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Secondary prevention of coronary artery disease in contemporary clinical practice

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Abstract

Background: *The highest priority in preventive cardiology was given to patients with established coronary artery disease (CAD). The aim of the study was to assess the implementation of guidelines for secondary prevention in everyday clinical practice by evaluating control of the main risk factors and the cardioprotective medication prescription rates for patients, following their hospitalization for CAD.*

Methods: *Five hospitals with cardiology departments serving the city and its surrounding districts in southern part of Poland participated in the study. Consecutive patients aged ≤ 80 years, hospitalized from January 1 2010 to April 31 2012 due to an acute coronary syndrome or for a myocardial revascularization procedure were recruited and interviewed 6–18 months after hospitalization.*

Results: *The medical records of 595 patients (mean age: 62.8 ± 9.0 years, 397 men and 198 women) were reviewed and included in the analyses. Proportions of medical records with available information on risk factors were high with the exception of total cholesterol levels as well as weight and height measurements, which were available in less than 80% of the hospital records. The prescription rate at discharge for antiplatelets was 99%, beta-blockers (BB) — 85%, angiotensin converting enzyme inhibitors (ACEI) or sartans — 85%, and lipid-lowering drugs — 94%. Patients scheduled for coronary artery bypass grafting were significantly less often prescribed BB, ACEI or sartans, and lipid-lowering drugs. The proportion of patients with high blood pressure (≥ 140/90 mm Hg) 6–18 months after hospitalization was 47%, with high*

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LDL cholesterol level (≥ 1.8 mmol/L) 73%, and with a high HbA_{1C} level (≥ 7.0%) 14%, whereas 20% of participants were smokers and 80% were overweight. The proportion of patients taking an antiplatelet agent 6–18 months after hospitalization was 90%, BB — 82%, ACEI — or sartan 78%, and lipid-lowering drug — 82%. Overall, 33.9% of the study participants declared that they had been advised to participate in a rehabilitation/secondary prevention program following their hospitalization and 30.5% participated in a rehabilitation/secondary prevention program. However, only 28.2% took part in at least half of the planned sessions. Using a multivariate analysis we showed that, in general, risk factors control and the prescription rates of cardioprotective medications were related to the patients' age, education, and participation in a rehabilitation/secondary prevention program following their hospitalization due to CAD.

Conclusions: *Our data provide evidence that there is a considerable potential for further reduction of cardiovascular risk in CAD patients. Our results suggest that increasing patient participation rates in rehabilitation/secondary prevention programs may improve the implementation of the secondary prevention.* (Cardiol J 2015; 22, 2: 219–226)

Key words: coronary artery disease, risk factors, secondary prevention, smoking, hypertension, hypercholesterolemia

Introduction

Coronary artery disease (CAD) is the most common single cause of death in developed countries [1]. In Poland, the standardized death rate from ischemic heart disease in people under 65 years of age is 24 per 100,000 and the number of ischemic heart disease deaths is 45,000 yearly [2, 3]. In recent years, rapid development in pharmacological as well as invasive CAD treatment methods has been observed. Nevertheless, the results of a mortality follow-up of the European Action on Secondary Prevention through Intervention to Reduce Events (EUROASPIRE) I–III surveys indicate that risk factors remain independent predictors of cardiovascular mortality in CAD patients [4]. The conclusion from another 5-year follow-up survey is that smoking cessation, providing advice on diet and ensuring optimal pharmacological treatment are crucial factors in reducing mortality in patients who have suffered myocardial infarction (MI) [5]. Thus, the highest priority for preventive cardiology was given to patients with established CAD [6].

The Cracovian Program for Secondary Prevention of Ischemic Heart Disease was launched in 1996 [7, 8]. The main goal of the program was to assess and improve the quality of medical care in the field of secondary CAD prevention. Later, the same centers took part in the EUROASPIRE surveys [9]. These projects allowed the assessment of temporal changes in the implementation of recommendations as well as international comparisons [9–11]. However, not much is known about the relation between types of acute coronary syndrome (MI vs. unstable angina [UA]) and the quality of secondary prevention in Poland. It is also not known whether CAD patients who have undergone a myocardial revascularization procedure receive better quality medical care than non-revascularized patients. The aim of the present study was to assess the recent status of implementation of the guidelines for secondary prevention in everyday clinical practice by assessing control of the main risk factors and the cardioprotective medication prescription rates in patients after hospitalization for CAD.

