



Is Participation in Cardiac Rehabilitation Programs Associated with Better Quality of Life and Return to Work after Coronary Artery Bypass Operations? The Israeli CABG Study

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Abstract

Objective: To explore the putative effect of cardiac rehabilitation programs on the 'health-related quality of life' and 'return to work' in pre-retirement patients one year after coronary artery bypass grafting.

Methods: Of the 2,085 patients aged 45–64 who survived one year after CABG and were Israeli residents, 145 (6.9%) had participated in rehabilitation programs. Of these, 124 (83%) who answered QOL questionnaires were individually matched with 248 controls by gender, age within 5 years, and the time the questionnaire was answered. All patients had full clinical follow-up including a pre-operative interview. The Short Form-36 QOL questionnaire as well as a specific questionnaire were mailed to surviving patients one year after surgery. Study outcomes included the scores on eight scales and two summary components of the SF-36, as well as 'return to work' and 'satisfaction with medical services' from the specific questionnaire. Analysis was done for matched samples.

Results: Cardiac rehabilitation participants had significantly higher SF-36 scores in general health, physical functioning, and social functioning. They had borderline significant higher scores in the physical summary component of the SF-36. The specific questionnaire revealed significantly better overall functioning, higher satisfaction with medical care, and higher rate of return to work. While participants in cardiac rehabilitation and their controls were similar in their socio-

demographic and clinical profiles, participating patients tended to be more physically active and more fully employed than their controls.

Conclusions: Rehabilitation participants had a self-perception of better HRQOL, most significantly in social functioning. Our findings of more frequent return to work and higher satisfaction with medical care should induce a policy to encourage participation in cardiac rehabilitation programs after CABG.

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The World Health Organization defined rehabilitation of coronary artery patients as the total activities needed to ensure the best physical, mental and social conditions to enable patients to return to their place in the community in order to conduct active and productive lives [1]. Numerous studies have reported a positive effect of rehabilitation in cardiac patients [2–11].

While cardiac rehabilitation programs tend to vary, their contents involve modification of patients' health behavior; sexual and dietary habits; re-education with regard to smoking, weight and exercise; and stress management counseling. There are three generally accepted phases in rehabilitating patients after coronary artery bypass graft [3,7]: a) in-hospital cardiac rehabilitation during the CABG hospitalization; b) second-phase rehabilitation that starts 3–6 weeks after discharge from hospital, lasts ideally 3–5 months, and is the subject of this report; and c) third-phase rehabilitation, a later program that involves long-term exercise training, follow-up and support.

CABG = coronary artery bypass grafting

QOL = quality of life

SF-36 = Short Form-36 QOL questionnaire

HRQOL = health-related quality of life

In Israel, the first rehabilitation unit was established at Sheba Medical Center, Tel-Hashomer during the 1960s. At the time of the study there were 12 centers operating under full supervision of cardiologists, internal medicine specialists and other professionals.

Considering the knowledge and experience in Israel, the poor participation in cardiac rehabilitation programs that we observed in the Israeli CABG study prompted an examination of the effect of rehabilitation on health-related quality of life, return to work, and satisfaction with medical care in the year following the CABG operation.

Materials and Methods

This report is part of the Israeli CABG study, for which every individual in the country who underwent isolated CABG during 1994 was eligible [12]. Patients were enrolled between 1 January and 31 December 1994 at all 14 cardiac surgery departments (including private centers) that perform these procedures.

Patients

The target population for this report comprised 2,085 men and women aged 45–64, residents of Israel, who survived for one year following an isolated CABG operation during 1994, the year of the CABG study. Surviving patients had been asked, while still in hospital, to participate in a post-discharge follow-up. Those who were unable to sign an informed consent and could be located one year later were asked by phone to participate. Those who agreed were mailed the SF-36 as a generic QOL questionnaire, and a specific questionnaire depicting symptoms and problems unique to CABG patients. In the specific questionnaire, patients were asked about participation in rehabilitation during the year following the CABG.

Rehabilitation programs differed significantly among the 12 rehabilitation centers in terms of duration and contents of the activities. Basically, they began 1–6 months postoperatively, lasted between 3 and 6 months, and included exercise training, dietary and psychological counseling. Of 246 patients who reported participation in second-phase rehabilitation, only 145 were actually verified by phone to have participated in such programs. The rest confused rehabilitation programs with short-term recovery facilities and other forms of advice given them by health professionals on various occasions.

