

ORIGINAL PAPER

EDUCATIONAL PROCESS IN PATIENTS AFTER MYOCARDIAL INFARCTION

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Abstract

Aim: The study aimed to determine the effect of education on the prevalence of risk factors and adherence to lifestyle measures in post-myocardial infarction patients. **Design:** A clinical, interventional, explanatory study. **Methods:** The sample (n = 165) comprised consecutive patients hospitalized for acute myocardial infarction. The interventional, explanatory study followed changes in two cohorts: intervention (n = 68) and control (n = 97). The intervention (prospective) group consisted of patients educated by a nurse using a previously developed nursing standard. The control (retrospective) group comprised patients who received no education on myocardial infarction provided by nurses. **Results:** After one-year follow-up, patients in the intervention group had statistically better knowledge about their condition ($p < 0.001$) and used their medication more regularly ($p < 0.001$) than controls. At one year, systolic blood pressure and total cholesterol decreased by a mean of 2.5 mmHg and 0.3 mmol/l, respectively, in intervention group participants. As early as after one month, patients in this group increased their physical activity by a mean of 35 minutes per week. **Conclusion:** Post-myocardial infarction patients educated according to the developed nursing care standard were shown to better adhere to their pharmacological therapy and lifestyle changes.

Keywords: education, intervention, myocardial infarction, nurse, patient, secondary prevention.

Introduction

Over the last 25 years, cardiovascular mortality has declined in Europe; yet the prevalence of coronary artery disease remains high in the Czech Republic (Čapková et al., 2016). The Czech middle-aged population was found to have a high prevalence of the main cardiovascular risk factors (Cífková et al., 2011). Also data from several European Countries including the Czech Republic continue to show that cardiovascular disease preventive care is not adequately provided. Many post-myocardial infarction patients do not adhere to a healthy lifestyle, do not know the risk factors and do not receive the proper treatment (Kotseva et al., 2016).

The core of cardiovascular disease prevention has shifted from drug therapy to preventive care through non-pharmacological interventions. Drug therapy should be initiated only after non-pharmacological interventions fail (Magnani et al., 2018). A systematic, comprehensive and multidisciplinary approach is needed that is focused on lifestyle and risk factor

management by physicians, nurses and other health workers (Piepoli et al., 2016). Nurses play a key role in educating patients after myocardial infarction. Nurses' educational activities contribute to improving the health status of both individuals and communities, leading to reduced cardiovascular risk and fewer rehospitalizations (Lachman et al., 2015).

The aim of the study was pilot implementation of a nursing care standard called Education of Post-Myocardial Infarction Patients. The nursing standard was developed by a multidisciplinary working group. The first step in the development of the standard was to formulate the basic STANDARD definition in accordance with Standard nursing care: an asset (Danasu, 2007). Subsequently, activities were defined, measured and selected using the Dynamic Standard Setting System (Kitson, 1990). To justify the nursing processes in the standard, an analysis from a literature search was used. The final standard consists of nine nursing processes complemented by justification, references to relevant studies and levels of evidence.

Aim

The study aimed to determine the effect of education on the prevalence of risk factors and adherence to lifestyle measures in post-myocardial infarction patients.

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Methods

Design

A clinical, interventional, explanatory study was conducted.

Sample

Included in the study were consecutive patients (convenience sampling) hospitalized for acute myocardial infarction (Figure 1). Data were collected at the Department of Cardiovascular Diseases, University Hospital Ostrava. The sample (Table 1) comprised a total of 165 participants divided into two groups, intervention ($n = 68$) and control ($n = 97$).

The inclusion criteria were patients after acute ST-elevation myocardial infarction, after percutaneous coronary intervention, aged 30–85

years. Excluded were patients in cardiogenic shock, after cardiopulmonary resuscitation, with serious complications or life-threatening comorbidities.

The intervention (prospective) group consisted of patients consecutively admitted for acute myocardial infarction in 2016. Their mean age was 58 years ($SD = 11.4$). The patients were educated by a nurse using the above nursing standard, with a follow-up at one, six and twelve months.

