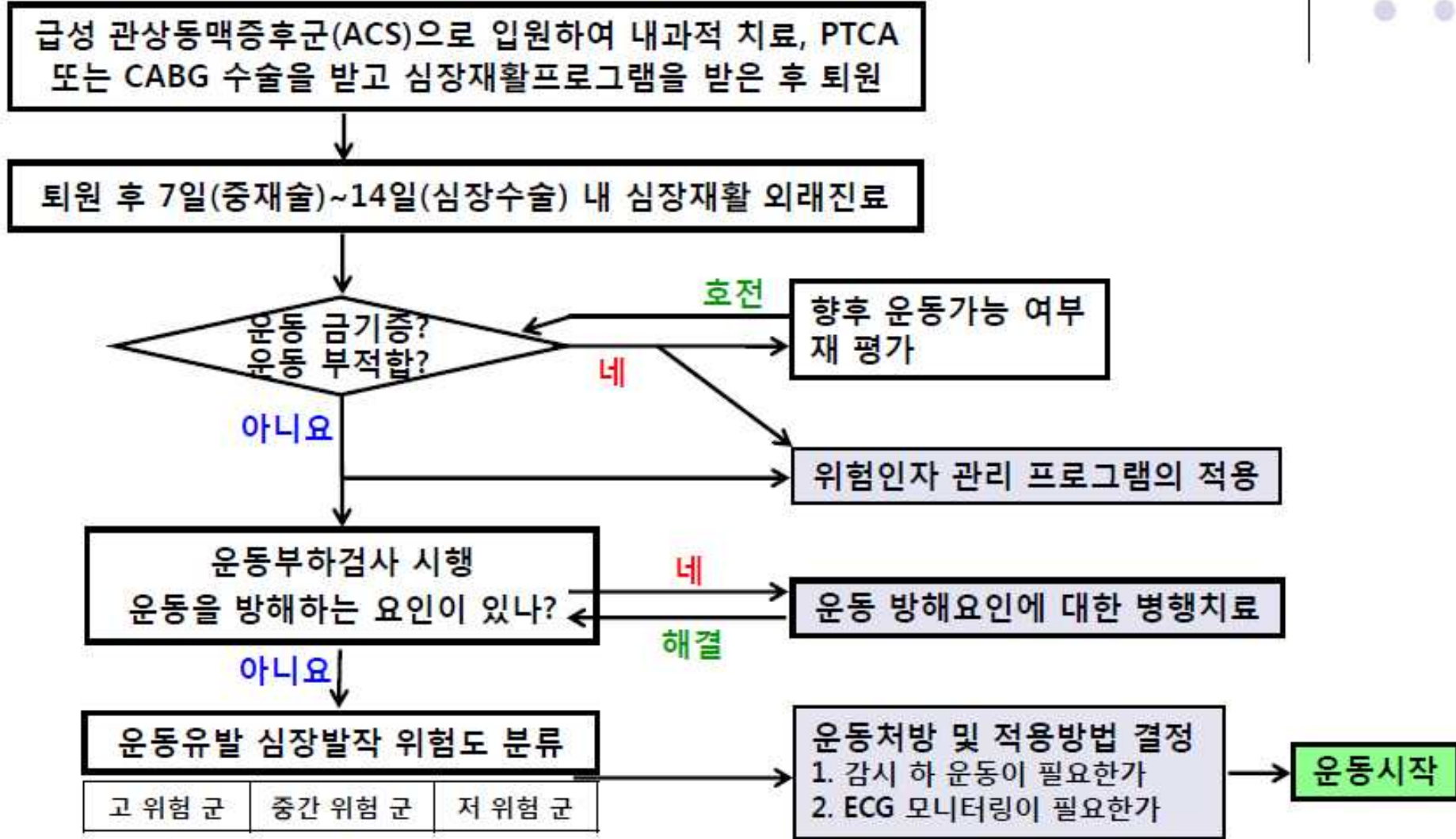
# CR Critical Pathway for AMI



# Algorithm of CR for AMI (Inpatient)



# Algorithm of CR for AMI (Outpatient)



# Analyses of Studies on Cardiac Rehabilitation for Patients with Cardiovascular Disease in Korea

Song, Yeoungsuk

Post Doctoral Fellow, School of Nursing, University of Minnesota, Minneapolis, MN, USA

**Table 1.** Characteristics of Patients in 19 Research Papers (N=19)

Variables	Category	n	%
Diagnosis/operation	MI or UA	10	52.6
	CABG, MVR, VSD	3	15.8
	PCI	4	21.1
	CABG+PCI	1	5.3
	HF	1	5.3
Age (average years)	40-49	3	15.8
	50-59	12	63.2
	60-64.6	4	21.1
Gender	Male	664	74.6
	Female	226	25.4
Sample size	19-25	2	10.5
	26-32	2	10.5
	33-44	5	26.3
	45-63	5	26.3
	64-80	5	26.3

MI=myocardial infarction; UA=unstable angina; CABG=coronary artery bypass graft; MVR=mitral valve replacement; VSD=ventricular septal defect patch closure; PCI=percutaneous coronary intervention; HF=heart failure.