Of the verified participants in rehabilitation, 124 (83%) answered the QOL questionnaire and were individually matched with two controls – by age within 5 years, gender, and time of answering the questionnaire (within 2 months). Matching was done to ensure similarity of age and gender for participants and non-participants in rehabilitation. We were also concerned that participants and non-participants in rehabilitation would have a similar time-window for answering the questionnaires, since proximity to the operation could have an effect on HRQOL. Thus, 124 participants in cardiac rehabilitation and their 248 matched controls were included in the analysis of HRQOL.

The effect of cardiac rehabilitation on return to work was studied only among patients who were employed (partially or fully) before the operation. There were 96 such patients among rehabilitation participants and 156 in the control group. There were no patients who had been unemployed prior to surgery and started to work after the operation.

Sources of data

Follow-up of all the Israeli CABG study patients included pre-operative interviews, catheterization and operation reports, postoperative daily follow-up, and summary of the hospitalization. The Short Form QOL questionnaire (SF-36) was selected as the generic tool because of its wide use, convenience for patients, the extensive efforts made to validate it in “normal” as well as various patient populations, and its authorized translation into Hebrew [13]. We ourselves translated the questionnaires into Arabic and Russian for special groups within our population. The Israeli CABG study specific questionnaire included items not present in the SF-36, such as current ischemic symptoms, sexual problems, sleep disturbances, details of return to work, re-hospitalizations, and utilization of medical services.

Study variables

The outcomes for this analysis included the scores for the eight scales of the SF-36, together with two summary components – Physical Health (PCS) and Mental Health (MCS). The eight scales represent different facets of self-perception of HRQOL – namely Physical Functioning, Role Physical, Mental Health, Role Emotional, Bodily Pain, Vitality, General Health, and Social Functioning [14]. Other outcomes derived from the specific questionnaire were categorical and are so presented in the tables.

Explanatory variables were analyzed to detect differences between participants in rehabilitation and non-participants that could confound differences in HRQOL in the two groups. These included clinical, demographic and behavioral characteristics prior to the operation.

From a previous analysis [12] we derived a risk percentile for each patient based on a “case-mix” 30 day mortality model for the total Israeli CABG population. This risk percentile, approximating a severity of illness score at the time of the operation, was evaluated for its possible effect on quality of life one year after CABG.

Statistical analysis

First, we compared rehabilitation participants with their controls regarding potential confounding factors that could influence HRQOL. It was hoped that participants and controls would be similar in all factors except for participation in rehabilitation. The comparison was based on matched triplets, and similarities or differences were evaluated within each triplet by a univariate McNemar chi-square and conditional logistic regression. Outcome variables depicting various aspects of HRQOL were evaluated in a similar fashion.

Then, two multivariate conditional logistic models were

constructed. One related to the difference between rehabilitation participants and matched controls on various SF-36 scales of quality of life, controlling for other possible differences between the groups. The other model explored differences between the two study groups in relation to return to work, controlling for other confounders.

Results

Potential differences between patients who participated in rehabilitation vs. their individually matched controls are presented in Table 1. There were few differences in the pre-operative clinical factors between cases and controls. In the rehabilitation group, participants smoked less and there were fewer patients with class IV angina pectoris. Regarding the demographic factors, cases and controls did not differ in social class (profession, education, and immigration status). Patients who participated in rehabilitation reported more physical activity and full employment prior to the operation.

The effect of cardiac rehabilitation on HRQOL is presented in Table 2. Of the eight SF-36 scales representing eight independent aspects of quality of life, rehabilitation participants fared better than their controls in three: self-perception of General Health ($P=0.05$), Physical Functioning ($P=0.01$), and Social Functioning ($P=0.01$). Regarding the two standardized summary components of the SF-36, participants had a higher Summary Physical component score with borderline statistical significance ($P=0.09$). Of the specific questionnaire items, all showed significant differences in favor of rehabilitation participants relative to their controls: self-perception of overall health status, overall functioning, and satisfaction with health care in the year since the operation [Table 3].

In the final multivariate conditional logistic model, three factors remained significantly associated with rehabilitation (controlling for all the other factors in the regression equation): General Health, Physical Functioning, and Social Functioning.

Rehabilitation participants returned to full or partial employment more often than their controls ($P<0.001$ for the trend) [Table 4]. Furthermore, they returned to work earlier than their controls (53.1% and 34.8% respectively, within 3 months), and fewer patients stopped work after initially going back to it (19.9 vs. 31.0% respectively). Significant factors affecting return to work are also presented in Table 4, representing the percentage of patients with the risk factor within rehabilitation and control groups. For example, 44.4% of females participating in rehabilitation returned to work compared to 27.0% of matched female controls. In the multivariate conditional logistic model for the effect of cardiac rehabilitation on return to work, rehabilitation alone was significantly associated with a 2.8-fold more return to work than the controls ($P=0.0019$). When other factors potentially affecting return to work were added to the model, the effect of rehabilitation remained strong (odds ratio 2.7, $P=0.0029$).