The control (retrospective) group comprised patients hospitalized for acute myocardial infarction in 2015, with a mean age of 61 years ($SD = 11.1$). They were approached by telephone twelve months after their heart attack. The controls received no education on their condition (i.e. myocardial infarction).

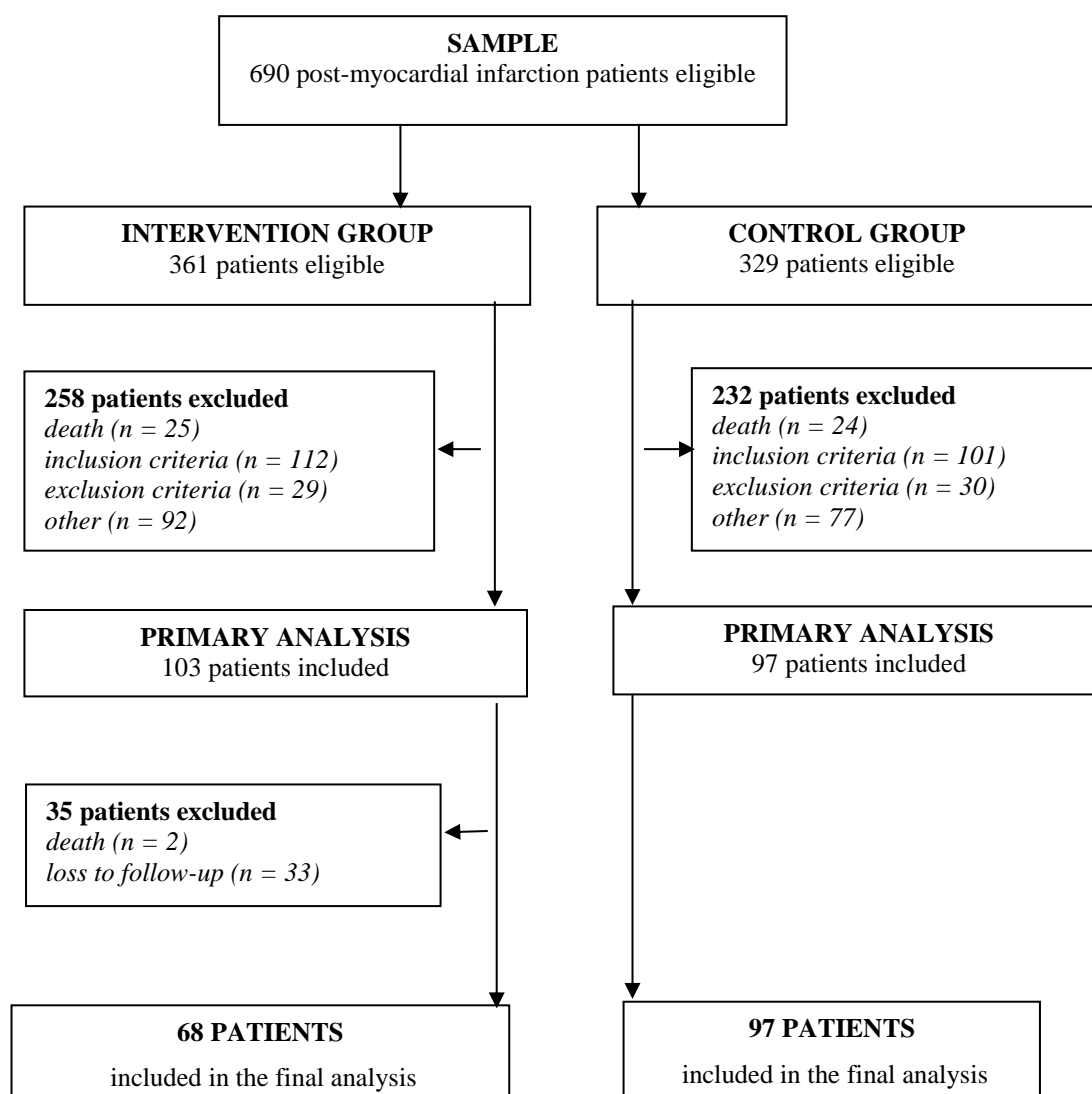


Figure 1 Patient selection process

Table 1 Patient characteristics

	Intervention group n (%)	Control group n (%)
Gender		
male	37 (54)	50 (52)
female	31 (46)	47 (48)
Age		
30–39 years	3 (4)	1 (1)
40–49 years	11 (16)	12 (12)
50–59 years	29 (43)	29 (30)
60–69 years	14 (21)	26 (27)
70–79 years	8 (12)	25 (26)
80–85 years	8 (4)	4 (4)
Education		
primary	5 (7)	10 (10)
vocational	37 (54)	59 (61)
secondary	19 (28)	19 (20)
tertiary	7 (10)	9 (9)
Body mass index		
under 25	24 (35)	23 (24)
25 to 29.9	31 (46)	43 (44)
30 or more	13 (19)	31 (32)

Description of the intervention

Interventions were provided in accordance with the standard. The nurse educated the patient within three days of myocardial infarction, during their stay at the Department of Cardiovascular Diseases, University Hospital Ostrava. Educational sessions were repeated after one, six and twelve months in an outpatient ward of the department. The date of the first follow-up session was set during the hospital stay; the other dates were agreed on during the preceding sessions in the outpatient ward. The education session duration was 30–60 minutes. In each patient, a nursing assessment was carried out based on an educational history and an educational plan was developed. Patients were educated individually through motivational interviewing.

During the initial session, patients were informed about their condition (myocardial infarction), warning signs, therapeutic regimen, use of medication and lifestyle changes. The latter included recommendations on an adequate diet, proper physical activity, smoking cessation and blood pressure control. At the end of the session, the nurse determined whether the goals were met and assessed the effectiveness of education.

At the beginning of each follow-up session, the patient's knowledge was tested. Based on the assessment, topics to be covered during the follow-up sessions were defined. The assessment of knowledge included all topics covered by the initial session using the following scale: 0 – topic not understood; 1 – mostly not understood; 2 – mostly understood;

3 – completely understood. The points were assigned based on questions asked to patients. Those receiving 0–2 points were repeatedly educated about that particular topic. If they received 3 points, they were not educated again.

