ORIGINAL PAPER

International Journal of Occupational Medicine and Environmental Health 2015;28(6):999–1010
http://dx.doi.org/10.13075/ijomeh.1896.00478

RE-INITIATING PROFESSIONAL WORKING ACTIVITY AFTER MYOCARDIAL INFARCTION IN PRIMARY PERCUTANEOUS CORONARY INTERVENTION NETWORKS ERA

ZDRAVKO BABIĆ[1,2], MARIN PAVLOV[1], MIRJANA OŠTRIĆ[3], MILAN MILOŠEVIĆ[2], MARJETA MISIGOJ DURAKOVIĆ[4], and HRVOJE PINTARIĆ[5,6]

[1] Sestre Milosrdnice University Hospital Centre, Zagreb, Croatia
Cardiac Intensive Care Unit
[2] University of Zagreb, Zagreb, Croatia
School of Medicine
[3] Zabok General Hospital, Zabok, Croatia
Department of Internal Medicine
[4] University of Zagreb, Zagreb, Croatia
Faculty of Kinesiology
[5] Sestre Milosrdnice University Hospital Centre, Zagreb, Croatia
Department for Invasive Cardiac Care
[6] University of Zagreb, Zagreb, Croatia
Faculty of Dental Medicine

Abstract

Objectives: To investigate the aspects of return to work, socio-economic and quality of life aspects in 145 employed patients under 60 years of age treated with primary percutaneous coronary intervention for acute ST-elevation myocardial infarction. **Material and Methods:** During hospital treatment demographic and clinical data was collected. Data about major adverse cardiovascular events, rehabilitation, sick leave, discharge from job and retirement, salary, major life events and estimation of quality of life after myocardial infarction were obtained after follow-up (mean: 836±242 days). **Results:** Average sick leave was 126±125 days. Following myocardial infarction, 3.4% of patients were discharged from their jobs while 31.7% retired. Lower salary was reported in 17.9% patients, major life events in 9.7%, while 40.7% estimated quality of life as worse following the event. Longer hospitalization was reported in patients transferred from surrounding counties, those with inferior myocardial wall and right coronary artery affected. Age, hyperlipoproteinemia and lower education degree were connected to permanent working cessation. Significant salary decrease was observed in male patients. Employer type was related to sick leave duration. Impaired quality of life was observed in patients who underwent in-hospital rehabilitation and those from surrounding counties. Longer sick leave was observed in patients with lower income before and after myocardial infarction. These patients reported lower quality of life after myocardial infarction. **Conclusions:** Inadequate health policy and delayed cardiac rehabilitation after myocardial infarction may lead to prolonged hospitalization and sick leave as well as lower quality of life after the event, regardless of optimal treatment in acute phase of disease.

Key words:
Quality of life, Return to work, Cardiac rehabilitation, Myocardial infarction, Percutaneous coronary intervention, Patient transfer

Received: October 2, 2014. Accepted: February 6, 2015.
Corresponding author: M. Pavlov, Sestre Milosrdnice University Hospital Centre, Cardiac Intensive Care Unit, Vinogradska 29, 10000 Zagreb, Croatia (e-mail: marin.pavlov@gmail.com).

INTRODUCTION

Up to 45% of patients with acute myocardial infarction (AMI) are younger than 65, which in most societies represents active population [1,2]. Primary percutaneous coronary intervention (PCI) networks organized in the developed countries ensure the best treatment results for patients with AMI, particularly those with ST-elevation myocardial infarction (STEMI) [1,2]. Croatian primary PCI network is recognized internationally as an example of good acute STEMI treatment at the national level with results comparable to randomised studies and registries of economically more developed countries [2,3]. Data from 1980's for the USA population showed that patients following uncomplicated AMI returned to work after 75 days, while in Europe the same occurred after 3 to 6 months. Modern guidelines proposed this period to be reduced to 1 to 3 months (50 days is the median (Me) in most countries) with variable protocols and policies in different European countries [4–6]. Kovoor et al. [7] consider return to full normal activities, including work, 2 weeks after AMI to be safe in patients stratified as low-risk. Perk [8] found that industrial and other jobs require significantly less effort than the average maximum work capacity of a healthy population (only 25% is generally demanded for modern workplace). Therefore, AMI patients without left ventricular dysfunction and exercise-induced myocardial ischemia are able to resume previous work as follows: light office work in 2 weeks, average manual work in 3 weeks, and strenuous physical work in 6 weeks. Rates of return to work found in Europe and USA are 60–95% (tendency of higher percentages in USA and Scandinavian countries).