Methods

The study groups and the methods used in the Cracovian Program for Secondary Prevention of Ischemic Heart Disease and Polish part of EUROASPIRE surveys were described in earlier reports [10, 11]. A brief description is given below.

Five hospitals with cardiology departments, serving the city and its surrounding districts in the southern part of Poland participated in the study. Total population of this area is about 1,200,000 inhabitants. In each department, medical records of consecutive patients hospitalized from January 1 2010 to April 31 2012 due to acute MI (first or recurrent, no prior percutaneous coronary intervention [PCI] or coronary artery bypass grafting [CABG]), UA (first or recurrent, no prior PCI or CABG), PCI (first, no prior CABG) or scheduled for CABG (first) were reviewed and patients aged ≤ 80 years were identified retrospectively excluding those who had died during their in-hospital stay and those who were scheduled for CABG combined

Table 1. Characteristics of the study population.

	MI (n = 267)	UA (n = 191)	PCI (n = 99)	CABG (n = 38)	P	Total (n = 595)
Age [years]	62.8 ± 9.4	63.2 ± 9.0	61.0 ± 7.7	65.9 ± 8.2	< 0.05	62.8 ± 9.0
Sex:					< 0.05	
Men	66.3%	58.6%	78.8%	78.9%		66.7%
Women	33.7%	41.4%	21.2%	21.1%		33.3%
Duration of education* [years]	11.5 ± 3.2	12.4 ± 3.6	11.3 ± 2.8	11.3 ± 3.1	0.08	11.8 ± 3.3
Practice setting*:					0.23	
Hospital outpatient clinics	57.4%	53.2%	46.9%	57.7%		53.8%
Outpatient clinics	29.1%	34.7%	39.5%	38.5%		33.8%
Private cardiology practices	8.8%	10.5%	13.6%	3.9%		10.0%
No regular health check-up	4.7%	1.6%	0.0%	0.0%		2.4%
Specialization of the physician*:					0.31	
Cardiologist	87.2%	93.5%	85.2%	96.2%		89.4%
General practitioner	12.2%	5.5%	14.8%	3.8%		10.3%
Not known	0.7%	0.0%	0.0%	0.0%		0.3%
Employed*	20.3%	17.1%	25.9%	19.2%	0.50	20.4%

*Among subjects who participated in the follow-up examination, as declared by the patients; CABG — coronary artery bypass grafting; MI — myocardial infarction; PCI — percutaneous coronary intervention; UA — unstable angina

with valve surgery. If a patient was hospitalized more than once within the study period, only the first hospitalization was accepted as an index event. The medical records of patients fulfilling the inclusion criteria were analyzed using the standardized data collection form.

Participants were invited to take part in the follow-up examination 6–18 months after discharge. Data on demographic characteristics, personal history of CAD, smoking status, blood pressure, fasting glucose, plasma lipids, and prescribed medications were obtained using a standardized data collection form. The patients' height and weight were measured in a standing position without shoes and heavy outer garments using standard scales with a vertical ruler. Body mass index (BMI) was calculated according to the following formula: BMI = weight [kg]/(height [m])^2. Blood pressure was measured twice, on the right arm in a sitting position after at least 5 min of rest. For plasma lipid and glucose measurements a fasting venous blood sample was taken between 7:30 and 8:30 in the morning. For the present report, results of the analyses which were done no later than 4 h after blood collection were used. Low density lipoprotein-cholesterol (LDL-C) levels were calculated according to Friedewald formula.

We also calculated the secondary prevention coefficient: for each risk factor controlled (not smoking, blood pressure < 140/90 mm Hg, LDL-C < 1.8 mmol/l, glycated hemoglobin [HbA_{1c}] < 7.0%, BMI < 25 kg/m^2) during the follow-up interview one point was given. Additionally, one point was given for taking an antiplatelet agent and an angiotensin converting enzyme inhibitor (ACEI) or a sartan. Thus, the secondary prevention coefficient could vary from 1 to 7. The survey protocol was approved by the institutional Bioethics Committee.