Patients also received educational materials on heart anatomy and physiology, basic facts about myocardial infarction, recognizing myocardial infarction symptoms, calling for professional help, cardiopulmonary resuscitation, myocardial infarction treatment, recovering from myocardial infarction and lifestyle changes following myocardial infarction.

Data collection

In both the intervention and control groups, the following items were compared one year after heart attack: adherence to lifestyle changes (dietary habits, physical activity, use of medication), prevalence of risk factors (smoking, total cholesterol level, blood pressure values, body mass index), knowledge of the condition (myocardial infarction) and need for rehospitalizations. To analyze changes in the variables, biomedical data were collected and a structured interview was conducted. Biomedical data collection included anthropometric measurements, clinical examination, biochemistry tests and data from medical records.

Adherence to dietary measures was assessed using our classification of eating habits that was based on the food pyramid and nutritional recommendations for the Czech population (Dostálová, Dlouhý, Tláškal 2012).

Physical activity (walking, household work, exercising and other leisure activities) was recorded in minutes per week. Physical activity assessment also took into account the participants' occupations. The physical intensity of their jobs was categorized based on job classes (Nařízení vlády č. 361/2007, Sb.).

Use of medication was recorded on a Likert scale. Participants were asked about regular use of drugs (0 – not at all; 1 – somewhat no; 2 – somewhat yes; 3 – yes).

Data analysis

The sample was characterized using descriptive statistics (median, arithmetic mean, standard deviation, frequency tables). For quantitative variables, normality of data distribution was assessed with the Shapiro-Wilk test; based on that, parametric or nonparametric tests were used. Differences between the intervention and control groups were analyzed with the nonparametric two-sample Mann-Whitney U test, chi-squared test and two-sample t-test. In the intervention group, pre-education values were compared to those obtained during the follow-up at

one, six and twelve months. Differences were tested with the following paired tests: chi-square test, Wilcoxon test and t-test. The level of statistical significance was set at 5% ($p < 0.05$ – H0-rejected; $p \geq 0.05$ – not rejected). The Stata version 13 software was used.