Predictors of return to work after AMI could be divided in 3 groups:

- medical and patient factors,
- psychosocial factors,
- economic and job related factors.

In 1st group (age, sex, education, previous AMI, severity of AMI, residual angina pectoris, poor left ventricular ejection fraction, low exercise capacity), age plays the most important role, while medical factors in general are less relevant. In dealing with psychosocial factors (anxiety, depression, stress at the workplace, motivation to resume work, patients' own perception of the severity of the disease) employer's role and sometimes psychiatrist's role is important. Finally, economic and job related factors (health insurance benefits and other financial incentives, employment rates, physical and mental workload demands) must be weighed against the possible risk for work-related recurrence of cardiac events. Cardiologist's role in this decision-making process for returning to work is evaluation of the sequelae and functional status after AMI, while occupational health doctor's role is to evaluate other aspects (day/night shift, location, position, environment, psychophysical stress, risks for a 3rd party). Responsibility for patients (return to work in the best condition) and society (expenses of sick leaves and retirements) is equally important for both specialties [9,10]. According to literature [10–12] quality of life decreases in 40–50% of patients after AMI. Predictors of quality of life after AMI are negative (diabetes, hypertension, hyperlipoproteinemia, history of myocardial infarction, myocardial infarction without ST-elevation in comparison with unstable angina pectoris) or positive (exercise of greater intensity, myocardial revascularization in the first 30 days after a coronary incident).

The main objective of the study has been to investigate different aspects of return to work, socio-economic and quality of life aspects in 145 employed patients under the age of 60 who suffered acute STEMI and were treated with primary PCI.

MATERIAL AND METHODS

Study design and population

The study was a prospective, single-centre, open trial involving the blinded evaluation of the end points. Patients admitted to the Coronary Care Unit (CCU) of

the Department of Internal Medicine, University Hospital Centre "Sestre Milosrdnice," Zagreb, Croatia for acute STEMI, as a part of Croatian Primary PCI Network were considered eligible for the study. Inclusion period was from February 10th 2008 to April 23rd 2011. The inclusion criteria were the age < 60 years and active employment. Non-inclusion criteria were: pre-existing coronary incident, presence of malignancy, renal failure and lack of informed consent. The follow-up period was set to 2 years. Exclusion criteria were death during follow-up and no contact after the follow-up. A total of 145 patients completed the study.

ST-elevation myocardial infarction was diagnosed in the quoted centre in Zagreb at the on-site PCI laboratory where primary PCI was performed (non-transferred patients) or in surrounding county hospitals (General Hospital Sisak, General Hospital Karlovac) without on-site catheterization laboratory. Later patients were urgently transferred to the PCI centre in Zagreb for primary PCI (transferred patients). The transfer was performed by an emergency ambulance on 24/7/365 basis.

ST-elevation myocardial infarction was diagnosed according to the criteria of the European Cardiac Society at the time of investigation [13] based on the presence of 2 out of 3 criteria:

- prolonged chest/retrosternal pain,
- ECG presence of ST-segment elevation > 1 mm in 2 consecutive leads at rest or *de novo*/transient left bundle branch block (LBBB),
- increased cardiac troponin T (cTnT), serum creatine kinase (CK) and iso-enzyme MB (CK-MB) levels.

Study protocol

Urgent coronarography was performed in all patients. Percutaneous coronary intervention of culprit lesion of acute STEMI was performed according to indication by means of the conventional technique and coronary stents used without restrictions. All diagnostic and therapeutic procedures were performed according to the clinical standard and in accordance with the recommendations relating to the current guidelines [13].

Investigated data (gender, age, dwelling, educational degree, employer, salary before STEMI, affected myocardial wall and coronary artery), presence of risk factors of CAD and comorbidities data (smoking status, hypertension, hyperlipoproteinemia, diabetes, family history) was collected once clinical symptoms diminished. Data about possible complications (cardiogenic shock, cardiopulmonary resuscitation) and duration of hospital stay was collected at the end of the hospitalization. Patients from Zagreb finished their hospitalization at the PCI centre, while those from surrounding counties were re-transferred to county hospitals on 2nd or 3rd day and finished their hospitalization there.

After the follow-up period, additional data was collected by telephone interview with patients or members of their family, or during regular outpatient visits. Data obtained was as follows: major adverse cardiovascular events (MACE) (re-infarction, restenosis, another coronary artery PCI, cardiac and non-cardiac re-hospitalisation, coronary artery by-pass graft (CABG), cerebrovascular insult (CVI) and angina pectoris (AP)) rate, rehabilitation (no/yes, in-hospital/out-hospital), sick leave (no/yes, number of days-cardiac/number of days non-cardiac), discharge from job (no/yes) and retirement (no/yes), salary before STEMI and at the time of questionnaire, major life events after STEMI (divorce, moving, death in family) and self-estimated quality of life in comparison with time before STEMI (same/worse/better).

