Editorial

The evidence base for the cost effectiveness of cardiac rehabilitation

Cardiac rehabilitation aims to restore wellbeing in patients with coronary disease and to retard disease progression. Nobody could argue with these aims and virtually every health authority in the United Kingdom provides some form of rehabilitation. However, in these cost conscious days health authorities have looked critically at the growth of these programmes and have sought evidence for their cost effectiveness.[1] It is reasonable for them to pose the question but the gaps in our knowledge pose problems in answering it; fortunately we have some information to make tentative proposals. When it was first introduced, cardiac rehabilitation was simply a system of graded exercise but nowadays it incorporates other important facets, notably tackling patients' psychological problems and educating them about self management of the major coronary risk factors—the term "comprehensive cardiac rehabilitation" is used to embrace these aspects. Unfortunately the term is rendered imprecise by wide differences between individual programmes. In terms of effectiveness, rehabilitation improves serum lipid concentrations, increases exercise tolerance, and may induce better psychological wellbeing, though the latter has been challenged.[2 3] However, two systematic reviews of 22 trials of exercise based cardiac rehabilitation, pooling the mortality data of nearly 4500 patients post-myocardial infarction, showed a 20–24% reduction in deaths over three years.[4 5] Based on these estimates one life would be saved every three years for every 31 to 45 participants in a rehabilitation programme.

Current cost to the health service

The cost of one cardiac rehabilitation programme may vary considerably from another because of—for example, extent of staff involvement, purchase of equipment, and costs of hiring facilities. In the British Cardiac Society's Working Party 1992 report, the cost of cardiac rehabilitation varied from £4 to £15 per patient per session; therefore, assuming 12 sessions per participant, the cost is £48 to £180 per patient.[6] Unfortunately the sources of these costs were not given.

Oldridge and colleagues[7] in their randomised controlled trial of cardiac rehabilitation performed a detailed cost analysis. Based on two outpatient rehabilitation sessions per week for eight weeks the marginal medical costs (subtracting cost of usual care and patient costs) in 1994–95 prices was £360 (health specific purchase power parity of £1 = US\$2·38[8]; Hospital Community Services pay and prices index for 1994–95 has risen by 25% since 1990–91[9]; multiplying factor = 1·25/2·38 = 0·525). However, the variation was great, namely £195 to £661. Extrapolating these service costs on the basis of the British Heart Foundation estimate of 321 programmes in the UK with each programme recruiting 160 patients a year, this would total an annual cost of between £8 and £34 million.[10]

Table 1 Cost effectiveness of selected cardiovascular health care interventions (1994–95 £/life year gained)

Smoking cessation	600
Aspirin	1 600
β blockers	2 800
Statins	38 300
ACE inhibitors	54 900
Cardiac rehabilitation	15 700

Adapted from Oldridge *et al*.[7]
ACE, angiotensin converting enzyme.

Cost effectiveness

Cost effectiveness is an umbrella term used by health economists for three specific modes of economic evaluation: cost effectiveness, cost-utility, and cost-benefit analysis. Each of these has its constraints and examines a different modality. For example, cost effectiveness can only be used to compare alternatives with the same one dimensional outcome—for example, survival, whereas cost-utility analysis summarises multidimensional benefits on one scale—for example, quality adjusted life years (QALY). Cost-benefit measures outcome in monetary terms of net gain or loss. Indirect measures, such as the value of increased earnings or productivity resulting from improvements in health, could be assessed this way. We have adapted to current UK costs the work of Oldridge *et al*[7] in deriving a cost effectiveness analysis by using their estimated costs and earlier work on meta-analysis of mortality as shown in table 1.

During their one year follow up Oldridge *et al*[7] assessed rehabilitation patients as gaining 0·052 QALY compared with those whose care did not include rehabilitation. From this they derived the cost-utility results which have been modified to current UK costs (table 2).

