

Cardiac rehabilitation in cardiac valve surgery patients: Beyond cost-effectiveness

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European Journal of Preventive
 Cardiology
 2017, Vol. 24(11) 1145–1147
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 Cardiology 2017
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sagepub.co.uk/journalsPermissions.nav
 DOI: 10.1177/2047487317706180
journals.sagepub.com/home/ejpc



Life expectancy growth and progressively complex therapeutic technique development are increasing health costs, which reminds us that financial resources are not unlimited. The numbers of surgical and percutaneous procedures for valve replacement and repair have been sharply rising, demanding an emergent economic analysis of the preventive and therapeutic interventions involved. Nowadays, economic analysis of health-related interventions is considered an important tool for optimisation of resources and frequently requested as essential to prove the real impact of interventions. Cardiac rehabilitation (CR) programmes, in several studies and different realities, have been demonstrated to be cost-effective in myocardial infarction and heart failure,¹ but this benefit is not transferable to heart valve surgery.

Despite the European Society of Cardiology (ESC) and European Association of Preventive Cardiology (EAPC) recommendations,^{2,3} CR in cardiovascular disease and particularly in heart failure and valve disease, is markedly underused due to several barriers.⁴ Data regarding CR in valve disease are scarce,⁵ even though CR has long been recommended for all patients after heart valve surgery, especially for those with a post-operative course complicated by heart failure.⁶ Recently, a Cochrane systematic review demonstrated that exercise-based rehabilitation compared with no exercise for adults after heart valve surgery, with or without other interventions, may improve exercise capacity.⁷ The authors considered that, due to the lack of scientific evidence, further high quality randomised clinical trials are needed in order to assess the impact of exercise-based rehabilitation on patient-relevant outcomes, including mortality, quality of life and cost-effectiveness analysis. This last outcome, cost-effectiveness, may be an important part of decision making, a reason why CR programme directors need to recognise and document the efficiency of their own programmes.

Keeping in mind that economic health analyses are always complex and very dependent on the target patients, countries and considered costs, the results

obtained might be different according to the evaluated specific settings, always needing critical evaluation.

The present study⁸ approaches this very interesting and important topic, since the cost-effectiveness and cost-utility analysis of CR in myocardial infarction and in heart failure, as previously remarked, cannot be extrapolated to valve surgery patients. This is the first CR cost-utility analysis in patients undergoing heart valve surgery and followed for six months, from the CopenHeartVR trial.⁹ It has the strength to include patient randomisation instead of gathering a CR cohort without a control group and to provide rather complete information on multiple costs, namely those which are patient-borne (transportation expenses and time spent on transportation and CR).

Several limitations are present in this study:

- The sample dimension is not large for this kind of analysis (147 patients) and includes a rather heterogeneous group of patients, with different affected valves, different pathologies and different aetiologies. The original recruitment target number of patients (210 patients) was not attained in the CopenHeartVR trial, though power was recalculated for the obtained sample. A minor gender imbalance was observed (11% more males in the CR group). The limited number of patients in the study did not allow separate sub-analysis of CR in the different settings. Results of cost-utility analysis might be different in old patients with degenerative aortic valve disease and multiple co-morbidities and in young patients with mitral valve prolapse and regurgitation or with pulmonary stenosis.
- This is a selected group of valve patients indicated for surgery with low surgical risk by Euroscore II

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(mean value 1%), good left ventricular ejection fraction (LVEF) (mean value 55% and 54%, for CR and control), New York Heart Association (NYHA) class <3 (74% and 69% of patients, for CR and control), mostly in sinus rhythm, with few diabetics and high educational level. More severe high-risk patients would probably lead to different results.

- The conclusions of the study must be restricted to the sample of operated valve Danish patients, which means that the results cannot be automatically assumed in other countries being the economic health analysis very dependent on the study population, as previously mentioned.
- Also, home-based CR should not be mixed with centre-based CR. Of the patients, 69% received a controlled rehabilitation programme and the others had home-based or self-training in a fitness centre. Different CR types should be evaluated differently. Also, separate analysis of different subsets is limited by the sample size. In this study, it is not possible to tell if the involved modalities may have influenced the analysis results.
- Cost-utility analysis, which was used in the present paper,⁸ has its own strengths and limitations. The unit of health used, quality adjusted life years (QALYs), is a measure which is more health and well-being related than a single natural unit (as years of life lost). QALYs assume that the only potential benefit from healthcare is the improvement in heart-related quality of life (HRQL). Different countries with different patterns of healthcare delivery and therefore different costs may have different results.