Statistics

The data was processed by means of descriptive statistics. Smirnov-Kolmogorov test was used to assess data distribution regarding quantitative variables, and according to findings appropriate non parametric tests were used in the following analyses. Mann-Whitney U and Kruskal-Wallis

tests were used to analyze differences in duration of return to work after STEMI (if there were ≥2 groups compared). Chi-square (Chi^2) test was used to analyze frequency differences of categorical parameters (permanent working cessation, significant salary and quality of life lowering). The value of $p < 0.05$ was considered significant. The statistical analysis was carried out using Statistica 10.0 for Windows software (StatSoft Inc 2011, version 10).

Ethics

The investigation was performed in accordance with the ethical standards laid down in the Declaration of Helsinki and was approved by the appropriate institutional review committee.

RESULTS

Average age of 145 investigated patients was 53.17±7.29 years. Study population characteristics are presented in Table 1. Average hospitalization duration was 11.84±4.62 days. The follow-up duration was 836.12±241.63 days with MACE evidenced in 29% of investigated patients (re-infarction: 2.1%, restenosis: 6.9%, re-PCI of another coronary artery: 6.9%, CABG: 1.4%, CVI: 0.0%, AP: 11.7%). Rehabilitation was carried out in 48.3% of patients (in-hospital in 26.2%, out-hospital in 22.1%).

Employment structure was as follows: 54.4% were employed in governmental firms, 16.6% – in private firms with less than 100 employees, 11.7% – in private firms with more than 100 employees, 14.5% – in their own business, and 2.1% – in a combination of the aforementioned. Average sick leave after STEMI was 125.83±125.04 days. Additional sick leave during the follow-up was used by 35.2% of patients (cardiac cause: 17.1±6.2 days, non-cardiac: 3.9±2.5 days). After STEMI, 3.4% of patients were discharged from their jobs, while 31.7% retired. Out of total, 17.9% patients reported significant salary decrease in comparison to the time before a coronary incident. Major life event was reported in 9.7% of cases (divorce: 0.7%, moving: 1.4%, death in family: 7.6%). Finally, 29.7% of patients estimated quality of life to remain the same as before STEMI, 40.7% – as worse, and 29.7% – as better.

Influences of different parameters on hospitalization duration after STEMI are shown in Table 2. Significantly longer hospitalization was observed in patients transferred from surrounding counties, those with inferior myocardial

Table 1. Study group characteristics

Variable	Respondents (N = 145)	
	n	%
Gender		
male	128	88.3
Admitted to PCI Centre directly	77	53.1
Smokers	104	71.7
History		
arterial hypertension	82	56.6
dyslipidaemia	79	54.5
diabetes	24	16.6
CAD in family	102	70.3
Educational degree		
elementary school	16	11.0
secondary school	101	69.7
high school	9	6.2
university degree	15	10.3
Myocardial wall infarction		
anterior	65	44.8
inferior	70	48.3
posterior	10	6.9
Culprit lesion of myocardial infarction		
LAD artery	64	44.2
right coronary artery	56	38.6
circumflex artery	25	17.2
Cardiogenic shock	1	0.7
Cardiac arrest	8	5.5

PCI – percutaneous coronary intervention; CAD – coronary artery disease; LAD – left anterior descedent.

wall and right coronary artery affected. Salary before and after STEMI, and self-reported change in quality of life after STEMI was related to sick leave duration, as shown in Table 3. Table 4 shows influence of different parameters on permanent working cessation, decrease in quality of life, and time to return to work after STEMI. Age proved to be significantly related to permanent working cessation (Chi^2). Significant salary decrease was observed in male patients ($p = 0.043$, Chi^2).

None of the traditional coronary artery disease risk factors (smoking history, hypertension, hyperlipoproteinemia, diabetes and family history of coronary artery disease) as well as affected myocardial wall and culprit coronary artery proved to be significantly related to permanent working cessation, decrease in salary and quality of life, and time to return to work after STEMI, employer type related to sick leave duration. Impaired quality of life was observed in patients who underwent in-hospital rehabilitation and those from surrounding counties.