Table 1. Characteristics of persons who participated in rehabilitation vs. two individually matched controls who did not (matched by gender, age within 5 years, and time of filling the questionnaire)

Patients' characteristics prior to surgery	Category	% among rehabilitation participants (n = 124)	% among matched controls (n = 248)
Sociodemographic and behavior factors			
Marital status	With spouse	91.1	93.1
	No spouse	8.1	6.4
Living with someone	Yes	96.0	96.0
	No	4.0	4.0
Immigration status	Israeli born	30.6	23.9
	Asia/North Africa	24.8	31.6
	Europe/America	44.6	44.5
Education (yrs schooling)	0-8	14.5	19.8
	9-12	40.3	41.5
	> 12	38.7	34.3
Profession	Academic	48.3	48.5
	White collar	25.0	21.2
	Blue collar	21.7	25.7
	House care	5.0	4.6
Smoking	None	34.7	31.4*
	Past smoker	50.0	41.9
	Current smoker	15.3	26.6
Employment	Full time	66.9	57.7*
	Part time	11.3	6.0
	Not employed (including house care)	20.1	35.8
Physical activity	Yes	65.3	53.2*
	No	34.6	46.7
Past hospitalization	None	29.8	31.1
	1-2	60.5	57.7
	≥ 3	9.7	11.2
Clinical characteristics			
Risk percentiles according to 'Case-mix' model**	-25th low	41.0	37.2
	-50th	25.4	28.1
	-75th	19.7	20.7
	-100th high	13.9	14.0
Angina pectoris by Canadian class	I + II	21.8	24.6
	III + IV	26.6	37.5
	V	25.0	16.1
	Missing	2.4	3.2
Sleeping problems	Yes	31.6	38.2
	No	68.4	62.8
Left ventricular dysfunction	Severe	2.4	3.7
	Moderate	4.9	7.4
	None	92.7	88.9
Peripheral vascular disease	Yes	4.9	6.9
	No	95.1	93.1

* $P<0.05$. P values were calculated for the trend using McNemar χ^2 for individually matched pairs, while the percentages in the table are crude proportions for the rehabilitation and control groups.

** Ref. 12

Table 2. Health-related quality of life after CABG among cardiac rehabilitation participants vs. their matched controls: SF-36 questionnaire with eight scales and two summary components

	Average scores		P
	Rehabilitation participants (n = 124)	Matched controls (n = 248)	
Self-perception of General Health	61.65	56.68	0.05
Physical Functioning	76.91	71.92	0.01
Role Physical	61.27	54.90	0.10
Pain Index	70.94	67.30	0.19
Vitality	57.68	55.54	0.27
Social Functioning	81.85	75.41	0.01
Role Emotional	69.44	61.13	0.37
Mental Health index	67.51	65.43	0.41
Summary Mental component	47.71	45.92	0.41
Summary Physical component	46.02	44.15	0.09

* P values were derived from a conditional logistic regression for matched pairs, while the presented scores are the crude average scores among rehabilitation participants and controls.

Discussion

There is no policy in Israel to promote second-phase cardiac rehabilitation after CABG. When surgeons were asked if they routinely recommended this activity to their patients, it became apparent that they did not. Participating patients reported that they had heard about rehabilitation programs either from friends or by chance. The findings of our study point to the potential benefit that both patients and society would derive from the promotion of such programs.

What drew our attention to the significance of rehabilitation was the finding in a previous analysis of HRQOL after CABG that participation in cardiac rehabilitation was an independent predictor of better HRQOL, after controlling for clinical and demographic characteristics in a multiple logistic model [15]. To evaluate whether differences in other factors could account for the advantage associated with rehabilitation (factors we did not measure before), we further matched our rehabilitation participants individually with age/gender controls and re-analyzed the data. The matched analysis presented in this paper supports the initial impression that patients participating in cardiac rehabilitation fared better in many aspects of HRQOL. While cardiac rehabilitation participants had higher scores in all SF-36 scales and most of the specific questionnaire items, significant differences between them and their matched controls lay mainly in aspects related to a general evaluation by the patient of his or her health situation. For example, in the specific questionnaire, items on general functioning and satisfaction with medical care were significantly different between participants and their controls. Similarly, in the SF-36, significant differences were observed for Social Functioning, Overall Health and Physical Functioning, while for questions related to Pain, Vitality and Mental Health the advantage of