**Table 2.** Analysis of Cardiac Rehabilitation Protocol (N=19)

Variables	Category	Subcategory	n*	%
Components		Education	6	31.6
		Exercise	6	31.6
		Education & Exercise	7	36.8
Frequency of intervention	Education (n=13)	2 times	4	30.8
		3 times	3	23.1
		5 times	2	15.4
		8 times	1	7.7
		9 times	2	15.4
		Not mentioned	1	7.7
		Exercise (n=13)	3 times/w × 6 weeks	5
3 times/w × 8 weeks	4	30.8		
3 times/w × 10 weeks	1	7.7		
Others	3	23.1		
Duration of intervention	Education (n=13)	≤ 30 min	6	46.2
		40-60 min	3	23.1
		Not mentioned	4	30.8
	Exercise (n=13)	30 min	3	23.1
		50-59 min	9	69.2
		Not mentioned	1	7.7
Research team		Multidisciplinary	6	31.6
		Only one researcher	5	26.3
		Researcher with one group of medical team	2	10.5
		Not mentioned	6	31.6

\*Multiple responses.

**Table 3.** Analysis of Content on Educational Intervention in Cardiac Rehabilitation (N=13)

Contents	n*	%
Symptoms	7	53.8
Getting medical help	4	30.8
Risk factors	11	84.6
Treatment plan related to risk factors	6	46.2
Understanding condition, tests & treatments	6	46.2
Coping with feelings	0	0.0
Reducing stress	5	38.5
Managing medicines	10	76.9
Quitting smoking	5	38.5
Eating well	10	76.9
Losing weight	1	7.7
Exercise	10	76.9
Physical activity	5	38.5
Follow up	2	15.4
Others	7	53.8

\*Multiple responses.

**Table 4.** Analysis of Content on Exercise Intervention in Cardiac Rehabilitation (N=13)

Category	Components	Contents	n*	%
Type	Warm-up & cool-down	Stretch	3	23.1
		Range of motion	6	46.2
		Not mentioned	6	46.2
	Main exercise	Treadmill	7	53.8
		Cycle ergometer	7	53.8
		Stair ascent	5	38.5
		Walk	5	38.5
		Exercise of extremity	2	15.4
		Sit down & up	1	7.7
		Gymnastics	1	7.7
Not mentioned	1	7.7		
Duration	Warm-up	10 min	6	46.2
	Main exercise	30-33 min	6	46.2
	Cool-down	10 min	6	46.2
	Not mentioned	7	53.8	
Intensity	Heart rate		10	76.9
	METs		3	23.1

\*Multiple responses; METs=metabolic equivalent.

Table 5. Outcome Indicators and Effects in Cardiac Rehabilitation

(N=19)

Category	Components	n* (%)	Indicators	n* (%)	Positive effect	No effect	
					n (%)	n (%)	
Education	Level of knowledge	5 (26.3)	Disease	4 (80.0)	3 (75.0)	1 (25.0)	
			Risk factor	4 (80.0)	3 (75.0)	1 (25.0)	
			Medication	5 (100.0)	5 (100.0)	0 (0.0)	
			Diet	5 (100.0)	4 (80.0)	1 (20.0)	
			Exercise	5 (100.0)	4 (80.0)	1 (20.0)	
			Activities of daily living	5 (100.0)	4 (80.0)	1 (20.0)	
			Follow up	2 (40.0)	1 (50.0)	1 (50.0)	
	Anxiety	7 (36.8)	State	7 (100.0)	4 (57.1)	3 (42.9)	
			Trait	1 (14.2)	0 (0.0)	1 (100.0)	
	Self efficacy	5 (26.3)	Physical adjustment	4 (80.0)	4 (100.0)	0 (0.0)	
			Psychologic adjustment	1 (20.0)	1 (100.0)	0 (0.0)	
	Health behavior	12 (63.2)	Exercise	12 (100.0)	11 (91.6)	1 (8.4)	
			Diet	12 (100.0)	9 (75.0)	3 (25.0)	
			Smoking cessation	6 (50.0)	3 (50.0)	3 (50.0)	
Management of stress			5 (41.6)	3 (60.0)	2 (40.0)		
Activities of daily living			6 (50.0)	6 (100.0)	0 (0.0)		
Medication			7 (58.3)	6 (85.7)	1 (14.3)		
Management of follow up			6 (50.0)	4 (66.7)	2 (33.3)		
Quality of life			6 (31.6)	Physical	6 (100.0)	3 (50.0)	3 (50.0)
				Psychologic	6 (100.0)	4 (66.6)	2 (33.4)
				Social	6 (100.0)	5 (83.3)	1 (16.7)
	Spiritual	1 (16.6)		0 (0.0)	1 (100.0)		
Depression	1 (5.3)	1 (100.0)	0 (0.0)	1 (100.0)			