Longer sick leave was observed in patients with lower income before and after myocardial infarction. These patients reported lower quality of life after

Table 2. Influence of different parameters on hospitalization duration after ST-elevation myocardial infarction

Variable	Respondents (N = 145) [n]	Hospitalization duration [days]			p[a]
		min.	max	M±SD	
Age [years]					0.722
< 40	9	9	21	12.38±3.89	
40–50	32	7	21	11.06±3.56	
51–60	104	3	30	12.15±5.49	
Gender					0.48
male	128	3	30	11.74±4.61	
female	17	6	24	12.59±4.74	
Smoking					0.769
no	41	3	30	12.03±5.18	
yes	104	5	30	11.77±4.40	
Hypertension					0.498
no	63	7	24	12.15±4.23	
yes	82	3	30	11.61±4.91	
Hyperlipoproteinemia					0.768
no	66	6	30	11.97±4.58	
yes	79	3	29	11.74±4.68	
Diabetes					0.366
no	121	3	30	12.00±4.84	
yes	24	7	21	11.04±3.21	
Positive family history					0.739
no	43	3	30	11.64±4.49	
yes	102	5	30	11.93±4.69	

Table 2. Influence of different parameters on hospitalization duration after ST-elevation myocardial infarction – cont.

Variable	Respondents (N = 145) [n]	Hospitalization duration [days]			p[a]
		min.	max	M±SD	
County					< 0.001
Zagreb	77	3	30	10.49±4.24	
Karlovac	27	7	18	11.88±3.12	
Sisak	41	7	30	14.33±5.13	
Educational degree					0.642
elementary school	16	7	17	11.94±2.64	
secondary school	101	6	30	12.10±4.57	
high school	9	7	25	11.44±5.48	
university degree	15	3	30	10.47±6.16	
Myocardial wall affected					0.012
anterior	65	3	25	10.86±3.59	
inferior	70	5	30	13.05±5.36	
posterior	10	6	17	10.20±3.36	
Coronary artery with culprit lesion of myocardial infarction					0.005
LAD artery	64	3	25	10.89±3.61	
right coronary artery	56	5	30	12.98±5.59	
circumflex artery	25	6	24	11.83±4.19	
Major complication					0.945
no	136	3	30	11.81±4.67	
cardiogenic shock	1	12	12	12.00±0.00	
cardiac arrest	8	7	21	12.38±4.27	

LAD – left anterior descedent; min. – minimum; max – maximum; M – mean; SD – standard deviation.
[a] Independent t-test and one-way ANOVA.

Table 3. Interdependence of time to return to work after ST-elevation myocardial infarction, quality of life and monthly income

Variable	Return to work after STEMI [days]				p[a]
	n	25th percentile	Me	75th percentile	
Quality of life					0.017
same	43	61.0	89	122	
worse	60	61.0	123	244	
better	42	29.0	61	121	

Table 3. Interdependence of time to return to work after ST-elevation myocardial infarction, quality of life and monthly income – cont.

Variable	Return to work after STEMI [days]				p[a]
	n	25th percentile	Me	75th percentile	
Income					
before STEMI					0.007
< 5 000 HRK	67	61.5	122	201	
5 000–10 000 HRK	57	61.0	89	154	
10 000–20 000 HRK	15	29.0	61	161.5	
> 20 000 HRK	6	14.0	23.5	28	
after STEMI					0.005
< 5 000 HRK	87	61.0	122	212	
5 000–10 000 HRK	38	61.0	89	154	
10 000–20 000 HRK	13	28.0	49	92	
> 20 000 HRK	5	14.0	22	25	

STEMI – ST-elevation myocardial infarction; HRK – Croatian kuna (1 HRK = 0.131 euros); Me – median.
[a] Pearson's Chi[2] test.

Table 4. Influence of different parameters on permanent working cessation, quality of life lowering, and return to work after ST-elevation myocardial infarction

Variable	Permanent working cessation [n (%)]				Quality of life lowering [n (%)]			Return to work after STEMI [days]		
	no	discharged	retired	p[a]	no	yes	p[a]	n	Me	p[b]
Age [years]				0.009			0.088			0.618
< 40	7 (7.4)	1 (20.0)	1 (2.2)		6 (7.1)	3 (5.0)		9	83.0	
40–50	28 (29.8)	0 (0.0)	4 (8.7)		19 (22.4)	13 (21.7)		32	106.0	
> 50	59 (62.7)	4 (80.0)	41 (89.1)		60 (70.6)	44 (73.4)		104	82.0	
Gender				0.285			0.112			0.820
male	85 (90.4)	5 (100.0)	38 (82.6)		72 (84.7)	56 (93.3)		128	92.0	
female	9 (9.6)	0 (0.0)	8 (17.4)		13 (15.3)	4 (6.7)		17	90.0	
County				0.821			0.039			0.245
Zagreb	51 (54.3)	3 (60.0)	23 (50.0)		52 (61.2)	25 (41.7)		77	89.0	
Karlovac	18 (19.1)	0 (0.0)	9 (19.6)		11 (12.9)	16 (26.7)		27	107.0	
Sisak	25 (26.6)	2 (40.0)	14 (30.4)		22 (25.9)	19 (31.7)		41	92.0	

Table 4. Influence of different parameters on permanent working cessation, quality of life lowering, and return to work after ST-elevation myocardial infarction – cont.