Table 3. Health-related quality of life among persons who participated in rehabilitation programs vs. those who did not: Specific Questionnaire

Significant items from the specific questionnaire	Category	% among rehab. participants (n = 124)	% among matched controls (n = 248)	P*
Self-perception of overall health	Excellent	9.4	4.8	0.002
	Very good	23.9	18.3	
	Good	49.6	42.7	
	Not so good	14.5	29.3	
Self-perception of general functioning	Bad	2.6	4.8	0.029
	Very good	25.4	11.9	
	Good	31.6	31.1	
	Mediocre	33.3	32.9	
Satisfaction with health care since operation	Bad	9.7	24.0	0.020
	Very satisfied	15.0	11.0	
	Satisfied	45.1	30.0	
	Dissatisfied	31.1	36.2	
	Entirely dissatisfied	8.8	22.7	

* P values presented here were calculated for the trend using McNemar χ^2 for individually matched pairs, while the percentages in the table are crude proportions for the rehabilitation and control groups.

Table 4. Return to work one year after CABG among patients employed prior to surgery, by time of return to work and by various patient characteristics

	% returned to work		P**
	Rehabilitation participants (n = 96)	Matched controls (n = 156)	
Overall study population			
Returned to work early*	53.1	34.8	
Returned to work late*	10.4	7.1	
Returned to work early but stopped working within 1 year	19.9	31.0	0.001
Never returned to work	16.7	27.1	
Patient characteristics			
Gender			
Male	65.5	42.8	
Female	44.4	27.0	0.010
Age			
45-49	60.6	52.8	
50-54	62.5	34.4	
55-59	71.9	37.8	
60-64	57.1	41.9	0.001
Immigration status			
Israeli born	78.1	50.0	
Asia/North Africa	54.2	38.0	
Europe/America	57.9	38.7	0.010
Profession			
Academic	69.2	42.7	
White collar	66.7	48.5	
Blue collar	50.0	35.0	0.003

* Early = within 3 months, late = after 3 months

** P values presented here were calculated for the trend using McNemar χ^2 for individually matched pairs, while the percentages in the table are crude proportions for the rehabilitation and control groups.

rehabilitation participants was not statistically significant. We interpreted the improved HRQOL of patients who experienced cardiac rehabilitation after CABG as evidence of the positive effect of such programs. While rehabilitation participants are not healthier than their controls, they seem to have a better perspective of their health problems and are thus able to cope better. These findings are comparable with the results of randomized studies reporting better self-perception of health status and overall life situation among post-CABG patients who participate in cardiac rehabilitation [9,16].

The return to work of patients after CABG was beneficial for those who participated in rehabilitation vs. those who did not (64.9 vs. 42.8% among males, and 44 vs. 27% among females). This is another important outcome related to rehabilitation. Similar to other reports in the literature [16–20], there is clear evidence in our data that more rehabilitation participants returned to work and fewer dropped out after returning to work. The conditional logistic models confirmed the strong association between rehabilitation and return to work, after controlling for clinical and behavior factors.

Study limitations

The self-selection of patients participating in cardiac rehabilitation programs in this country raises doubts in interpretation of the data. It is possible that rehabilitation participants differed from non-participants in health-related quality of life unrelated to their participation in a rehabilitation program. However, the concern that these patients were “healthier” than their controls was examined and discarded. In addition, levels of education, profession and immigration status, known to be strong predictors of HRQOL in this population [3], were similarly distributed among cases and controls. We did not study in any detail the psychological traits of rehabilitation participants and control patients, nor their health behavior (except physical activity), which could theoretically affect HRQOL after CABG. Nonetheless, we believe that despite these limitations our findings suggest a favorable effect of cardiac rehabilitation after CABG. It is also associated with return to work.

The need for the kind of support provided by rehabilitation programs was evidenced in informal letters attached to the returned SF-36 questionnaires. A common complaint was the “lack of someone to turn to” after leaving the hospital. Since cardiac rehabilitation programs are relatively inexpensive [21] in that they do not include in-patient facilities, their suggested benefits should make them attractive to policy makers.

Conclusion

Few patients in Israel benefit from the knowledge and experience of cardiac rehabilitation centers. Our finding that patients participating in cardiac rehabilitation had a better evaluation of their health-related quality of life, greater satisfaction with medical care, and higher rate of return to work should induce physicians to recommend these programs to their patients, and health insurance companies to fully finance such programs.

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