Exercise	Hemodynamic changes	9 (47.4)	Systolic blood pressure	7 (77.7)	0 (0.0)	7 (100.0)
			Diastolic blood pressure	6 (66.7)	0 (0.0)	6 (100.0)
			Heart rate	9 (100.0)	4 (44.4)	5 (55.6)
Body composition	1 (5.3)	Body weight	1 (100.0)	1 (100.0)	0 (0.0)	
		Body mass index	1 (100.0)	1 (100.0)	0 (0.0)	
		Percentage of body fat	1 (100.0)	1 (100.0)	0 (0.0)	
Exercise capacity	10 (52.6)	Peak oxygen uptake	8 (80.0)	8 (100.0)	0 (0.0)	
		Anaerobic threshold	3 (30.0)	3 (100.0)	0 (0.0)	
		Exercise endurance time	9 (90.0)	8 (88.8)	1 (11.2)	
			Metabolic equivalent	5 (50.0)	2 (60.0)	2 (40.0)

**Conclusion: Various types of cardiac rehabilitation in Korea were performed by researchers. Therefore, we need to develop the standard protocol, to add psychosocial intervention, and to study cost effectiveness of cardiac rehabilitation.**

Serum	3 (15.0)	Lipid	Total cholesterol	2 (66.6)	1 (50.0)	1 (50.0)
			Triglyceride	2 (66.6)	1 (50.0)	1 (50.0)
			High density lipoprotein-cholesterol	2 (66.6)	1 (50.0)	1 (50.0)
		Inflammation	Low density lipoprotein-cholesterol	2 (66.6)	1 (50.0)	1 (50.0)
			C-reactive protein	1 (33.3)	0 (0.0)	1 (100.0)
			Interleukin-6	1 (33.3)	0 (0.0)	1 (100.0)
			Tumor necrosis factor-alpha	1 (33.3)	1 (100.0)	0 (0.0)

\*Multiple responses.

## 한국에서 심장재활이 활성화 되지 못하는 이유

- 의사들의 심장재활에 대한 관심 부족.
- 심장재활에 대한 병원내 의료진의consensus 가 부족하다.
- 심장재활을 위한 공간, 장비, 인력이 갖추어져 있지 않다.
- 운동을 싫어하는 환자들이 운동에 대한 이해가 부족하다.
- 지역(시, 도)내에 심장재활을 받을 수 있는 병원이 없다.
- 시간적인 여유가 없다. (환자 및 보호자)
- 국가보건정책에 반영되지 않았다.
- 건강보험 적용이 안 된다.



## The Reason That the Cardiacs Did Not Participate in Cardiac Rehabilitation Program in Subject Group 1

	Those who did not recognize of cardiac rehabilitation (78 patients)	Those who recognized of cardiac rehabilitation (26 patients)
<b>Doubt on effect</b>	30 (38.5%)	18 (69.2%)
Poor physical condition	32 (41.0%)	6 (23.1%)
Cost problem	29 (37.2%)	7 (26.9%)
Lack of time	13 (16.7%)	17 (65.4%)
Discomfort to move	27 (34.6%)	2 (7.7%)
No need	14 (17.9%)	14 (53.8%)
Anxiety	18 (23.1%)	8 (30.8%)
Distance problem	21 (26.9%)	2 (7.7%)
Traffic problem	14 (17.9%)	1 (3.8%)

## The Reason That Drop out the Cardiacs from the Cardiac Rehabilitation Program in Subject Group 2 (n=47)

Lack of time	12 (25.5%)
Thought of being able to perform at home	11 (23.4%)
Poor physical condition	7 (14.9%)
Cost problem	6 (12.8%)
No need	2 (4.2%)

**Conclusion:** To raise the participation rate and compliance in cardiac rehabilitation, it is very important to make a pitch for cardiac rehabilitation and improve program service for patient's convenience

## 현 보험체계에서 추가적용

- 운동치료(사-116)

가) 복합운동치료: 전산화된 등속성 운동기구를 제외한 기계를 사용한 근력 강화 운동과 기능 훈련 등 30분 이상 실시한 경우

6,190원

나) 등속성 운동치료: 전산화된 평가 및 치료가 가능한 등속성 운동기구를 사용하여 근력운동을 30분 이상 실시한 경우에 산정한다

6,550원

**Very Highly Cost Effective**

**No Hospital want to have CR program**

## 심장재활에 필요한 인력

- 심장재활감독(심장전문의, 심장 재활 전문의)
- 프로그램코디네이터/ 심장재활 전문 간호사
- 운동치료사(Exercise physiologist, specialist)
- 물리치료사, 작업치료사, 직업재 상담치료사
- 임상영양사
- 임상심리치료사

**모든 팀구성원은 기본심폐소생술(BCLS)을  
시행할 수 있어야 한다.**

# Conclusion

- 심장재활은 심장질환의 악화를 방지하고 환자의 사회 복귀를 도와 주는 필수 치료 과정으로 간주하는 인식이 필요하다
- 우리나라의 심장 재활은 아직 초보적인 단계로 많은 심장 전문의의 관심과 심장재활 전문가의 양성이 필요하다
- 현실적인 문제로 보험수가의 현실화와 적용 재활 분야에서 보험적용의 확대가 필요하다