

# The Effects of Cardiac Tertiary Prevention Program after Coronary Artery Bypass Graft Surgery on Health and Quality of Life

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Date of Submission: May 2, 2011

Date of Acceptance: Jul 21, 2011

## ABSTRACT

**Objectives:** Cardiac tertiary prevention programs intend to support the recovery course following coronary artery bypass grafting (CABG). We investigated the effects of attendance at cardiac rehabilitation (CR) programs following CABG on patients' mortality, morbidity and health related quality of life.

**Methods:** Eighty patients who underwent CABG were selected in a way that half of them had attended a cardiac rehabilitation program and the other half had not. Health related quality of life (HRQoL) was measured using the Short Form 36 (SF-36) questionnaire at a mean of 23.4 months postoperatively. Severity of cardiac symptoms on the basis of the New York Health Association (NYHA), the occurrence of any neurological symptoms, hospitalization and restoration of patients to their previous level of performance in social activities were assessed after CABG surgery.

**Results:** There were no deaths. There were no differences in post-operative NYHA scores, neurological symptoms, and hospitalization. Three of the eight health domains measured by SF-36, namely general health ( $P = 0.010$ ), physical function ( $P = 0.002$ ), and mental health ( $P < 0.001$ ), showed significantly better values for attendants than non-attendants. Rehabilitation participants returned to their previous level of performance in social activities more than their control counterparts.

**Conclusions:** Higher general health scores (SF-36) were associated with attendance at CR programs. The findings of this study provide rationale to consider a broader scope of physiological and psychosocial parameters to predict outcomes of CABG surgery.

**Keywords:** Coronary artery bypass grafting, Cardiac rehabilitation, Health related quality of life.

Int J Prev Med 2011; 2(4): 269-274

## INTRODUCTION

Heart disease is one of the most common causes of mortality and morbidity worldwide.<sup>1</sup> Coronary artery bypass graft (CABG) surgery is a frequently used cardiothoracic revascularization method to treat coronary artery disease (CAD).<sup>2,3</sup>

In addition to physical impairments and activity restrictions in the immediate postoperative period, patients encounter some obstacles to

exhibit improvements in health related quality of life (HRQoL) in the longer term.<sup>4,5</sup>

Tertiary prevention programs generally consist of the prevention of disease progression and patient suffering after disease establishment. These interventions aim to reduce the negative impact of disease by restoring function and reducing disease-related complications and therefore, include the rehabilitation of disabling conditions.<sup>6</sup>

Cardiac rehabilitation (CR) programs are interventions aimed to reduce mortality and morbidity of patients with ischemic heart diseases through promoting a healthier lifestyle among patients.<sup>6</sup> CR programs are used to restore, maintain, or improve both physiologic and psychosocial outcomes and finally the quality of life in patients through a combination of exercise, education and psychological support.<sup>7</sup> Although some studies have investigated the effects of CR on cardiac and biochemical parameters,<sup>8,9</sup> there are a few comparative studies on beneficial effects of CR on HRQoL in Iran.

Considering the poor participation in cardiac rehabilitation programs in Iran, this study prompted to investigate the effect of rehabilitation on HRQoL approximately 2 years following the CABG operation.

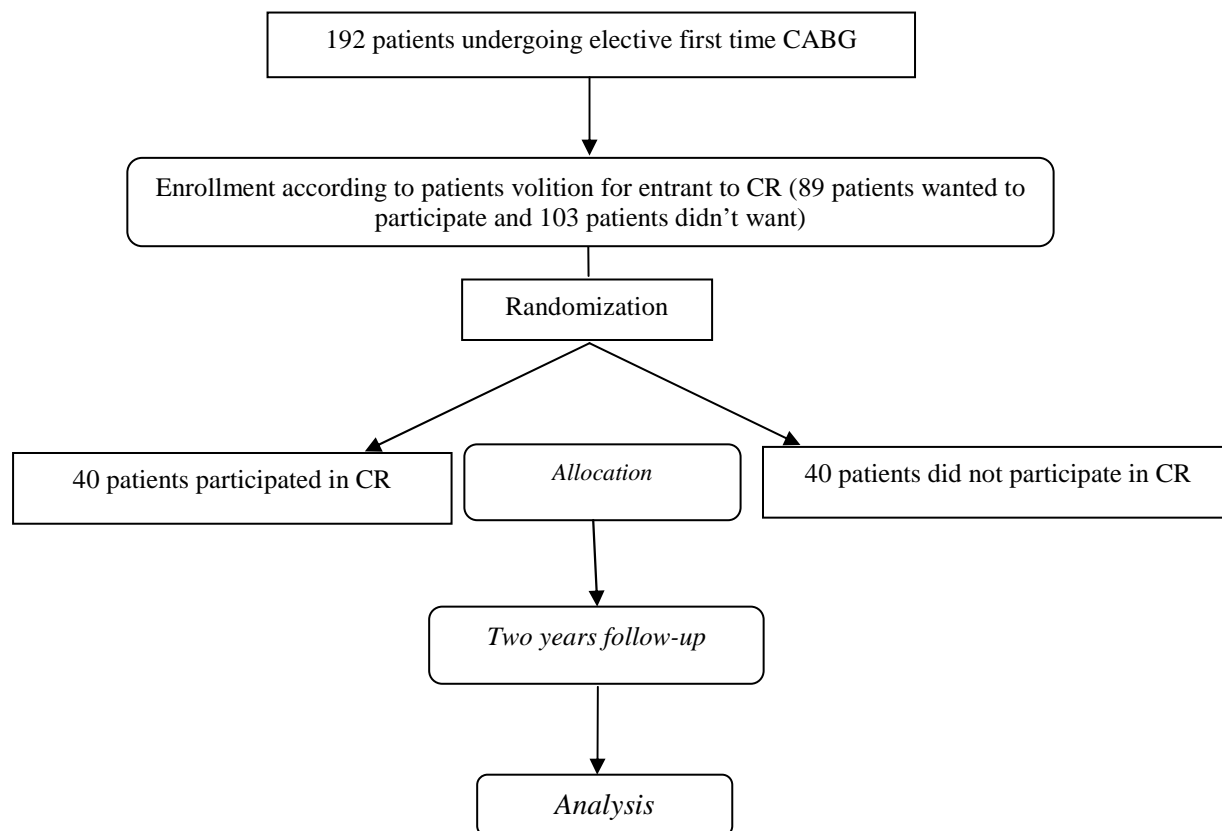
In this study, we report HRQoL, severity of cardiac symptoms on the basis of the New York Health Association (NYHA), the occurrence of any neurological symptoms, hospitalization, and restoration of patients' to their previous level of performance in social activities after CABG surgery. We examined the relation between these variables and attendance or non-attendance at CR programs following CABG.

