

# Effects of Phase II Cardiac Rehabilitation on Job Stress and Health-Related Quality of Life After Return to Work in Middle-Aged Patients With Acute Myocardial Infarction

Ryusuke YONEZAWA,<sup>1</sup> MSc, Takashi MASUDA,<sup>2</sup> MD,  
Atsuhiko MATSUNAGA,<sup>2</sup> PhD, Yumi TAKAHASHI,<sup>3</sup> Masakazu SAITOH,<sup>1</sup> MSc,  
Akira ISHII,<sup>1</sup> MSc, Toshiki KITSUNA,<sup>1</sup> MSc, Takuya MATSUMOTO,<sup>1</sup> MSc,  
Kazuya YAMAMOTO,<sup>1</sup> MSc, Naoko AIBA,<sup>1</sup> MSc, Miyako HARA,<sup>1</sup> MSc,  
and Tohru IZUMI,<sup>4</sup> MD

## SUMMARY

The aim of the present study was to clarify the effects of phase II cardiac rehabilitation (CR) on job stress and health-related quality of life (HRQOL) after return to work in middle-aged patients with acute myocardial infarction (AMI). A total of 109 middle-aged outpatients ( $57 \pm 7$  years) who completed a phase I CR program after AMI were enrolled, 72 of whom participated in a phase II CR program for 5 months after hospital discharge (CR group) and 37 who discontinued the phase II CR program after the discharge (non-CR group). Job stress was assessed at 6 months after the AMI using a brief job stress questionnaire containing questions related to job stressors, worksite support, level of satisfaction with work or daily life, and psychological distress. HRQOL was assessed using the short-form 36-item health survey (SF-36) at hospital discharge and at 3 and 6 months after the AMI. There were no significant differences in clinical and occupational characteristics between the CR and non-CR groups. The CR group patients exhibited significantly better results for job stressors and psychological distress and higher SF-36 scores at 6 months after the AMI, as compared with those in the non-CR group. These findings suggest that discontinuing a phase II CR program induced chronic psychosocial stress after return to work in these middle-aged post-AMI patients. (Int Heart J 2009; 50: 279-290)

**Key words:** Myocardial infarction, Rehabilitation, Middle-aged, Stress, Quality of life

**P**ATIENT-PERCEIVED health-related quality of life (HRQOL) is one of the most important and fundamental parameters in the evaluation of the health

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From the <sup>1</sup> Graduate School of Medical Sciences, and <sup>2</sup> Department of Rehabilitation, School of Allied Health Sciences, Kitasato University, <sup>3</sup> Cardiovascular Center, Kitasato University Hospital, <sup>4</sup> Department of Internal Medicine and Cardiology, School of Medicine, Kitasato University, Sagami-hara, Kanagawa, Japan.

Address for correspondence: Takashi Masuda, MD, Kitasato 1-15-1, Sagami-hara, Kanagawa 228-8555, Japan.

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condition in patients recovering from coronary artery disease (CAD).<sup>1)</sup> Although physical activity, psychological status, socioeconomic status, and social role are known to influence the HRQOL in patients with acute myocardial infarction (AMI),<sup>1-3)</sup> this influence appears to differ widely between middle-aged and more aged patients. Retired and aged patients with CAD have been reported to readily develop depression because of physical inactivity, living alone, and low socioeconomic status.<sup>4)</sup> On the other hand, middle-aged patients with CAD may often experience anxiety and depressed mood due to loss of social position and economic instability.<sup>4)</sup> Most patients who were working before AMI desire to return to work soon after hospital discharge, because they hope to regain their social position, or need to support their family.<sup>4,5)</sup> It has been reported that post-AMI patients who could successfully return to work exhibited greater emotional well-being after hospital discharge than those who could not.<sup>3-5)</sup> Return to work is thus one of the most important goals of the phase II CR program after an AMI for middle-aged patients.