This study, with the described limitations, did not confirm statistical differences in HRQL, or in societal costs between both groups (CR and no CR) in this sample of patients. However, it showed a tendency towards cost savings, which may need to be confirmed in future studies with a larger homogeneous higher risk population, like older patients with aortic stenosis (a growing population segment) submitted to valve replacement with a well-defined CR programme, uniform in modality.

Despite the importance of economic analysis, doctors need to continue treating patients in the best way possible. Many of these surgical valve patients are severely deconditioned by previous auto-limitation of functional activities due to symptoms. Especially in older heart failure patients, daily life capacities are progressively limited, decreasing daily life activities, independence and quality of life. For most patients, enhanced functional capacity leads to a greater ability to perform the activities of daily living and to tolerate longer periods of activity with less perceived exertion.¹⁰ Before aortic valve replacement, many patients are classified in class

III or IV NYHA^{11,12} and the average improvement after surgery at six months without CR is one class.¹¹⁻¹⁴ Abnormal rest and exercise cardiac haemodynamics persist for 6–12 months after surgery.¹³ The exercise training component of CR is useful for reversing the symptoms associated with deconditioning. After aortic valve replacement, the increase in aerobic capacity can be 38% higher at six months and 37% higher at 12 months in exercise training patients compared to patients without CR.¹⁵ Besides functional aerobic training in the exercise programme, flexibility, equilibrium and strength training are considered fundamental.

These patients also need, besides the functional component of CR, all other components, like medical management and, no less important, education regarding safety and risks of physical activity, symptom monitoring, nutrition information, comorbidity treatment, risk factors control and adherence to medication (such as anticoagulation in mechanical prosthetic valves and in atrial fibrillation). Older surgical valve patients, with longer hospital admissions and more complications, namely atrial fibrillation,¹⁶ are a particular group requiring comprehensive multidisciplinary CR.

The clinical reason for CR is to treat the patient after surgery, to optimise his physical and psychological status, while the reason for surgery is to treat the diseased valve, repairing it or implanting a new one. So, the target of surgery is the valve and the target of CR is the patient.

Some questions remain:

- If we can improve a patient's functional, psychological or independence status with CR, which is certainly less expensive than most interventions with devices, why should we leave a patient only partially treated by cardiac surgery?
- If a valve is implanted and the patient still needs to remain in bed, depending on someone for daily life activities, because of muscle atrophy and loss of strength, joints stiffness, risk of falls and depression can we consider this intervention a therapeutic success?
- And if we want to consider health costs, are all costs included in the economic health analysis at long-term, like patient long-duration incapacity to work or early retirement, frequent work absence of family members to support the patient, more medication needed (namely antidepressants or benzodiazepines), loss of independence and complications of immobilisation?

This paper,⁸ maybe due to several limitations, does not absolutely prove cost-utility of CR in this analysis in a small and heterogeneous sample of low-risk patients from Denmark, but proves that there is no economic cost-utility advantage regarding not performing CR. Even more, despite not having improved HRQL, it

shows a positive tendency in cost savings, suggesting the likelihood of CR being cost-effective to society, outweighing the extra costs of CR, as the authors conclude.

Based on the best clinical practice, I would prefer to consider that CR should not be restricted by the cost-utility analysis results demonstrated in this study. With all the already proven and expected benefits of CR in these patients, the intervention would have to be economically disastrous (which it was not) for not being provided to all operated valve patients. It must be stressed that this study does not change that all valve patients operated who are stable and have no clear contra-indications should perform CR, with a tailored programme, identical to heart failure programmes, with confirmed benefits but adjusted, especially for those who can get the greatest gains, like the old, frail, dependent, functionally limited, obese, with several comorbidities or with heart failure patients.

A larger economic study will probably demonstrate, in different groups of valve disease patients, the beneficial cost-effectiveness of CR after surgery and this might be important for those who are not completely convinced by the positive clinical and social impact of this essential intervention. Even more, the analysis and evaluation of results should take into account that some costs (dependence, depression, disability) have not been considered in the economic analysis and might be the greatest.

At this point, we may ask ourselves, as Joep Perck¹⁶ did before for coronary disease: Does CR need to be cost-effective? Is there a better alternative?

I do not think so. Since we do need CR in these patients, our efforts should be applied, not in evaluating the cost-utility of CR in valve disease patients, but in evaluating which specific programme or protocol is more cost-effective, including the forgotten social, familiar and personal costs, in these particular patients. The same way a surgeon considers, when valve surgery is indicated to a patient, not if the valve needs to be cost-effective, but which is the best valve to implant.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship and/or publication of this article.

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