## METHODS

### Study Design

This study has been approved by the local ethics committee of Sina Cardiovascular Center in Isfahan. All patients signed an informed consent. Flow diagram of patient participation through the study has been shown in figure 1. This prospective observational study was part of a larger study carried out in Sina Cardiovascular Center from 2008. A random sample of 80 patients undergoing elective first time CABG was selected in a way that half of them had attended in a CR program (CR group) while the other half had not (control group). Patient randomization was done by a computer generated randomization list with 20 consecutive balanced blocks of two patients for each group.

To evaluate patients' quality of life, the Short Form 36 (SF-36) questionnaire (Persian standard version) was completed for all patients at an average time of 23.4 months afterward CABG. The reliability and validity of the Persian version of the SF-36 have been well established.<sup>10</sup> SF-36 is a thirty-six item scale that generates scores for eight items which can finally establish physical and mental component summary scores. Physical component summary



**Figure 1.** Flow diagram of patient participation through the study

score includes physical functioning, role limitations due to physical health, bodily pain, and self-perception of general health. Mental component summary score includes vitality, social functioning, role limitations due to emotional problems, and mental health. SF-36 scores were calculated according to the methods determined by the authors of the questionnaire.<sup>11,12</sup> A questionnaire was used to collect data on age, sex, medical history and attendance in cardiac tertiary prevention programs.

Patients in CR group were attended in a cardiac tertiary prevention program  $10.6 \pm 1$  weeks after operation at Isfahan Cardiac Research Center. The program was at least eight weeks long and consisted of exercise training and dietary and psychological counseling.

Morbidity and mortality were assessed via telephone interviews approximately  $23.4 \pm 1$  months after CABG. The interview was comprised of questions related to the recurrence of angina, subsequent cardiovascular associated hospitalization and/or contact with the health-care system such as emergency department. During this interview, participants were asked about chest pain and shortness of breath on the basis of the NYHA, and the occurrence of any neurological symptoms representative of transient ischemic attack or stroke. Patients were also questioned regarding their level of activity, their employment status and their restoration to previous level of performance in social activities after surgery.

### Statistical Analysis

Differences in the outcome variables of attendance or non-attendance at CR programs

were tested using Fisher exact or  $\chi^2$  tests for categorical variables and Student's t or Mann-Whitney tests for continuous variables in SPSS version 16 (SPSS Inc., Chicago, IL).

## RESULTS

The response rate of the study patients was 100% and all the patients were alive. Baseline characteristics of patients who participated in CR vs. their individually matched controls are presented in Table 1. There were no differences in the pre-operative clinical factors between CR and control groups.

**Table 1.** Patients' baseline characteristics

Characteristic	CR Group (n = 40)	control Group (n = 40)
Age (years, mean $\pm$ SD)	62.12 $\pm$ 1.08	64.20 $\pm$ 1.03
Sex (male/female)	(25/15)	(25/15)
Smoker*	9 (22.5%)	14 (35%)
History of hypertension	16 (40%)	20 (50%)
Diabetes mellitus	19 (47.5%)	21 (52.5%)
Previous MI	25 (62.5%)	20 (50%)
Professional status		
Employed	4 (10%)	5 (12.5%)
Unemployed/Retired	36 (90%)	35 (87.5%)
Coronary vessel disease ( $\geq 70\%$ stenosis)		
2-Vessel disease*	8 (20%)	2 (5%)
$\geq 3$ -Vessel disease	32 (80%)	38 (95%)
Ejection fraction (mean $\pm$ SD)	54.52 $\pm$ 1.51	52.62 $\pm$ 1.55

All data are numbers of patients (with percentages) unless otherwise stated.