Results

In the study, the following variables were compared: number of rehospitalizations, knowledge of the condition (myocardial infarction), use of medication, blood pressure values, body mass index, total cholesterol level, smoking status, physical activity and dietary habits (Table 2).

Table 2 Comparison of values of the studied variables

Item	Intervention group		Control group	
	before education	after one year	before education	after one year
1. number of rehospitalizations	-	034.0	-	027.0
2. knowledge of the condition	013.7	017.5	-	014.2
3. use of medication	-	091.2	-	084.5
4. systolic blood pressure	127.2	124.7	130.4	129.3
5. diastolic blood pressure	074.5	070.2	074.1	072.2
6. body mass index	026.9	026.4	028.3	028.4
7. total cholesterol	005.3	005.0	004.6	004.7
8. number of smokers	042.6	020.6	035.0	023.7
9. number of cigarettes smoked	014.9	008.8	016.4	016.2
10. physical activity	597.0	633.0	634.0	610.0
11. regular eating	073.5	082.4	060.8	063.3
12. recommended diet	022.1	035.3	006.2	009.3

1. numbers of rehospitalized patients expressed as relative frequency; 2. mean number of points obtained in knowledge assessment; 3. numbers of patients reporting regular use of medication expressed as relative frequency; 4. mean systolic blood pressure; 5. mean diastolic blood pressure; 6. mean body mass index; 7. mean total cholesterol; 8. numbers of smokers expressed as relative frequency; 9. mean number of cigarettes smoked by smokers; 10. mean number of minutes of physical activity per week; 12. numbers of patients reporting regular eating expressed as relative frequency; 13. numbers of patients reporting eating the recommended diet expressed as relative frequency

After one-year follow-up, patients in the intervention group showed statistically significantly higher rates of rehospitalization for coronary artery disease than controls ($p = 0.035$). In that respect, the intervention (education) was not successful.

Patients in the intervention group had, after one year, statistically better knowledge about their condition than controls ($p < 0.001$). Their knowledge at all time intervals (one, six and twelve months after myocardial infarction) was also statistically significantly better ($p < 0.001$) compared to that before education.

Compared to controls, patients in the intervention group used their medication statistically significantly more regularly ($p < 0.001$). At all time intervals (one, six and twelve months), the rates of intervention group participants regularly taking their drugs increased.

After one-year follow-up, systolic blood pressure was statistically significantly lower in patients in the intervention group than in controls ($p = 0.0146$). In intervention group participants, systolic blood pressure dropped by a mean of 2.5 mmHg. After one-year follow-up, there was no statistically significant difference in diastolic blood pressure between the two groups ($p = 0.2783$).

One year after myocardial infarction, patients in the intervention group had statistically significantly lower

body mass index values than controls ($p = 0.0013$). On average, their body mass index decreased by 0.5 points (Figure 2).

Prior to education, total cholesterol levels were statistically significantly higher in patients in the intervention group than in controls ($p < 0.001$). After one-year follow-up, the difference between the groups was no longer statistically significant ($p = 0.1326$). In intervention group participants, total cholesterol decreased by a mean of 0.3 mmol/l.

There were no statistically significant differences in the numbers of smokers between the two groups, either before ($p = 0.323$) or after ($p = 0.623$) the follow-up. At one year, smokers in the control group smoked more cigarettes than their counterparts in the intervention group.

Controls showed a statistically significant decrease in the mean number of minutes of physical activity per week at one year after myocardial infarction ($p = 0.0003$). By contrast, intervention group participants statistically significantly ($p = 0.0001$) increased their physical activity at all time intervals (Figure 3). As early as after one month, patients in the intervention group increased their physical activity by a mean of 35 minutes per week.