Variable	Permanent working cessation [n (%)]				Quality of life lowering [n (%)]			Return to work after STEMI [days]		
	no	discharged	retired	p[a]	no	yes	p[a]	n	Me	p[b]
Educational degree				0.108			0.080			0.092
elementary school	10 (11.0)	0 (0.0)	6 (13.3)		6 (7.2)	10 (17.2)		16	107.5	
secondary school	59 (64.8)	5 (100.0)	37 (82.2)		59 (71.1)	42 (72.4)		101	91.0	
high school	8 (8.8)	0 (0.0)	1 (2.2)		8 (9.6)	1 (1.7)		9	106.0	
university degree	14 (15.4)	0 (0.0)	1 (2.2)		10 (12.0)	5 (8.6)		15	49.0	
Major complication				0.447			0.621			0.144
no	90 (95.7)	5 (100.0)	41 (89.1)		80 (94.1)	56 (93.3)		136	91.0	
cardiogenic shock	0 (0.0)	0 (0.0)	1 (2.2)		1 (1.2)	0 (0.0)		1	n.a.	
cardiac arrest	4 (4.3)	0 (0.0)	4 (8.7)		4 (4.7)	4 (6.7)		8	184.0	
Hospitalization duration				0.174			0.151			
< 10 days	51 (56.0)	4 (80.0)	19 (43.2)		47 (58.0)	27 (45.8)				
≥ 10 days	40 (44.0)	1 (20.0)	25 (56.8)		34 (42.0)	32 (54.2)				
Rehabilitation				0.672			0.029			0.350
no	45 (47.9)	3 (60.0)	27 (58.7)		51 (60.0)	24 (40.0)		75	90.0	
out-hospital	24 (25.5)	1 (20.0)	7 (15.2)		18 (21.2)	14 (23.3)		32	92.0	
in-hospital	25 (26.6)	1 (20.0)	12 (26.1)		16 (18.8)	22 (36.7)		38	106.0	
MACE				0.517			0.053			0.066
no	71 (75.5)	2 (40.0)	30 (65.2)		65 (76.5)	38 (63.3)		103	89.0	
reinfarction	1 (1.1)	0 (0.0)	2 (4.3)		2 (2.4)	1 (1.7)		3	n.a.	
restenosis	6 (6.4)	0 (0.0)	4 (8.7)		4 (4.7)	6 (10.0)		10	61.0	
re-PCI of another coronary artery	5 (5.3)	1 (20.0)	4 (8.7)		8 (9.4)	2 (3.3)		10	184.0	
CABG	1 (1.1)	0 (0.0)	1 (2.2)		0 (0.0)	2 (3.3)		2	n.a.	
stroke	0 (0.0)	0 (0.0)	0 (0.0)		0 (0.0)	0 (0.0)		0	n.a.	
angina pectoris	10 (10.6)	2 (40.0)	5 (10.9)		6 (7.1)	11 (18.3)		17	187.0	
Employer				0.177			0.862			0.001
governmental firm	46 (48.9)	2 (40.0)	31 (68.9)		47 (56.0)	32 (53.3)		79	92.0	
private firm ≤ 100 employees	17 (18.1)	2 (40.0)	5 (11.1)		15 (17.9)	9 (15.0)		24	81.5	
private firm > 100 employees	12 (12.8)	1 (20.0)	4 (8.9)		10 (11.9)	7 (11.7)		17	152.0	
own business	18 (19.1)	0 (0.0)	3 (6.0)		10 (11.9)	11 (18.3)		21	31.0	
combination	1 (1.1)	0 (0.0)	2 (4.4)		2 (2.4)	1 (1.7)		3	14.0	

MACE – major adverse cardiovascular events; PCI – percutaneous coronary intervention; CABG – coronary artery by-pass graft; STEMI – ST-elevation myocardial infarction; n.a. – not available.

[a] Chi^2 test.