On the other hand, job stress by itself has recently been shown to be a risk factor for AMI and for other cardiovascular events such as life-threatening arrhythmias, recurrence of AMI, and sudden death.<sup>6)</sup> Although an appropriate level of job stress is required for fruitful work, excessive stress induced by a highly demanding occupation, low job latitude, or low work-related social support can exaggerate psychosomatic symptoms, including anxiety, depression, and fatigue.<sup>7)</sup> Healthcare managers thus need to recognize that in addition to being a risk factor for coronary events, job stress can also produce deterioration of the HRQOL in AMI patients after return to work.

Some studies have suggested that education of patients about their disease, behavioral counseling, and the use of a psychosocial approach as part of a comprehensive CR program may decrease stress related to work and daily life in post-AMI patients.<sup>7-9)</sup> In addition, some studies have examined the effects of comprehensive CR on the success rate of return to work in middle-aged patients.<sup>9)</sup> However, few reports have documented the beneficial effects of CR programs on the job stress perceived by AMI patients who returned to their work. The purpose of the present study was to clarify the beneficial effects of a phase II CR program on the job stress level, psychosocial aspects of life, including the status of depression and anxiety, and HRQOL in middle-aged AMI patients returning to work after hospital discharge.

## METHODS

**Patients:** The study protocol was approved by the Ethics Committee of Kitasato University on Human Research. Patients who were admitted to the Cardiovas-

cular Center of Kitasato University Hospital from September 2003 to July 2006 with AMI and who underwent phase I CR during hospitalization were enrolled as eligible candidates for the present study. Patients were excluded if they had limitation of activities of daily living caused by central neurologic disease or orthopedic disorder or were 65 years of age or older. A total of 266 patients who met the eligibility criteria were given information about the purpose and method of the study and provided consent for participation in the questionnaire surveys to evaluate the job stress level, HRQOL, and the severity of anxiety and depression. Of the 266 middle-aged post-AMI patients, 109 (90 men and 19 women; mean age,  $56 \pm 7$  years; range, 35 to 64 years) who had undergone percutaneous coronary intervention ( $n = 78$ ) or coronary artery bypass grafting ( $n = 31$ ) during the hospitalization and returned to their previous jobs after hospital discharge participated. The patients decided of their own will whether they participated in a phase II CR or not after completion of a phase I CR program. The patients were divided into the following two groups: a CR group, consisting of 72 patients who underwent phase II CR as outpatients for 5 months after hospital discharge, and a non-CR group comprised of 37 patients who discontinued CR and did not attend the phase II CR program for outpatients after hospital discharge. The patients were also interviewed to determine the job stress level at 6 months after the AMI, and given questionnaires for determining the HRQOL and status of anxiety and depression at the time of hospital discharge, and at 3 and 6 months after AMI.

**Measurements of the clinical and occupational characteristics:** Age, sex, number of stenotic coronary arteries, and left ventricular ejection fraction (LVEF) were assessed on admission, and the body mass index, exercise capacity, muscle strength of the lower limbs, duration of hospital stay, and score for type A behavior pattern were evaluated at hospital discharge. LVEF, exercise capacity, and muscle strength of the lower limbs were reevaluated at 6 months after the AMI in the CR and non-CR groups. The duration from hospital discharge to return to work, job description, and working conditions after return to work were assessed 6 months after the AMI as occupational characteristics. Exercise capacity was calculated from the exercise time on treadmill exercise testing using the Bruce protocol. Muscle strength of the lower limbs was measured using a hand-held dynamometer ( $\mu$ Tas MT-1, Anima, Tokyo) while patients performed isometric knee extension in a sitting position. The mean peak muscle strength (kg) in the right and left legs was normalized to the body weight and expressed as a percentage of the body weight (%BW) for statistical analysis. The type A behavior pattern score was measured by the discrimination test for the type A behavior pattern, which was developed for Japanese subjects.<sup>10)</sup>

**Assessment of job stress:** Job stress was assessed using a brief job stress ques-

tionnaire<sup>11)</sup> containing questions related to four main categories: job stressors (quantitative job overload, qualitative job overload, physical demand, interpersonal conflict, poor physical environment, job control, skill underutilization, suitable job and rewarding job), worksite support (supervisor support, coworker support and family support), level of satisfaction with work or daily life and psychological distress (lack of vigor, irritability, fatigue, anxiety, depressed mood, and somatic symptoms), while the quantitative job overload and qualitative job overload represented the psychological job demand. Each of the topic subscales was graded from 1 to 5 and adjusted for age and sex. A score of 3 represented the mean score for age-matched healthy workers, and lower scores indicated greater stress in AMI patients after return to work.