MI = myocardial infarction; CR= cardiac rehabilitation.

\* Significant difference between groups ( $p < 0.05$ )

**Table 2.** The SF-36 scores obtained from cardiac rehabilitation program attendants (CR group) compared to the control group

	CR group	Control group
Self- perception of general health	64.84 $\pm$ 1.54	57.53 $\pm$ 2.54*
Physical functioning	77.62 $\pm$ 1.42	68.50 $\pm$ 2.44*
Role limitations due to physical health	64.37 $\pm$ 2.51	66.87 $\pm$ 2.26
Mental health	71.75 $\pm$ 0.69	64.32 $\pm$ 1.28*
Role limitations due to emotional problems	85.83 $\pm$ 3.35	89.16 $\pm$ 3.01
Energy/ fatigue (vitality)	57.25 $\pm$ 0.96	55.53 $\pm$ 1.12
Social functioning	97.50 $\pm$ 0.91	95.00 $\pm$ 2.44
Bodily Pain	91.68 $\pm$ 1.10	89.91 $\pm$ 1.86

\*Significant difference between groups ( $P < 0.05$ )

## DISCUSSION

Based on the findings of this study, although there was no difference in mortality and morbidity (ischemic symptoms and NYHA functional classes, occurrence of any neurological symptoms representative of transient ischemic attack or stroke, and cardiovascular associated hospitalization) among the two groups, patients who attended CR had higher postoperative self-perception of general health, physical function and mental health (Table 2). The CR program participants had also returned to their previous level of performance in society more than the control group. Due to the present healthcare strategies of decreased length of hospitalization for CABG patients, healthcare providers are challenged to provide interventions that will facilitate optimal patient outcomes.<sup>12</sup>

In agreement with the results of our study, previous analyses of the effects of CR participation on patients' HRQoL after CABG, controlled for clinical and demographic characteristics in a multiple logistic models, have shown CR to be an independent predictor of better HRQoL.<sup>13,14</sup>

Two systematic reviews that analyzed 48 randomized controlled trials reported a 20% decrease in all-cause mortality and a 27% reduction in cardiac mortality in participants of CR programs at two to five years after surgery.<sup>15,16</sup> The improvement in general health status has been observed five years after CABG.<sup>7</sup> It has been demonstrated that patients who attended CR recognized their health and overall life situation to be better than those who did not.<sup>17</sup>

There was no difference in the incidence or severity of cardiac associated symptoms and hospitalization between CR attendants and non-attendants (Table 2), corroborating the results from another study that investigated the impacts

of attendance at cardiac rehabilitation on the outcomes after myocardial infarction.<sup>18</sup>

Using the SF-36, several studies have found improved physical functioning and increased participation in activities<sup>19-24</sup> as indicators of HRQoL improvement specifically 2 years after CABG surgery without rehabilitation.<sup>25</sup> Furthermore, it has been shown that the categories of behaviors affected by health are physical function, social function, emotional function, self-perception of health, and well-being.<sup>19</sup>

As Patients' perceptions of their health despite of the physical health, determine the likelihood of their return to work after CABG,<sup>26,27</sup> it is conceivable to observe that CR program participants had returned to their previous level of performance in society more than control group. This is another imperative outcome related to rehabilitation. Similar reports in the literature<sup>28-32</sup> have shown that more rehabilitation participants returned to work and fewer dropped out afterwards.

In conclusion, while rehabilitation participants are not healthier than their control counterparts, they appear to have a better viewpoint of their health problems and are thus able to cope better. These findings are comparable with the results of above mentioned randomized studies reporting better self-perception of health status and overall life situation among post-CABG patients who participated in cardiac rehabilitation programs.

Although the results of current observational study should be interpreted with caution, and also considering that self-selection of patients participating in CR programs may be redolent of their better motivation, the improved HRQoL of patients who participated in CR after CABG can be interpreted as evidence of the positive effects of such programs.

**Table 3.** The comparison of mortality items and return to previous level of performance in social activity between cardiac rehabilitation participants (CR group) and control group

	CR Group	Control Group
<b>NYHA: functional class</b>		
I	25 (62.5%)	29 (72.5%)
II	14 (35%)	11 (27.5%)
III	1 (2.5%)	0
IV	0	0
<b>Return to previous level of performance in social activities*</b>	39 (97.5%)	32 (80%)
<b>Hospitalization</b>	3 (7.5%)	3 (7.5%)
<b>Neurological symptoms</b>	0	1 (2.5%)

\*Significant difference between groups ( $p < 0.05$ )

NYHA: New York Health Association



## ACKNOWLEDGEMENTS

The authors thank all patients contributed in this study.

**Conflict of interest statement:** All authors declare that they have no conflict of interest.

**Source of funding:** This study was supported by Tehran University of Medical Sciences, Tehran, Iran.

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