[b] Kruskal-Wallis test (differences between 3 or more groups) or Mann-Whitney U test (differences between 2 groups).

myocardial infarction. No investigated parameter had influence on major life events rate after STEMI. Multivariate regression analysis revealed that, beside age ($p < 0.001$, odds ratio (OR) = 1.5), hyperlipoproteinemia ($p < 0.05$, OR = 0.32) and lower education degree ($p < 0.05$, OR = 0.04) related to higher discharge and retirement rate after STEMI.

DISCUSSION

Descriptive data analysis obtained in this study could be expected and corresponds to such data in the literature [1,2]. High percentage of male gender, smokers, low rate of cardiogenic shock could be explained by inclusion and exclusion criteria: patients needed to be younger than 60 years old and alive 2 years after STEMI. Younger age may also explain high percentage of rehabilitated patients in comparison with data from the literature [14]. Comparing educational structure, there were more people with elementary school education in the general than in the study population [15].

Average hospitalization duration found in this study is longer than in other studies [16], particularly for transferred patients and those with inferior myocardial wall and right coronary artery affected. Longer hospital stay, designated as one of negative predictors of returning to work, is a consequence of traditional health care policy in Croatia, as well as longer waiting list for rehabilitation after STEMI [14]. For the same reasons average sick leave among investigated patients is relatively long as compared to other European countries (126 vs. 50 days) [4,5], although reports [17,18] with even longer average time to return to work after AMI exist.

Many studies [8,11,18–21], as this one, emphasize age as a prognostic factor for working ability and disablement after AMI. Several of psychosocial, economic and job related factors are confirmed as important for fast return to work and return to work at all after AMI: higher income [11], financial benefit that promts empoyees to retire [19], higher educational level, self-related health and quality of life [20], non-manual labor and lower physical job demands, married status [19,21]. The same was found in this study. Patients with lower education degree who most often perform jobs with higher physical demand, are more often perform or retire after STEMI, those with lower salary before and after STEMI are longer on sick leave and those with longer sick leave report lower quality of life after STEMI. Significantly shorter sick leave in smaller private firms and in own businesses as compared to governmental and larger private firms could be expected, bearing in mind possible financial consequences.

On the other hand, importance of medical factors on predicting return to work after AMI is controversial. There are studies that found them important [19], while others [8,18,21,22] found little or no relevance of medical variables for re-employment, including the type of AMI or revascularization strategy used and its success. Among investigated medical parameters, authors found myocardial wall, affected coronary artery and lipid status important for hospitalization and sick leave duration. No other clinical parameter proved to be important in predicting return to work in this study. Rate of return to work found in this study (64.9%) is near lower values found in other studies in Europe and USA (60–95%) [8,21,22]. Explanation could be current socio-economic situation in Croatia (low average income, high unemployment rate, health and pension insurance benefits).

Importance of income as a risk factor for AMI is well documented. According to investigators from Sweden [23], women experiencing financial strain have increased risk for recurrent acute coronary events. Several socio-economic factors including levels of education and income are closely associated with increase of AMI risk in China and the effect of education is stronger in women than men [24]. Even neighborhood income has influence on overall case fatality rates, being highest among AMI patients living in low neighborhood income areas in the USA [25].

Also, in a tax-financed healthcare system, patients with low socio-economic status treated with primary PCI could face a worse prognosis than those with high socio-economic status [26]. Fortunately, using income level before acute STEMI, previous finding was not proved in this study. However, the fact that male gender in AMI patients is associated with an increased risk for experiencing a loss of annual income (data from the register-based study of Danish population [27]), was confirmed in this investigation. This income loss is most probably related to a job change to physically less demanding jobs but the authors cannot provide the proof to this statement.

Self-related quality of life is a positive predictor for early return to work after AMI [20]. Many parameters may lower (diabetes, hyperlipoproteinemia, multivessel disease, history of myocardial infarction) [10] or improve (exercise of greater intensity, myocardial revascularization in the first 30 days) [28] quality of life after AMI. Although some authors found no influence of cardiac rehabilitation after AMI on return to work [11,21], predominant opinion today is that cardiovascular rehabilitation encompasses the improvement of physical fitness and quality of life, reintegration into social life and employment, and decreases economic consequences of AIM [8,19]. One of important characteristics of modern cardiac rehabilitation, which assure all those positive effects, is its initiation as early as possible after AMI [19,29]. Absence of early admission to a rehabilitation centre, as was the case in investigated patients under this study [14], may even lead to lowering of quality of life after such rehabilitation.

CONCLUSIONS

Public and corporate policies without financial benefit, that prompts employees to be on prolonged sick leave or to retire should be promoted to help workers to return to their jobs [22]. Individualized cardiac rehabilitation should be considered and planned by designated team immediately after acute phase of AMI. Inadequate health policy and delayed cardiac rehabilitation after AMI may lead to prolonged hospitalization and sick leave, and quality of life lowering after AMI, regardless of optimal treatment in acute phase of disease.