**Assessment of psychosocial aspects:** HRQOL was assessed using the medical outcome study short-form 36-item health survey (SF-36) Japanese version 1.20.<sup>12)</sup> The SF-36 includes eight subscales: physical functioning (PF), role-physical (RP), bodily pain (BP), general health perceptions (GH), vitality (VT), social functioning (SF), role-emotional (RE), and mental health (MH). Norm-based scale scores were adjusted for age and sex to enable comparison between the CR and non-CR groups, with higher scores in each subscale indicating a better HRQOL. Anxiety and depression were assessed using the hospital anxiety and depression scale (HADS).<sup>13)</sup> Scores on the HADS were graded from 0 to 16, with scores of 8 or higher indicating anxiety or depression. In addition, patients were instructed to fill out a self-reported questionnaire freely and concretely if they had any anxiety or problem related to working or daily life after hospital discharge.

**CR program:** At the Cardiovascular Center of Kitasato University Hospital, all patients are individually offered a comprehensive CR program, including exercise prescription, exercise training, dietary advice, instruction on medications and smoking cessation, referred to as phase I CR, during hospitalization. Before hospital discharge, the patients were briefed about the need to continue with CR and encouraged to participate in the comprehensive CR program, the phase II CR program for outpatients. The patients who participated in the phase II CR program received supervised exercise training and counseling as comprehensive CR for an hour once a week. The exercise session in the CR program included stretching, resistance training, aerobic exercise, and cool-down periods. After sufficient stretching of the quadriceps and triceps surae, the patients performed knee extensions with weights and calf raises for resistance training at a perceived exertion grade of 11-13. The exercise intensity in aerobic training was maintained at 65% of the peak heart rate determined during the treadmill exercise test. In the counseling session, a physical therapist confirmed the patients' physical condition, including the blood pressure, heart rate, arrhythmias, and leg

fatigue during the exercise training, and offered consultation for fitness conditioning for working and daily life.

**Statistical analysis:** The unpaired *t*-test and  $\chi^2$  test were used to examine the differences between the CR and non-CR groups in terms of the clinical and occupational characteristics, scores on the brief job stress questionnaire, and self-reported anxiety or problems in working or daily life. The paired *t*-test was used to compare the LVEF, exercise capacity, and muscle strength of the lower limbs measured at hospital discharge and 6 months after the AMI in the CR and non-CR groups. Two-way analysis of variance for repeated measures was used to examine the differences in the scores on the SF-36 and HADS between the two groups. All values are expressed as the mean  $\pm$  standard deviation (SD), with *P* values of less than 0.05 considered to represent significant differences. All analyses were performed using SPSS 11.0J for Windows (SPSS Japan Inc., Tokyo).

