Cardiac Rehabilitation

Past & Present

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Definition

"... the sum of activity required to ensure cardiac patients the best possible physical, mental and social conditions so that they may, by their own effort, regain as normal a place in the community, and lead an active life."

World Health Organization, 1964

World Health Organization

History

"I know one who set himself a task of sawing wood for half an hour every day, and was nearly cured"

1710-1801

Heberden W. *Commentaries on the history and cure of diseases*. London: T Payne, 1802.

History

"the symptoms of debility of the heart are often removable by a regulated course of gymnastics, or by pedestrian exercise"

1804-1878

Stokes W. *The diseases of the heart and the aorta*. Dublin: Hodges & Smith, 1854.

History

- Mobility restriction was imposed on patients with acute coronary events
- In the 1930s, patients with acute coronary events were advised to observe 6 weeks of bed rest
- Chair therapy was introduced in the 1940s
- In the early 1950s, a very short daily walk of 3 to 5 minutes was allowed 4 weeks after the coronary events

History

Morris JN, Heady JA. Mortality in relation to the physical activity of work: a preliminary note on experience in middle age. Br J Ind Med 1953;10:245-54.

Billion Dollar Heart Attack

Eisenhower's

65 y/o male executive, former smoker, experiences "indigestion" after playing 9 holes of golf in Denver

Oxygen tent and strict bedrest for one month

9/26/1955: stock market drops 6% ($14 billion, largest one-day drop since crash of 1929

F.H. Messerli, A.W. Messerli and T.F. Lüscher, *N Engl J Med* **353** (2005), pp. 1205–120


A WORK OF
OF HEART
CARDIAC REHABILITATION

Rehab Components

UpToDate®

- baseline patient assessment
- nutritional counseling
- risk factor assessment
- psychosocial management
- physical activity counseling
- exercise training

Balady, G. et al. Core components of cardiac rehabilitation/secondary preventive programs: A statement for healthcare professionals from the American Heart Association and the American Association of Cardiovascular and Pulmonary Rehabilitation. Circulation, 2000; 102:1069-1073.

Phases

Phase I

Phase II

Phase III

Indications

Circulation

- Acute MI within the preceding 12 months
- CABG
- Stable angina pectoris
- Heart valve repair/replacement
- Percutaneous coronary intervention with or without stenting
- Heart or heart-lung transplant
- Chronic heart failure

Other candidates for cardiac rehabilitation/secondary prevention programs include those with diabetes, peripheral arterial disease, pulmonary artery hypertension, and congenital heart disease [6].

Kwan G, Balady GJ. Cardiac rehabilitation 2012: advancing the field through emerging science. Circulation 2012; 125:e369.

Exercise-based Rehab

JACC
Journal of the American College of Cardiology

- 2016 meta-analysis of 63 trials
- 14,486 patients
- A lower risk of cardiovascular death (relative risk [RR] 0.74, 95% CI 0.64-0.86)
- A lower risk of hospital admission (RR 0.82, 95% CI 0.70-0.96).
- There was no significant effect on rates of all-cause death, MI, or revascularization.

Anderson L, Oldridge N, Thompson DR, et al. Exercise-based cardiac rehabilitation. J Am Coll Cardiol 2016; 67.

Stable Angina

Circulation

- men age ≤70 with class I to III angina and angiographic evidence of coronary disease
- training program (20 minutes of bicycle ergometry per day) or PCI with stenting
- At one year, survival free of cardiac events (cardiac death, cardiac arrest, MI, stroke, revascularization, or hospitalization for worsening angina) was significantly higher with exercise training (88 versus 70 percent).

Hambrecht R, Walther C, Möbius-Winkler S, et al. Percutaneous coronary angioplasty compared with exercise training in patients with stable coronary artery disease: a randomized trial. Circulation 2004; 109:1371

Post-PCI

JACC
Journal of the American College of Cardiology

- study of over 600,000 older Medicare patients with coronary artery disease
- who had undergone PCI
- significantly lower one- to five-year mortality rates (approximately 30 percent) in users of cardiac rehabilitation compared with non-users.

Suaya JA, Stason WB, Ades PA, et al. Cardiac rehabilitation and survival in older coronary patients. J Am Coll Cardiol 2009; 54:25.

Post-CABG

Circulation

- community-based analysis of 846 individuals
- who underwent CABG between 1996 and 2007
- those who participated in a cardiac rehabilitation program (compared to those who had not) had a lower incidence of all-cause mortality (adjusted) at 10 years (23.0 versus 35.7 percent; adjusted hazard ratio 0.54, 95% CI 0.40-0.74)

Pack QR, Goel K, Lahr BD, et al. Participation in cardiac rehabilitation and survival after coronary artery bypass graft surgery: a community-based study. Circulation 2013; 128:590.

Heart Transplantation

UpToDate®

- Although data are limited, cardiac rehabilitation may provide benefit both early and later after transplant. Long-term improvement is limited, which may be due to the effects of aging, cardiac denervation, transplant therapy, and prior heart failure.