REFERENCES

1. Andersen HR, Nielsen TT, Rasmussen K, Thuesen L, Kelbaek H, Thayssen P, et al. A comparison of coronary angioplasty with fibrinolytic therapy in acute myocardial infarction. N Engl J Med. 2003;349(8):733–42, http://dx.doi.org/10.1056/NEJMoa025142.
2. Nikolić Heitzler V, Babić Z, Miličić D, Bergovec M, Raguž M, Mirat J, et al. Results of the Croatian Primary Percutaneous Coronary Intervention Network for patients with ST-segment elevation acute myocardial infarction. Am J Cardiol. 2010;105(9):1261–7, http://dx.doi.org/10.1016/j.amjcard.2009.12.041.
3. Widimsky P, Wijns W, Fajadet J, de Belder M, Knot J, Aaberge L, et al. Reperfusion therapy for ST elevation acute myocardial infarction in Europe: Description of the current situation in 30 countries. Eur Heart J. 2010;31(8):943–57, http://dx.doi.org/10.1093/eurheartj/ehp492.
4. Dennis C, Houston-Miller N, Schwartz RG, Ahn DK, Kraemer HC, Gossard D, et al. Early return to work after uncomplicated myocardial infarction. Results of a randomized trial. JAMA. 1988;260(2):214–20, http://dx.doi.org/10.1001/jama.1988.03410020080032.
5. Boudrez H, de Backer G. Recent findings on return to work after an acute myocardial infarction or coronary artery bypass grafting. Acta Cardiol. 2000;55(6):341–9, http://dx.doi.org/10.2143/AC.55.6.2005765.
6. Levine GN, Bates ER, Blankenship JC, Bailey SR, Bittl JA, Cercek B, et al. ACCF/AHA/SCAI Guideline for Percutaneous Coronary Intervention: Executive summary. A report of the American College of Cardiology Foundation/American Heart Association Task Force on practice guidelines and the Society for Cardiovascular Angiography and Interventions. Cathet Cardiovasc Interv. 2012;79(3):453–95, http://dx.doi.org/10.1002/ccd.23438.