**Table I.** Clinical and Occupational Characteristics of Patients

Groups	CR		Non-CR	
	Hospital discharge	6 months	Hospital discharge	6 months
Number	72		37	
Age (years)	57 $\pm$ 6		57 $\pm$ 7	
Sex (Man/Woman)	59/13		31/6	
Body mass index (kg/m <sup>2</sup> )	23.4 $\pm$ 2.6		22.6 $\pm$ 4.0	
Multiple vessel disease (%)	46		55	
Treatment (%)				
Percutaneous coronary intervention	68		78	
Coronary artery bypass grafting	32		22	
Type A behavior pattern score (points)	15.7 $\pm$ 5.2		15.4 $\pm$ 3.8	
Duration of hospital stay (days)	23 $\pm$ 7		22 $\pm$ 9	
Left ventricular ejection fraction (%)	48.9 $\pm$ 10.7	53.1 $\pm$ 9.1*	47.2 $\pm$ 13.7	53.9 $\pm$ 6.8
Exercise capacity (METs)	9.2 $\pm$ 1.9	11.4 $\pm$ 2.0**	9.1 $\pm$ 2.4	10.4 $\pm$ 3.0
Muscle strength of the lower limbs (%BW)	56.3 $\pm$ 13.8	68.9 $\pm$ 16.3**	52.8 $\pm$ 11.6	60.1 $\pm$ 8.0
Duration to return to work (days)		29 $\pm$ 33		24 $\pm$ 23
Job description (%)				
Managerial posts		31		20
Independent business		32		13
Part-time job		4		38
White-collar work		25		13
Blue-collar work		21		13
Working condition after return to work (%)				
Decreased workload and work hours		13		18
Change of job		3		0
No change		83		82

Mean  $\pm$  SD. CR indicates cardiac rehabilitation; 6 months, 6 months after acute myocardial infarction; MET, metabolic equivalent; BW, body weight; \*, *P* < 0.05 and \*\*, *P* < 0.01 versus hospital discharge in the CR group.

## RESULTS

**Clinical and occupational characteristics:** The clinical and occupational characteristics of the patients in the CR and non-CR groups are shown in Table I. There were no significant differences in the clinical or occupational characteristics between the two groups at hospital discharge and 6 months after AMI. LVEF, exercise capacity, and muscle strength of the lower limbs were significantly improved at 6 months after the AMI as compared with the respective values measured at hospital discharge in the CR group ( $P < 0.05$ ,  $P < 0.01$  and  $P < 0.01$ , respectively), while no significant changes were observed during the study period in the non-CR group. No significant difference was found between the two groups in regard to the duration from hospital discharge to return to work. Sixty patients (83%) in the CR group and 30 patients (82%) in the non-CR group could return to their previous workplace under the same working conditions, and 31% in the CR group and 20% in the non-CR group were engaged in managerial work. There were no significant differences between the two groups in the job description or working conditions after return to work.

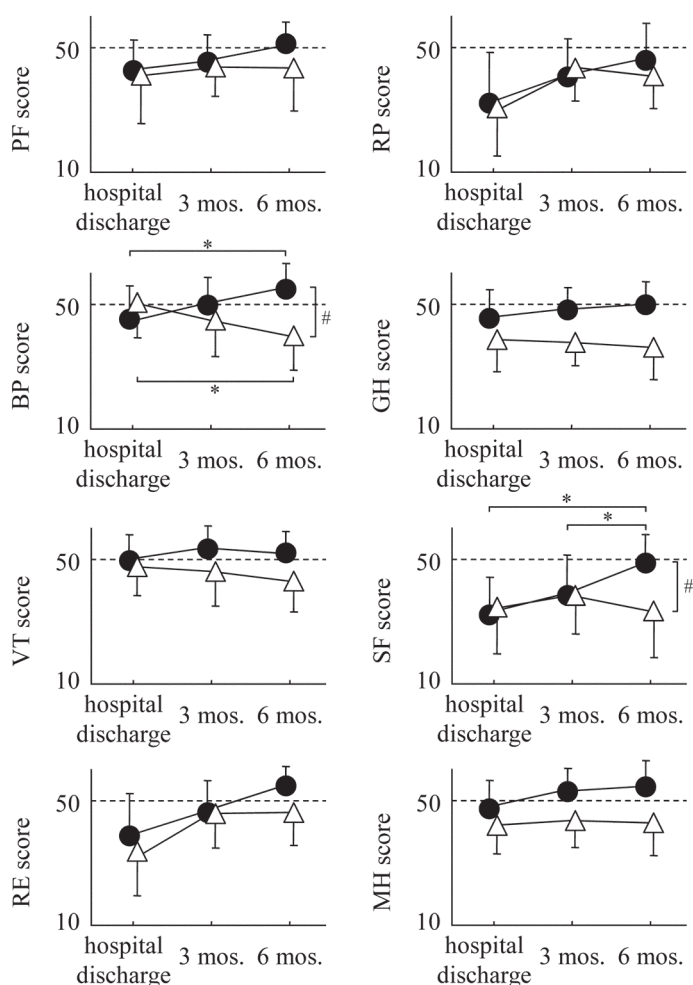
**Brief job stress questionnaire:** The scores on the brief job stress questionnaire are shown in Table II. Although no significant differences were found between

