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ORIGINAL ARTICLE

Cost-effectiveness of a Population-based Lifestyle Intervention to Promote Healthy Weight and Physical Activity in Non-attenders of Cardiac Rehabilitation

Qinglu Cheng, MSc [a*], Jody Church, MA [b], Marion Haas, MPH, PhD [b], Stephen Goodall, MSc, PhD [b], Janice Sangster, MPH, PhD [c], Susan Furber, MPH, PhD [d,e]**

[a]Australian Centre for Health Services Innovation, Queensland University of Technology, Brisbane, QLD, Australia
[b]Centre for Health Economics Research and Evaluation, University of Technology Sydney, Sydney, NSW, Australia
[c]School of Dentistry and Health Sciences, Charles Sturt University, Wagga Wagga, NSW, Australia
[d]Health Promotion Service, Illawarra Shoalhaven Local Health District, Warrawong, NSW, Australia
[e]School of Public Health and Community Medicine, University of New South Wales, Sydney, NSW, Australia

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Background To evaluate the long-term cost-effectiveness of two home-based cardiac rehabilitation (CR) interventions (Healthy Weight (HW) and Physical Activity (PA)) for patients with cardiovascular disease (CVD), who had been referred to cardiac rehabilitation (CR) but had not attended. The interventions consisted of pedometer-based telephone coaching sessions on weight, nutrition and physical activity (HW group) or physical activity only (PA group) and were compared to a control group who received information brochures about physical activity.

Methods A cost-effectiveness analysis was conducted using data from two randomised controlled trials. One trial compared HW to PA (PANACHE study), and the second compared PA to usual care. A Markov model was developed which used one risk factor, body mass index (BMI) to determine the CVD risk level and mortality. Patient-level data from the trials were used to determine the transitions to CVD states and healthcare related costs. The model was run for separate cohorts of males and females. Univariate and probabilistic sensitivity analysis were conducted to test the robustness of the results.

Results Given a willingness-to-pay threshold of $50,000/QALY, in the long run, both the HW and PA interventions are cost-effective compared with usual care. While the HW intervention is more effective, it also costs more than both the PA intervention and the control group due to higher intervention costs. However, the HW intervention is still cost-effective relative to the PA intervention for both men and women. Sensitivity analysis suggests that the results are robust.

Conclusion The results of this paper provide evidence of the long-term cost-effectiveness of home-based CR interventions for patients who are referred to CR but do not attend. Both the HW and PA interventions can be

*Corresponding author at: Australian Centre for Health Services Innovation, Institute of Health and Biomedical Innovation, Queensland University of Technology, 60 Musk Avenue, Kelvin Grove, QLD, Australia, 4059. Tel.: +61 (07) 3138 6222, Email: qinglu.cheng@qut.edu.au
**Corresponding author at: Centre for Health Economics Research and Evaluation, UTS Business School, University of Technology Sydney, PO Box 123, Broadway, NSW, Australia, 2007. +61(02) 9514 9887, Email: jody.church@chere.uts.edu.au

recommended as cost-effective home-based CR programs, especially for people lacking access to hospital services or who are unable to participate in traditional CR programs.

Keywords Cardiovascular disease • Rehabilitation • Body Mass Index • Cost effectiveness • Pedometer • Telephone coaching

Introduction

Cardiovascular disease (CVD) is currently the leading cause of death in Australia. According to the Australian Health Survey (AHS), 3.7 million Australians were affected by one or more long-term cardiovascular conditions in 2011/12 [1]. In 2012, 43,946 people died of CVD, which accounts for 29.9% of all deaths in Australia [2]. The burden of CVD is reflected not only in years of life lost to premature death and disability, but also in the impact on healthcare costs. During 2008-09, the total estimated healthcare expenditure on CVD in Australia amounted to $7,605 million, more than for any other disease group [3].

For patients who have already experienced CVD events, cardiac rehabilitation (CR) is recommended to prevent the recurrence of cardiac events or death. Cardiac rehabilitation is traditionally hospital-based and consists of multidisciplinary programs that involve medical supervision and combine health education about physical activity, lifestyle and dietary behaviour modification for patients[4,5]. Studies have shown that CR has beneficial effects on risk factors including lowering blood pressure, cholesterol level and excess body weight [6–8].

Low attendance rates of hospital-based CR programs have resulted in the implementation of home- or community-based CR programs [9–13]. The effectiveness of modified CR programs has been evaluated in several studies alongside randomised controlled trials. In most circumstances, only short-term results have been reported [14–18]. The CHOICE program, on the other hand, followed up with participants longer and found that health benefits obtained from three-month modified CR programs were maintained at four years [19]. However, no Australian studies have reported the longer-term cost-effectiveness of home-based interventions, particularly for CVD patients who choose to not attend hospital-based CR programs. This study aims to determine the long-term cost-effectiveness of a home-based CR program for patients who were referred to but did not attend a CR program in Australia.

Methods

Economic Evaluation

The basic tasks of economic evaluation are to identify, measure, value and compare costs and consequences of alternatives being considered [20]. To compare costs and effectiveness of alternatives, incremental cost-effectiveness ratios (ICERs) are often used as the primary outcome. Incremental cost-effectiveness ratios are calculated as the difference in cost between two alternatives divided by the difference in quality adjusted life years (QALYs).

A Markov model was developed to simulate the long-term progression of CVD and to evaluate how alternative home-based CR interventions would impact on future mortality outcomes, quality of life and related costs relative to conventional hospital-based CR. The model is populated using data from two trials. In a randomised trial, Furber et al. [21] evaluated the effectiveness of a pedometer-based telephone intervention for patients who chose not to attend a CR program. The intervention group (PA) was given instructions and support about physical activity by telephone calls while the control group was sent two physical activity information brochures by mail and received no reinforcement telephone calls. The PANACHE (Physical Activity, Nutrition and Cardiac Health) study was a randomised controlled trial which evaluated the effectiveness of a pedometer-based telephone coaching program on weight and physical activity. The study is fully described elsewhere [22,23]. In the PANACHE trial, adults who were referred to CR at two urban and two rural hospitals in the state of New South Wales in Australia were randomly allocated to two interventions: healthy weight (HW) (four pedometer-based telephone coaching sessions on weight, nutrition and physical activity) or physical activity (PA) (two pedometer-based telephone coaching sessions on physical activity alone). The PA intervention in the PANACHE study is identical to that in the previous study by Furber et al. [21]. A cost-effectiveness analysis of the PANACHE study indicated that in the short-term the HW intervention is both cost-saving and more effective relative to the PA intervention for patients not attending CR [24].

The PANACHE study did not contain a usual care control arm, so the control arm used in the model was taken from Furber et al. [21]. There is a high degree of exchangeability between the two trials. The PA intervention in both trials was identical in terms of delivery and follow-up, therefore it is acceptable to be used as a common comparator between the HW intervention (PANACHE study) and the control group from the Furber study. In addition, the patient baseline characteristics from both studies were similar with no statistical difference in mean BMI (primary model input). Therefore, the HW and PA intervention can be compared to a 'no intervention' setting which reflects a real world context.

Model Design

Most studies in this area focus on how interventions would impact on CVD risk factors for a population free of CVD at