7. Kovoor P, Lee AK, Carrozzi F, Wiseman V, Byth K, Zecchin R, et al. Return to full normal activities including work at two weeks after acute myocardial infarction. Am J Cardiol. 2006;97(7):952–8, http://dx.doi.org/10.1016/j.amjcard.2005.10.040.
8. Perk J. Returning to work after myocardial infarction. In: Perk J, Mathes P, Gohlke H, Monpere C, Hellemans I, editors. Cardiovascular prevention and rehabilitation. 1st ed. London: Springer; 2007. p. 317–23, http://dx.doi.org/10.1007/978-1-84628-502-8_38.
9. Benetti M, Araujo CL, Santos RZ. Cardiorespiratory fitness and quality of life at different exercise intensities after myocardial infarction. Arq Bras Cardiol. 2010;95(3):399–404, http://dx.doi.org/10.1590/S0066-782X2010005000089.
10. Uchmanowicz I, Loboz-Grudzien K, Jankowska-Polanska B, Sokalski L. Influence of diabetes on health-related quality of life results in patients with acute coronary syndrome treated with coronary angioplasty. Acta Diabetol. 2013;50(2):217–25, http://dx.doi.org/10.1007/s00592-011-0280-2.
11. Yuval R, Halon DA, Lewis BS. Perceived disability and lifestyle modification following hospitalization for non-ST elevation versus ST elevation acute coronary syndromes: The patients' point of view. Eur J Cardiovasc Nurs. 2007;6(4):287–92, http://dx.doi.org/10.1016/j.ejcnurse.2007.02.002.
12. Staniūtė M, Brožaitienė J. Changes in health-related quality of life among patients with coronary artery disease: A 2-year follow-up. Medicina (Kaunas). 2010;46(12):843–50.
13. Van de Werf F, Bax J, Betriu A, Blomstrom-Lundqvist C, Crea F, Falk V, et al. Management of acute myocardial infarction in patients presenting with persistent ST-segment elevation. Eur Heart J. 2008;29(23):2909–45, http://dx.doi.org/10.1093/eurheartj/ehn416.
14. Cerovec D, Lakusic N, Baborski F. Cardiac rehabilitation efficacy and cost effectiveness. Cardiol Croat. 2012;7:106–7.
15. Croatian Bureau of Statistics [Internet]. [Statistical yearbook of the Republic of Croatia 2011]. Zagreb: Croatian Bureau of Statistics; 2011 [cited 2014 Sep 4]. Available from: http://www.dzs.hr/Hrv_Eng/ljetopis/2011/SLJH2011.pdf. Croatian.
16. Kaboli PJ, Go JT, Hockenberry J, Glasgow JM, Johnson SR, Rosenthal GE, et al. Associations between reduced hospital length of stay and 30-day readmission rate and mortality: 14-year experience in 129 veterans affairs hospitals. Ann Intern Med. 2012;157(12):837–45, http://dx.doi.org/10.7326/0003-4819-157-12-201212180-00003.
17. Monpère C, Rajoelina A, Vernochet P, Mirguet C, Thebaud N. [Return to work after cardiovascular rehabilitation in 128 coronary patients followed for 7 years. Results and medico-economic analysis]. Arch Mal Coeur Vaiss. 2000;93(7):797–806. French.
18. Slebus FG, Jorstad HT, Peters RJ, Kuijer PP, Willems JH, Sluiter JK. Return to work after an acute coronary syndrome: Patients' perspective. Saf Health Work. 2012;3(2):117–22, http://dx.doi.org/10.5491/SHAW.2012.3.2.117.
19. Slebus FG, Kuijer PP, Willems JH, Sluiter JK, Frings-Dresen MH. Prognostic factors for work ability in sick-listed employees with chronic diseases. Occup Environ Med. 2007;64(12):814–9, http://dx.doi.org/10.1136/oem.2006.031807.
20. Waszkowska M, Szymczak W. Return to work after myocardial infarction: A retrospective study. Int J Occup Med Environ Health. 2009;22(4):373–81, http://dx.doi.org/10.2478/v10001-009-0033-4.
21. Isaaz K, Coudrot M, Sabry MH, Cerisier A, Lamaud M, Robin C, et al. Return to work after acute ST-segment elevation myocardial infarction in the modern era of reperfusion by direct percutaneous coronary intervention. Arch Cardiovasc Dis. 2010;103(5):310–6, http://dx.doi.org/10.1016/j.acvd.2010.04.007.
22. Mittag O, Kolenda KD, Nordman KJ, Bernien J, Maurischat C. Return to work after myocardial infarction/coronary artery bypass grafting: Patients' and physicians' initial viewpoints and outcome 12 months later. Soc Sci Med. 2001;52(9):1441–50, http://dx.doi.org/10.1016/S0277-9536(00)00250-1.
23. Georgiades A, Janszky I, Blom M, László KD, Ahnve S. Financial strain predicts recurrent events among women

with coronary artery disease. Int J Cardiol. 2009;135(2): 175–83, http://dx.doi.org/10.1016/j.ijcard.2008.03.093.

24. Guo J, Li W, Wang Y, Chen T, Teo K, Liu LS, et al. Influence of socioeconomic status on acute myocardial infarction in the Chinese population: The INTERHEART China study. Chin Med J (Engl). 2012;125(23):4214–20.
25. Foraker RE, Patel MD, Whitsel EA, Suchindran CM, Heiss G, Rose KM, et al. Neighborhood socioeconomic disparities and 1-year case fatality after incident myocardial infarction: The Atherosclerosis Risk in Communities (ARIC) Community Surveillance (1992–2002). Am Heart J. 2013;165(1):102–7, http://dx.doi.org/10.1016/j.ahj.2012.10.022.
26. Jakobsen L, Niemann T, Thorsgaard N, Thuesen L, Lassen JF, Jensen LO, et al. Dimensions of socioeconomic status and clinical outcome after primary percutaneous coronary intervention. Circ Cardiovasc Interv. 2012;5(5):641–8, http://dx.doi.org/10.1161/CIRCINTERVENTIONS.112.968271.
27. Rayce SL, Christensen U, Hougaard CØ, Diderichsen F. Economic consequences of incident disease: The effect on loss of annual income. Scand J Public Health. 2008;36(3): 258–64, http://dx.doi.org/10.1177/1403494808086987.
28. Benetti M, Araujo CL, Santos RZ. Cardiorespiratory fitness and quality of life at different exercise intensities after myocardial infarction. Arq Bras Cardiol. 2010;95(3):399–404, http://dx.doi.org/10.1590/S0066-782X2010005000089.
29. Yonezawa R, Masuda T, Matsunaga A, Takahashi Y, Saitoh M, Ishii A, et al. 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. Int Heart J. 2009;50(3):279–90, http://dx.doi.org/10.1536/ihj.50.279.