Statistical analysis

Categorical variables were reported as percentages and continuous variables as means ± standard deviation. The Pearson χ^2 test was applied to all categorical variables. Normally distributed continuous variables were compared by using the Student's t test or analysis of variance. Variables without normal distributions were evaluated using the Mann-Whitney U test or the Kruskal-Wallis analysis of variance. Stepwise multivariate analysis was performed using the multivariate regression analysis as implemented in the STATISTICA 8.0 software (StatSoft INC., Tulsa, USA). Adjusted R^2 statistic was used as an indicator of the best statistical model. A 2-tailed p value < 0.05 was regarded as indicating statistical significance.

Results

The medical records of 595 patients were reviewed and included in the analyses. The mean age, sex and proportion of men to women by survey are presented in Table 1. The patients from the PCI

Table 2. Proportions of hospital records with available information on risk factors.

	MI	UA	PCI	CABG	P	Total
Smoking*	92.5%	88.5%	95.0%	92.1%	0.25	91.6%
Hypertension*	96.6%	97.9%	96.0%	97.4%	0.77	97.0%
Blood pressure**	98.9%	98.4%	96.0%	100.0%	0.21	98.3%
Dyslipidemia*	84.35	82.2%	92.9%	89.5%	0.08	85.4%
Total cholesterol**	75.7%	78.0%	66.7%	73.7%	0.20	74.8%
Diabetes*	98.5%	100.0%	98.0%	100.0%	0.26	99.0%
Weight and height**	61.8%	73.8%	98.0%	52.6%	< 0.001	71.1%

*Any information in the medical record about risk factor prior to hospitalization; **Measurement during hospitalization; CABG — coronary artery bypass grafting; MI — myocardial infarction; PCI — percutaneous coronary intervention; UA — unstable angina

Table 3. Prescription rates of cardioprotective drugs at discharge.

	MI	UA	PCI	CABG	P	Total
Antiplatelets	99.3%	99.0%	100.0%	100.0%	0.72	99.3%
Beta-blockers	83.2%	84.8%	95.0%	76.3%	0.01	85.2%
ACEI/sartans	79.8%	89.0%	97.0%	73.7%	< 0.001	85.2%
Calcium antagonists	20.2%	31.4%	23.2%	18.4%	0.04	24.2%
Diuretics	36.0%	43.5%	45.5%	39.5%	0.26	40.2%
Lipid lowering drugs	92.1%	95.8%	99.0%	84.2%	< 0.01	93.9%
Antidiabetic agents	28.5%	23.0%	30.3%	34.2%	0.35	27.4%
Anticoagulants	24.3%	23.0%	9.1%	34.2%	< 0.01	22.0%

ACEI — angiotensin converting enzyme inhibitors; CABG — coronary artery bypass grafting; MI — myocardial infarction; PCI — percutaneous coronary intervention; UA — unstable angina

group were the youngest, whereas the proportion of women was the highest in the UA group.

The proportions of medical records with available information on risk factors are presented in the Table 2. We found no major differences in the proportions of medical records with available information on risk factors between index diagnoses with the exception of weight and height. The proportion of medical records with available information on weight and height was significantly lower in the CABG and MI groups when compared with the other index diagnoses. Cardioprotective drugs prescription rates at discharge are shown in Table 3. The prescription rate of beta-blockers (BB), ACEI or sartans, calcium antagonists, lipid-lowering drugs, and anticoagulants differed between the index diagnoses, whereas the prescription rate of antiplatelets and diuretics were similar across groups.

Out of the 595 invited patients 380 (63.9%) participated in the follow-up examination 6–18 months after discharge from hospital. The participation rate differed significantly across the index events: MI group — 55.4%, UA group — 65.4%, PCI group — 81.8%, CABG group — 68.4% ($p < 0.05$). No significant differences were found between men and women (63.5% vs. 64.6%, p = NS). There were no significant differences in mean age of those who underwent a follow-up examination and those who did not (62.6 ± 8.6 years vs. 63.2 ± 9.7 years, p = NS).

The study participants did not differ significantly between the index events in respect of the duration of education, employment, practice setting, and the specialization of the physician deciding on the course of management (Table 1). Overall, 33.9% of the study participants declared they had been advised to participate in a rehabilitation/secondary prevention program following the index hospitalization (MI 39.2%, UA 32.8%, PCI 21.0%, CABG 50.0%; $p < 0.05$) and 30.5% participated in a rehabilitation/secondary prevention program following the index hospitalization. However, only 28.2% took part in at least half of the planned sessions (MI 32.4%, UA 25.6%, PCI 17.3%, CABG 50.0%; $p < 0.05$).