Cost-benefit and potential cost savings of cardiac rehabilitation

The two controlled trials examining the medium to long term implications of cardiac rehabilitation have shown a significant reduction in the costs of readmission to hospital

Table 2 Cost-utility of selected cardiovascular health care interventions (1994–95 £/quality adjusted life year gained)

Coronary artery bypass surgery left main	4 100
Coronary artery bypass surgery single vessel & mild angina	35 800
Treatment of diastolic hypertension	
Severe	9 300
Mild	18 200
Cardiac rehabilitation	6 900

Adapted from Oldridge *et al*.[7]

Table 3 Controlled trials examining medium to long term implications of cardiac rehabilitation

Reference	*Outcome*	*Savings per patient (1994–95 costs)*	*Follow up period*
Levin *et al*[11]	Health care utilisation	£448	5 years
	Return to work	£8 097	
Ades *et al*[12]	CAD readmissions	£338	3 years

CAD, coronary artery disease.

and treatment coupled with savings resulting from earlier return to work (table 3).[11 12]

As these trials were not randomised, had different follow up periods and outcomes, and the cost estimates were obtained in different countries (Sweden and the USA) it would be unwise to generalise too widely from them. Nonetheless from a societal perspective, the savings that could accrue as the result of this improvement in return to work are impressive. In terms of health service costs, the reduction in health service utilisation as the result of rehabilitation amounted to about £100 per patient per year. Based on these figures it would take only two years to recoup the costs of rehabilitation for each patient and beyond two years there would be a net saving to the health service.

Conclusion

The current growth and investment in cardiac rehabilitation services in the UK appears justified in terms of mortality (cost per life year gained) and quality of life (cost per QALY). Moreover, there seems to be a substantial cost saving to the National Health Service viewed over a three year span or longer. There are hazards in extrapolating the findings in this way. First, it is based on a limited number of economic evaluations, often from non-randomised trials. Second, and perhaps particularly important, these studies have been performed in countries with different patterns of health care delivery and therefore differing costs. Finally, even in Britain, the exact components of individual programmes varies widely with the likelihood of their cost effectiveness being equally variable. As with many other common medical interventions there is an urgent need to derive information from the UK and, therefore, to advocate that any trials of cardiac rehabilitation should also contain information on the costs.

ROD TAYLOR
BRIAN KIRBY

Postgraduate Medical School,
University of Exeter,
Barrack Road,
Exeter EX2 5DW, United Kingdom

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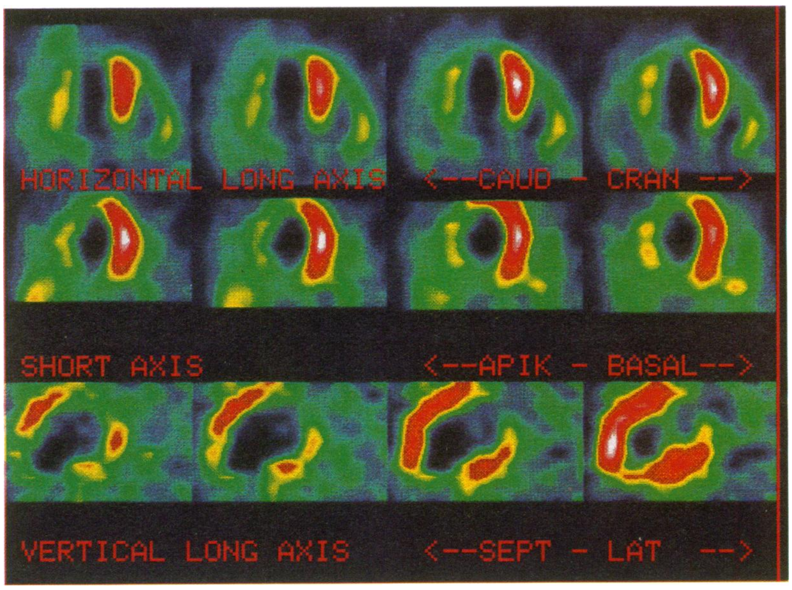
12 Ades PA, Huang D, Weaver SA. Cardiac rehabilitation predicts lower hospitalization costs. *Am Heart J* 1992;**123**:916–21.

IMAGES IN CARDIOLOGY

Cardiac sarcoidosis



Rest thallium-201 SPECT scintigraphy was performed in a 31 year old man with cardiac sarcoidosis proved by right ventricular endomyocardial biopsy. The tomograms revealed patchy tracer uptake defects in the apex, septum, and inferior wall of the left ventricle. A diagnosis of pulmonary sarcoidosis had been made when the patient was 26 years old because of bilateral hilar lymphadenopathy. During the subsequent years, progressive exertional dyspnoea and severe congestive heart failure developed. The patient refused cardiac transplantation and, despite intensive medical treatment including steroids and methotrexate, he died from terminal heart failure 11 months after first admission.

RAINER ZIMMERMANN
ARMIN HAUNSTETTER
WOLFGANG KÜBLER