**Table II.** Scores on the Brief Job Stress Questionnaire

Groups	CR	Non-CR
Job stressors		
Quantitative job overload	3.5 ± 1.1	2.8 ± 1.5
Qualitative job overload	2.8 ± 1.1	2.4 ± 1.3
Physical demand	2.9 ± 0.9	2.5 ± 1.0
Interpersonal conflict	3.6 ± 1.1	3.4 ± 1.0
Poor physical environment	4.2 ± 0.9	3.7 ± 1.1
Job control	4.0 ± 0.9	4.3 ± 1.0
Skill underutilization	4.1 ± 1.0	3.7 ± 0.6
Suitable job	3.6 ± 1.2	3.1 ± 1.0
Rewarding job	3.9 ± 1.1*	2.8 ± 1.3
Worksite support		
Supervisor support	3.9 ± 0.7	3.9 ± 0.6
Coworker support	3.5 ± 0.9	3.3 ± 0.9
Family support	4.2 ± 1.1	4.3 ± 0.9
Level of satisfaction with work or daily life	3.6 ± 1.0	3.5 ± 1.1
Psychological distress		
Lack of vigor	4.2 ± 0.7**	3.1 ± 0.8
Irritability	4.0 ± 1.0*	3.3 ± 1.1
Fatigue	3.9 ± 0.7**	3.0 ± 0.4
Anxiety	3.5 ± 0.8	3.1 ± 0.7
Depressed mood	4.0 ± 1.0**	2.7 ± 0.5
Somatic symptoms	3.6 ± 1.0*	2.5 ± 1.0

Mean ± SD. CR indicates cardiac rehabilitation; \*,  $P < 0.05$  and \*\*,  $P < 0.01$  versus non-CR group.

the two groups in regard to worksite support or level of satisfaction with work or daily life, the score for 'rewarding job' in job stressors was significantly higher in the CR group than in the non-CR group ( $P < 0.01$ ). The scores for lack of vigor, irritability, fatigue, depressed mood, and somatic symptoms in psychological distress were significantly higher in the CR group than in the non-CR group ( $P < 0.01$ ,  $P < 0.05$ ,  $P < 0.01$ ,  $P < 0.01$  and  $P < 0.05$ , respectively).



**Figure 1.** Changes in the norm-based scale scores for the subscales of SF-36.

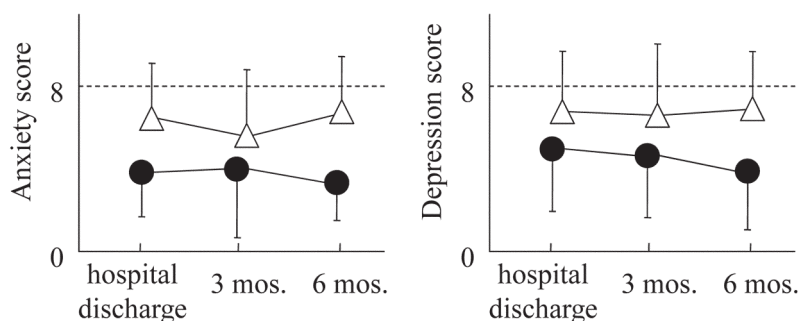
● indicates CR group; △, non-CR group; CR, cardiac rehabilitation; 3 mos., 3 months after acute myocardial infarction; 6 mos., 6 months after acute myocardial infarction; PF, physical functioning; RP, role-physical; BP, bodily pain; GH, general health perceptions; VT, vitality; SF, social functioning; RE, role-emotional; MH, mental health; \*,  $P < 0.05$  versus 6 months after acute myocardial infarction and #,  $P < 0.05$  between the CR and non-CR groups.