We found that 20.3% of the participants smoked, 47.2% had high blood pressure, 72.8%

Table 4. Proportions of patients who did not reach treatment goals 6–18 months after discharge.

	MI	UA	PCI	CABG	P	Total
Smoking	17.6%	22.4%	22.2%	19.2%	0.75	20.3%
BP ≥ 140/90 mm Hg	43.5%	46.3%	54.3%	50.0%	0.47	47.2%
LDL-C ≥ 1.8 mmol/L	71.1%	72.6%	73.8%	80.0%	0.83	72.8%
HbA_{1c} ≥ 7.0%	16.2%	13.3%	15.0%	8.6%	0.20	13.9%
BMI ≥ 25 kg/m^2	79.1%	80.5%	84.0%	76.9%	0.80	80.4%
BMI ≥ 30 kg/m^2	38.5%	40.7%	39.5%	15.4%	0.11	37.8%

BMI — body mass index; BP — blood pressure; HbA_{1c} — glycated hemoglobin; LDL-C — low density lipoprotein cholesterol; CABG — coronary artery bypass grafting; MI — myocardial infarction; PCI — percutaneous coronary intervention; UA — unstable angina

Table 5. Proportions of patients taking cardioprotective drugs 6–18 months after discharge from hospital.

	MI	UA	PCI	CABG	P	Total
Antiplatelets	91.9%	84.8%	93.8%	88.5%	0.13	89.7%
Beta-blockers	80.8%	77.7%	88.9%	88.5%	0.15	81.8%
ACEI/sartans	76.4%	81.6%	76.5%	76.9%	0.73	78.2%
Calcium antagonists	17.6%	31.2%	22.2%	19.2%	0.06	23.2%
Diuretics	37.2%	45.6%	40.7%	38.5%	0.56	40.8%
Lipid lowering drugs	83.1%	76.8%	87.7%	88.5%	0.18	82.4%
Antidiabetic agents	26.4%	27.3%	35.4%	32.0%	0.50	29.0%
Anticoagulants	4.9%	5.0%	10.1%	16.0%	0.10	6.8%

ACEI — angiotensin converting enzyme inhibitors; CABG — coronary artery bypass grafting; MI — myocardial infarction; PCI — percutaneous coronary intervention; UA — unstable angina

Table 6. Proportions of smokers (before the index hospitalization or at the time of the follow-up examination) being ever instructed by a physician on smoking cessation (as declared by the patients).

	MI	UA	PCI	CABG	P	Total
Oral advice	68.5%	74.4%	63.6%	44.4%	0.36	67.7%
Advice using printed materials	31.4%	34.3%	36.4%	33.3%	0.98	33.3%
Referral to a smoking cessation clinic	22.2%	20.6%	22.7%	12.5%	0.93	21.1%
Nicotine replacement therapy	11.1%	20.6%	13.6%	0.0%	0.38	13.6%
Bupropion or varenicline	11.1%	9.1%	4.6%	0.0%	0.63	8.3%
Advice on other methods	11.4%	8.8%	4.6%	0.0%	0.62	8.3%

CABG — coronary artery bypass grafting; MI — myocardial infarction; PCI — percutaneous coronary intervention; UA — unstable angina

high LDL-C level, 13.9% had HbA_{1c} ≥ 7.0%, and 37.8% were obese 6–18 months after discharge (Table 4). No significant relation between the index events and the control of risk factors was found. Proportion of patients taking antiplatelets, BB, ACEI/sartans, diuretics, lipid-lowering drugs, and antidiabetic agents did not differ significantly between the index groups (Table 5). The only significant difference was higher proportion of patients from the UA group taking calcium antagonists as compared with the MI group ($p < 0.01$), and higher proportion of CABG participants taking anticoagulants when compared with the MI ($p < 0.05$) and UA ($p < 0.05$) groups.

The proportions of smokers being ever instructed on methods of smoking cessation are presented in Table 6, whereas the proportions of patients being ever instructed in healthy diet are presented in Table 7. The study groups did not differ in proportions of participants instructed in smoking cessation methods or healthy diet.

The mean secondary prevention coefficient was 4.35 ± 1.08. In the univariate analysis, the secondary prevention coefficient was related

Table 7. Proportions of patients being ever instructed by a physician in healthy diet (as declared by the patients).