After one-year, patients in the intervention group ate

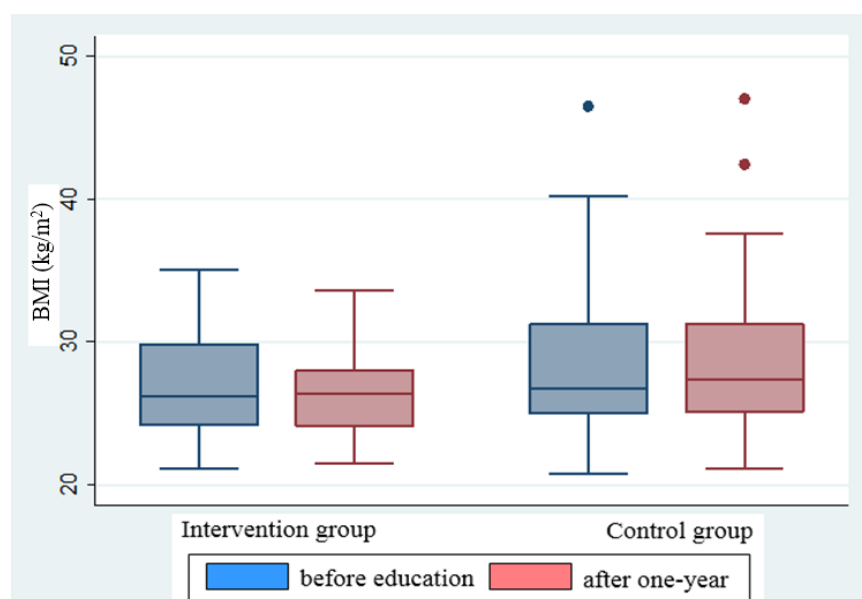


Figure 2 Differences in patients' body mass index

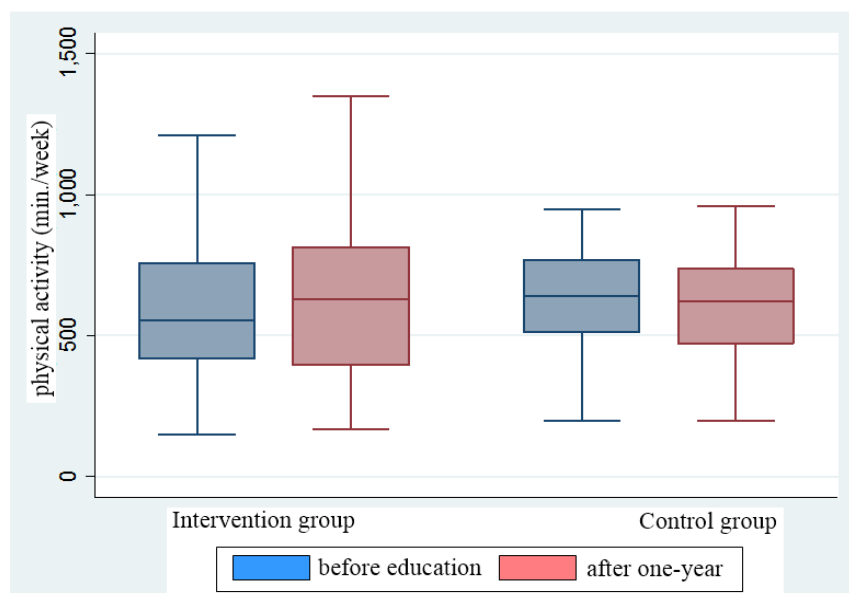


Figure 3 Patients' physical activity before and one year after education

statistically significantly more regularly than controls ($p = 0.010$). There was also a statistically more significant shift to a healthier diet in intervention group participants than in controls ($p < 0.001$).

Discussion

Nurses who work in health facilities, particularly in inpatient settings, adhere to local professional standards and providing nursing care based on current scientific evidence confirmed by research and practice (Jarošová, Zeleníková, 2014). Therefore, prior to its implementation, the standard was tested in clinical practice using a correlational study.

Nurses and other health professional should ensure follow-up of educated post-myocardial infarction patients (Piepoli et al., 2016). To achieve permanent lifestyle changes and adherence to therapy, continued support in the form of repeated sessions is needed (Rydén et al., 2013). That is why patients included in the study were educated within three days of myocardial infarction and then after one, six and twelve months.