**SF-36 and HADS:** The changes in the norm-based scale scores of the SF-36 in the CR and non-CR groups are shown in Figure 1. There were significant interactions in the changes of the BP and SF scores between the CR and non-CR groups ( $F = 5.17$ ,  $P < 0.05$  and  $F = 3.32$ ,  $P < 0.05$ , respectively). The BP score was significantly improved at 6 months after the AMI as compared with that at hospital discharge in the CR group ( $P < 0.05$ ), whereas it was significantly decreased in the non-CR group ( $P < 0.05$ ). The SF score was significantly improved at 6 months after the AMI as compared with those at hospital discharge and at 3 months after the AMI in the CR group ( $P < 0.05$  and  $P < 0.05$ , respectively), while no significant changes were observed during the study period in the non-CR group. The BP and SF scores at 6 months after the AMI were significantly higher in the CR group than in the non-CR group ( $P < 0.05$  and  $P < 0.05$ , respectively).

The changes in the anxiety and depression scores in the CR and non-CR groups are shown in Figure 2. There were no significant differences in the anxiety or depression scores between the CR and non-CR groups throughout the study period.

**Self-reported anxieties or problems on the job or in daily living:** The self-reported anxieties or problems on the job or in daily living are shown in Table III. The percentage of patients who had anxieties or problems related to work or daily living was significantly higher in the non-CR group than in the CR group ( $P < 0.01$ ). Nine patients had anxieties or problems related to work or daily living in the CR group (13%), including those related to recurrence of AMI (89%), self-management of medication or diet (22%), smoking cessation (22%), and physical activity (22%). On the other hand, 17 patients had anxieties or problems in



**Figure 2.** Changes in the anxiety and depression scores in HADS.

● indicates CR group; △, non-CR group; CR, cardiac rehabilitation; 3 mos., 3 months after acute myocardial infarction and 6 mos., 6 months after acute myocardial infarction.



**Table III.** Self-Reported Anxieties or Problems on the Job or in Daily Living

	CR	Non-CR
Do you have any anxieties or problems related to work or daily living?		
No (%)	87	54
Yes (%)	13	46*
Breakdown of anxieties or problems		
Recurrence of AMI (%)	89	18
Self-management of medication usage or diet (%)	22	35
Smoking secession (%)	22	6
Physical activities (%)	22	53

CR indicates cardiac rehabilitation; AMI, acute myocardial infarction and \*,  $P < 0.01$  analyzed by the chi-square test.

the non-CR group (46%), including those related to recurrence of AMI (18%), self-management of medication or diet (35%), smoking cessation (6%), and physical activity (53%).

In the non-CR group, the reasons for discontinuation of CR into the phase II CR were patient refusal in 29 patients and the long time needed to come to the hospital in 8 patients.

## DISCUSSION

It was recently reported that 50% of AMI patients returned to work as early as within a month after the occurrence of AMI,<sup>14)</sup> and that 75% begin to work again under the same conditions as those before the admission.<sup>15)</sup> In the present study, the mean duration from hospital discharge to return to work was 29 days in the CR group and 24 days in the non-CR group, and more than 80% of the patients in both groups returned to their previous work and working conditions within 6 months after the AMI. These findings suggest that in Japan many middle-aged post-AMI patients return to work early after hospital discharge and continue to work with few disadvantages arising out of the absence from work, findings which are similar to those for other countries.<sup>14,15)</sup>