- Post-transplantation rehabilitation should begin in the immediate post-operative period if possible and should continue and progress as the patient's condition allows.

Ileana L Piña, Rehabilitation after cardiac transplantation, UpToDate, May 21, 2014.

Mechanism

- Lipid profile improvement
- Blood pressure reduction
- Treat and prevent DM2
- Smoking cessation
- Normalize body weight

Lawler PR, Filion KB, Eisenberg MJ. Efficacy of exercise-based cardiac rehabilitation post-myocardial infarction: a systematic review and meta-analysis of randomized controlled trials. Am Heart J 2011; 162:571.

Mechanism

JACC
Journal of the American College of Cardiology

- Reduction in inflammation
- Decrease C-reactive protein concentration
- Ischemic preconditioning
- Improved endothelial function
- Fibrinolytic balance

Milani RV, Lavie CJ, Mehra MR. Reduction in C-reactive protein through cardiac rehabilitation and exercise training. J Am Coll Cardiol 2004; 43:1056.

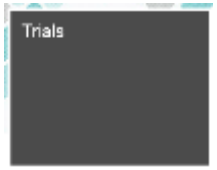
Post-MI mechanism

Circulation

- Improve left LV function
- Attenuate remodeling
- Exercise in Left Ventricular Dysfunction (ELVD) trial
- efficacy of exercise was evaluated in patients with a first Q wave MI and a left ventricular ejection fraction below 40 percent
- A six-month exercise training program increased both exercise capacity and the left ventricular ejection fraction (from 34 to 38 percent)

Giannuzzi P, Temporelli PL, Corrà U, et al. Attenuation of unfavorable remodeling by exercise training in postinfarction patients with left ventricular dysfunction: results of the Exercise in Left Ventricular Dysfunction (ELVD) trial. Circulation 1997; 96:1790.

Post-MI mechanism



- a 2011 systematic review
- beneficial effect of exercise training on left ventricular remodeling
- The greatest benefit occurred when training started earlier following MI (from one week) and lasted longer than three months

Haykowsky M, Scott J, Esch B, et al. A meta-analysis of the effects of exercise training on left ventricular remodeling following myocardial infarction: start early and go longer for greatest exercise benefits on remodeling. Trials 2011; 12:92.

Psychosocial interventions

JAMA

- ENRICHD trial
- psychosocial interventions in 2481 patients after MI
- patients receiving psychosocial intervention had less depression and better levels of perceived social support, but there was no reduction in mortality

Berkman LF, Blumenthal J, Burg M, et al. Effects of treating depression and low perceived social support on clinical events after myocardial infarction: the Enhancing Recovery in Coronary Heart Disease Patients (ENRICHD) Randomized Trial. JAMA 2003; 289:3106.

Program Completion

Circulation

- prospective cohort study of 5886 patients following coronary angiography
- subsequently referred for cardiac rehabilitation between 1996 and 2009
- 2432 did not start, 554 started but did not complete, and 2900 completed a program
- The median length of follow-up was 5.4 years and
- the median time to enrollment (among those who participated) was 84 days

Program Completion

Circulation

- The patients who completed cardiac rehabilitation, compared to the combination of non-completers and non-enrollers, had a lower risk of death (adjusted hazard ratio [HR] 0.59, 95% CI 0.49-0.84) and all-cause hospitalization .

Hammill BG, Curtis LH, Schulman KA, Whellan DJ. Relationship between cardiac rehabilitation and long-term risks of death and myocardial infarction among elderly Medicare beneficiaries. Circulation 2010; 121:63.

Program Completion

Circulation

- patients who attended 36 sessions had a 22 percent lower risk of death than those who completed 12 sessions (HR, 0.78; 95% CI, 0.71 to 0.87).

Hammill BG, Curtis LH, Schulman KA, Whellan DJ. Relationship between cardiac rehabilitation and long-term risks of death and myocardial infarction among elderly Medicare beneficiaries. Circulation 2010; 121:63.

Long-term Impact

- In ELMI, 322 patients
- usual care or ongoing intervention
- At four years, the Framingham risk score, total and low density lipoprotein-cholesterols were significantly lower compared to baseline in the intervention group
- The blood pressure fell significantly in the intervention group and rose in the usual care group.

Lear SA, Spinelli JJ, Linden W, et al. The Extensive Lifestyle Management Intervention (ELMI) after cardiac rehabilitation: a 4-year randomized controlled trial. Am Heart J 2006; 152:333.

Safety

Circulation

- The 2007 American Heart Association scientific statement on exercise and acute cardiovascular events estimated that

The risk of any major cardiovascular complication (cardiac arrest, death, or MI) is one event in 60,000 to 80,000 hours of supervised exercise

Thompson PD, Franklin BA, Balady GJ, et al. Exercise and acute cardiovascular events placing the risks into perspective: a scientific statement from the American Heart Association Council on Nutrition, Physical Activity, and Metabolism and the Council on Clinical Cardiology. Circulation 2007; 115:2358.