One in five patients suffering cardiovascular or cerebrovascular events needs rehospitalization within one year and even one in three patients over a period

of three years (Alberts et al., 2009). Therefore the present study focused on rehospitalization rates. After one-year follow-up, patients in the intervention group needed statistically significantly more rehospitalizations than controls.

These data fail to confirm results of RESPONSE (Randomised Evaluation of Secondary Prevention by Outpatient Nurse Specialists) showing that education of post-myocardial infarction patients by nurses resulted in fewer repeated hospital stays (Jorstad et al., 2013). Similarly, our result contradicts those reported by GOSPEL (Global Secondary Prevention Strategies to Limit Event Recurrence after Myocardial Infarction). This randomized clinical study concluded that education programs for post-myocardial infarction patients reduced both rehospitalization rates and the risk for cardiovascular diseases (Giannuzzi et al., 2008).

The Czech Republic is among countries with low health literacy of the population (Šedová et al., 2016a). According to a randomized clinical study by Gallagher et al. (2013), education with a standardized instrument and adjusted to the patient's needs is more effective, leading to their better knowledge about possible symptoms of acute myocardial infarction and attitude to recovery over two months from heart attack. These results were consistent with those in the present study, with patients in the intervention group having statistically significantly better knowledge about their condition than controls.

Similarly, a randomized clinical study by O'Brien et al. (2014) found that post-myocardial infarction participants educated by a nurse had a significantly higher level of knowledge on their disease and therapy than controls who received no education.

A 2016 randomized clinical study (Polsook, Aungsuroch, Thongvichea, 2016), showed that subjects educated by a nurse on the use of prescribed medication adhered to their treatment regimen more effectively and used their drugs more regularly than controls. This is consistent with our findings. In the present study, intervention group participants used their medication statistically significantly more regularly than controls.

The effect of education on blood pressure reduction in post-myocardial infarction patients was also shown in a randomized clinical study by Campbell et al. (1998) stating that secondary prevention provided by nurses to patients with coronary heart disease was effective. Their results suggested that the incidence of future cardiovascular events and potential deaths may be decreased by as much as one-third. This is consistent with findings in the present study. After one-year follow-up, patients in the intervention group

had statistically significantly lower blood pressure than controls. The difference in diastolic blood pressure between the two groups was not statistically significant after one year.

In their randomized clinical study, Lachman et al. (2015) found that after twelve months, post-myocardial infarction patients educated by nurses on the need for weight reduction and adequate physical activity had better quality of life and fewer risk factors than controls without education. Lower body mass index values in educated patients were also found in the present study. After one-year follow-up, intervention group participants had statistically significantly lower body mass index values than those in the control group.

The Czech post-MONICA cross-sectional study (Cífková et al., 2011) on a representative randomly selected sample of the middle-aged Czech population found a high prevalence of major cardiovascular risk factors contributing to persistently high cardiovascular mortality in the Czech Republic. These findings were confirmed by Olišarová et al. (2016) claiming that education on cardiovascular risk factors provided by nurses in the Czech Republic is inadequate.

High total cholesterol levels are among major cardiovascular risk factors. Before education, total cholesterol levels were statistically significantly higher in the intervention group than in controls. After one-year follow-up, the difference between the two groups was no longer statistically significant.

The positive effect of nurses' educational activities on lowering of total cholesterol levels in post-myocardial infarction patients was also noted in KORINNA (Coronary Infarction Follow-up in the Elderly). Post-myocardial infarction patients educated by nurses on lifestyle changes showed fewer rehospitalizations and deaths, better hypertension control, lower cholesterol levels and less depression than controls receiving no education (Kirchberger et al., 2015).

In post-myocardial infarction patients, smoking cessation is potentially the most effective secondary prevention measure (Steg et al., 2012). Similarly, Svěráková (2012) reported that smoking cessation is a notable component of lifestyle changes in patients after myocardial infarction. On the other hand, smoking cessation was found to be most difficult for post-myocardial infarction patients (Šedová et al., 2016b).