In the brief job stress questionnaire survey conducted at 6 months after the AMI in the present study, no significant differences were found between the CR and non-CR groups in most of the subscales of job stressors, worksite supports, and level of satisfaction with work or daily life, although many subscales of psychological distress showed that the patients in the CR group felt less stressed than those in the non-CR group. It is believed that the main reason for the absence of any influence of the phase II CR on the scores of job stressors and worksite support is that the CR program provided did not include active intervention in the patients' work environment. The European Commission, Directorate-General for Employment and Social Affairs, recommended redesigning

of the job surroundings, ie, avoiding overload, improving worksite support, and adjusting occupational settings to suit a worker's abilities, in order to prevent recurrence of health hazards such as depression, psychosomatic disorders, and CAD.<sup>16)</sup> It thus appears important for healthcare managers to collaborate with industrial specialists to improve the working conditions to accommodate the changes in the patients' cardiac and physical functions.

In regard to job stress, it has been reported that higher job demand, lower job control or lower worksite support represent greater risk in terms of psychological distress and cardiovascular disease.<sup>17)</sup> However, the present study revealed scores of above 3 for many subscales of job stressors and worksite support in both the CR and non-CR groups, suggesting that middle-aged post-AMI patients had less job stress than expected after return to work. Such patients appear to be able to build up close personal relationships in their social lives soon after hospital discharge or return to work, with sufficient support from the supervisors, coworkers, and family. Additional stressors such as limitation of physical activity or social isolation should also be considered in the assessment of the psychological distress in AMI patients.

It was reported that workers who exercised regularly during the previous 6 months showed greater job satisfaction than those who did not.<sup>18)</sup> The phase II CR program provides an opportunity for patients to engage in exercise and to consult with healthcare managers about their fears and problems related to physical activities or daily living. We speculated that such a supportive environment would enhance exercise capacity and physical activity levels in patients after return to work, to produce high motivation and job satisfaction levels at work. Furthermore, it has been reported that workers who felt that their job was rewarding, even if the job was excessively demanding, showed lower psychological distress than those who did not feel that way.<sup>19)</sup> The present study results also suggested that a low score for 'rewarding job', observed in the non-CR group, resulted in high psychological distress or decreased HRQOL.

The present study showed no significant changes in the subscales of SF-36 in the non-CR group, and in particular, the BP score decreased significantly during the study period. It has been reported that the BP score in patients who feel fatigue is lower than that in healthy persons.<sup>20)</sup> The decreased BP score in the non-CR group suggested that the patients continued to work while experiencing fatigue and somatic symptoms for 6 months after AMI, because they showed no improvement in their physical functions. Furthermore, the anxiety and depression manifested by patients with AMI have been reported to be strong indicators of poor HRQOL on long-term follow-up after hospital discharge.<sup>21)</sup> Anxieties and depressive mood may be induced by the prospect of the disadvantages in life, health, social roles, and employment in patients with AMI, because of the

sudden and unexpected turn of events.<sup>22)</sup> As the patients in the non-CR group had fewer opportunities to receive advice from healthcare managers after return to work, it was considered that chronic anxieties derived from working or daily life induced higher psychological distress and lower HRQOL in middle-aged post-AMI patients after return to work.

We recommend that middle-aged post-AMI patients undergo frequent evaluation of their physical and psychosocial conditions by experienced healthcare managers, not only during the period of hospitalization, but also after discharge, and that when possible, they should participate in a phase II CR program to maintain a better physical and psychological status after returning to work.

**Study limitations:** It was ethically unacceptable to randomize the patients in the present study, because it is well known that a comprehensive CR program reduces mortality and prevents recurrence of AMI.<sup>23-25)</sup> Although the patients decided of their own will whether or not they would participate in a phase II CR, there were no significant differences in the clinical and occupational characteristics of the patients, subscale scores of SF-36, or anxiety and depression scores of HADS at hospital discharge between the CR and non-CR groups. In addition, it was reported that the psychological problems including depression or anxiety disorder observed during hospitalization did not prevent cardiac patients from participating in a phase II CR program.<sup>26)</sup> Therefore, we believe that the psychological problems and HRQOL could be compared between the CR and non-CR groups in spite of the nonrandomized design of the study.

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