Utilization Rate

UpToDate®

Despite the benefits of cardiac rehabilitation described below, only 10 to 20 percent of eligible patients following myocardial infarction participate in formal structured cardiac rehabilitation in the United States and the United Kingdom

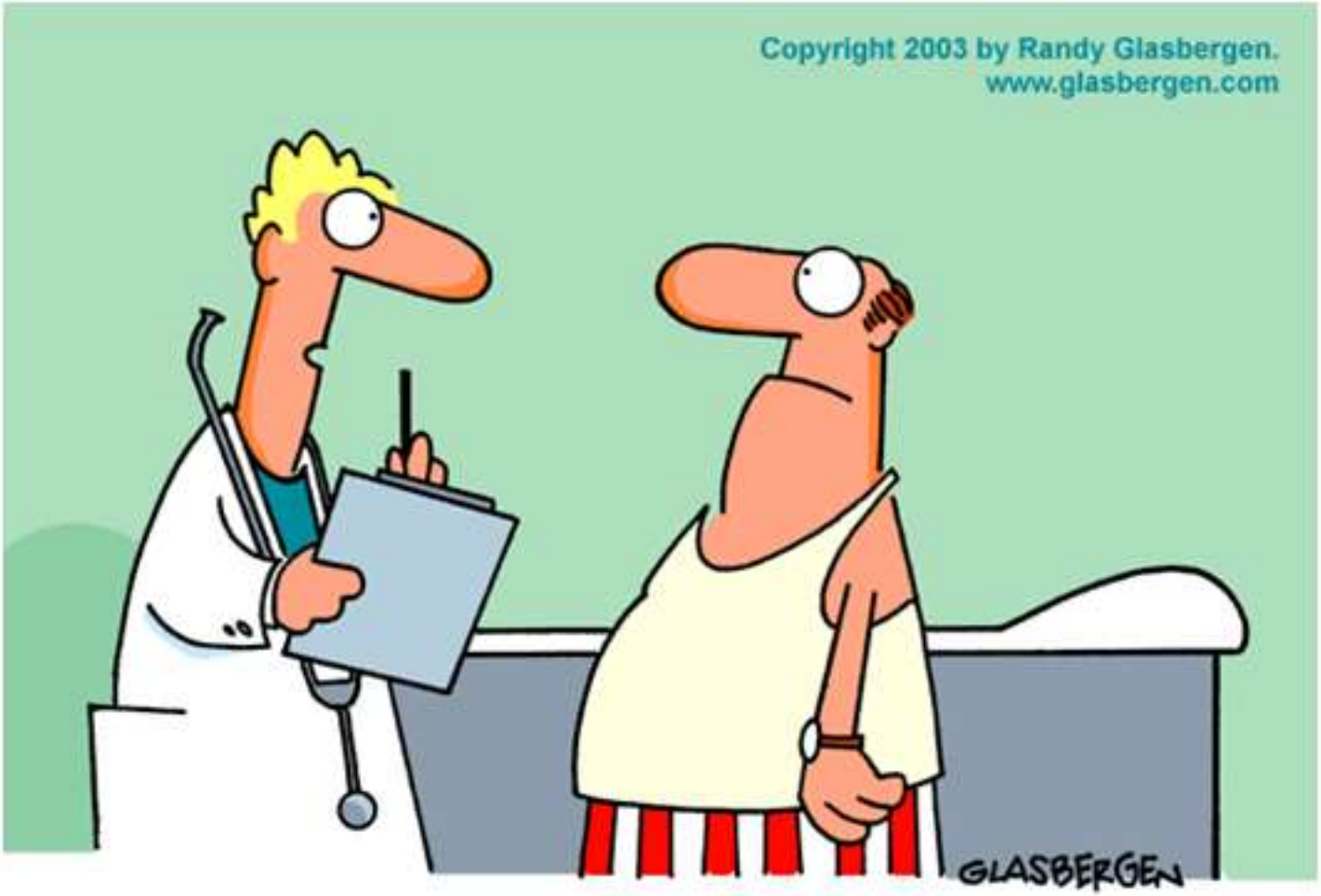
Barriers

BMJ

Box 3: Barriers to cardiac rehabilitation participation. Adapted from Menezes et al[18]

- Poor referral rates, especially for certain groups:
  - Women
  - People from ethnic minority groups
  - Elderly people
  - People living in rural settings
  - People in low socioeconomic classes
- Poor patient adherence, leading to low enrolment and high dropout rates
- Lack of endorsement by a doctor
- Obesity (high body mass index)
- Multiple morbidities, leading to poor functional capacity
- Poor exercise habits
- Cigarette smoking
- Depression
- Problems with transport
- Poor social support
- Lack of leave from work to attend centre-based sessions

BMJ 2015;351:h5000 doi: 10.1136/bmj.h5000 (Published 29 September 2015)



"What fits your busy schedule better, exercising one hour a day or being dead 24 hours a day?"