In their cohort study, Harbman (2014) showed that post-myocardial infarction patients educated by nurses on smoking cessation, hypertension treatment, sufficient physical activity and diet had lower coronary heart disease morbidity and mortality rates than participants in a control group without education.

Similarly, the present study found a positive effect of education on patients' smoking status. After one-year follow-up, smokers in the control group smoked more cigarettes than those in the intervention group.

Also a cohort study by Bellman et al. (2009) found that post-myocardial infarction patients educated by nurses on the harmfulness of smoking stopped smoking more frequently than controls with no education. Finally, Farrell and Keeping-Burke (2014) claim that nurses' educational activities towards smoking cessation has repeatedly proved highly effective and should be further developed in the future.

Regular physical activity is another important feature of a healthy lifestyle (Rosolová et al., 2013). In 2016, Kotseva et al. (2016) conducted a cross-sectional study called EUROASPIRE IV (European Action on Secondary and Primary Prevention by Intervention to Reduce Events). The study results suggest that following their myocardial infarction, most patients failed to stop smoking, eat unhealthy foods, have inadequate physical activity and thus suffer from overweight or obesity and a high prevalence of diabetes mellitus.

The effect of education on physical activity was confirmed by the present study. After one-year follow-up, controls statistically significantly reduced their physical activity expressed as minutes per week. By contrast, there were statistically significant increases in intervention group patients' physical activity at all time intervals.

Positive effects of nurses' educational activities on physical activity were also noted in a randomized clinical study by Yan et al. (2014) showing that post-myocardial infarction participants receiving repeated telephone follow-up instructions from nurses had more positive perceptions of their condition, could recognize the warning signs, were better at adhering to lifestyle measures, did more physical activity and had higher quality of life than their counterparts in a control group who received no education. Similar conclusions were reported in a randomized clinical study by Hanssen et al. (2007) who stated that post-myocardial infarction patients systematically educated by nurses were in much better physical condition and showed more responsible approach to the treatment of their disease than controls without education.

According to Rosenberg (2014), prevention of cardiovascular diseases is based on a healthy diet and lifestyle changes. The present study showed a positive effect of education on dietary changes. After one-year follow-up, patients in the intervention group ate statistically significantly more regularly than controls. There was also a statistically more significant

shift to a healthier diet in intervention group participants than in controls.

These results were also confirmed by a cohort study by Hwang and Kim (2015). The study showed that post-myocardial infarction patients educated by nurses on lifestyle measures were considerably more willing to adhere to their treatment regimen and recommended dietary changes, perform adequate physical activity and monitor the warning signs than controls receiving no education.

Limitation of study

The study has certain limitations. The effectiveness of nursing care provided would be better assessed by comparing the intervention and control groups in a prospective study. Moreover, a multicenter study would be more appropriate.

Conclusion

Nurses' educational activities concerning secondary prevention of coronary heart disease are the key to better knowledge of the condition, regular use of medication, blood pressure control, optimal body mass index, stable total cholesterol levels, smoking cessation, adequate physical activity and dietary habits in patients after myocardial infarction.

The study outcomes will serve to improve the quality and effectiveness of nursing care provided to patients after myocardial infarction. Post-myocardial infarction patients educated according to the developed nursing care standard were shown to better adhere to their pharmacological therapy and lifestyle changes.

Ethical aspects and conflict of interest

The study was conducted in accordance with the basic principles relevant to research involving human subjects valid for all research phases (Declaration of Helsinki, 2013). The study was approved by the Ethics Committee of the University Hospital Ostrava.

Data for the study were collected as part of a project called Contract for Life (for life after myocardial infarction) that aimed to develop an education program for patients after heart attack. The author, as a member of the Contract for Life project team, was granted permission to use the data.

The authors declare no conflict of interest; the article has not been published in any other journal.

Author contribution

Conception and design (JD, DJ), data analysis and interpretation (JD, DJ), manuscript draft (JD), critical

revision of the manuscript (DJ), final approval of the manuscript (JD).

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