	MI	UA	PCI	CABG	P	Total
Reduction of salt intake	73.8%	78.7%	81.5%	80.8%	0.54	77.5%
Reduction of fat intake	80.7%	84.4%	87.7%	88.5%	0.50	84.0%
Increase in unsaturated fats intake	77.4%	81.2%	86.4%	88.5%	0.29	81.3%
Reduction of calories intake	71.2%	76.2%	70.4%	76.9%	0.71	73.1%
Increase in vegetables and fruits intake	78.1%	79.5%	86.4%	84.6%	0.44	80.8%
Increase in fish intake	67.8%	68.9%	77.8%	80.8%	0.26	71.2%

CABG — coronary artery bypass grafting; MI — myocardial infarction; PCI — percutaneous coronary intervention; UA — unstable angina

to participation in the rehabilitation/secondary prevention program following the index hospitalization, yet not to the index event (Table 8). In a multivariate model, the secondary prevention coefficient was related to the patient's age, education and participation in a rehabilitation/secondary prevention program following the index hospitalization (Table 9).

Discussion

In general, our results did not show a big improvement in the management of patients after hospitalization for CAD as compared to the previous survey which was finished in 2012 [11]. As in the previous surveys we found considerable potential for further reduction of cardiovascular risk in CAD patients [8, 10, 11].

Unfortunately, no study published in recent years was designed to assess secondary prevention of CAD outside Krakow. However, some recently published data from registries of patients hospitalized due to acute coronary syndromes are available [12, 13]. In a nation-wide registry of acute coronary syndrome hospitalizations it was estimated that the average prescription rate at discharge for aspirin and lipid lowering agents was slightly below 90%, and for BB and ACEI below 80% [12]. In 3,564 patients hospitalized for ST-elevation MI in Greater Poland, the prescription rates were 96% for antiplatelet agents, 74% for BB, 58% for ACEI and 90% for statins [13]. It should be stressed that the prescription rates of cardiopreventive medications in Poland are similar to the average prescription rates in centers participating in the EUROASPIRE III Survey [9], and much higher compared to centers from high-income countries participating in the PURE Study [14].

The present results confirm the observations of the survey carried out in 2006–2007 which suggested no major sex-related difference in the proportions of patients who achieved recommended treatment targets in secondary prevention [15]. We also showed that older patients (age ≥ 70 years)

Table 8. The secondary prevention coefficient (SPC) values according to subgroups of patients.

Subgroup	SPC	P
Age:		0.14
< 60 years	4.24 ± 1.11	
60–70 years	4.33 ± 1.07	
≥ 70 years	4.54 ± 1.05	
Sex:		0.14
Men	4.41 ± 1.06	
Women	4.24 ± 1.09	
Duration of education:		0.09
≤ 11 years	4.27 ± 1.09	
> 11 years	4.47 ± 1.08	
Index diagnosis:		0.58
Myocardial infarction	4.41 ± 1.16	
Unstable angina	4.36 ± 1.08	
PCI	4.21 ± 0.94	
CABG	4.46 ± 1.14	
Practice setting:		0.37
Hospital outpatient clinics	4.42 ± 1.08	
Outpatient clinics	4.21 ± 1.07	
Private cardiology practices	4.48 ± 1.03	
No regular health check-up	4.38 ± 1.51	
Specialization of the physician:		0.08
Cardiologist	4.39 ± 1.10	
General practitioner	4.05 ± 0.97	
Professionally active	4.34 ± 0.97	0.93
Professionally inactive	4.36 ± 1.12	
Rehabilitation/secondary prevention program:		< 0.05
Participated	4.55 ± 1.10	
Not participated	4.28 ± 1.07	
Total	4.35 ± 1.08	

CABG — coronary artery bypass grafting, PCI — percutaneous coronary intervention

Table 9. Variables related to the value of the secondary prevention coefficient in the multivariate analysis.

	Beta ± standard error	P
Age [years]	0.15 ± 0.05	0.01
Participation in a rehabilitation/secondary prevention program following the index hospitalization (yes: 1, no: 0)	0.11 ± 0.05	< 0.05
Duration of education [years]	0.11 ± 0.05	< 0.05
Sex (male: 1, female: 0)	0.08 ± 0.05	0.11
Practice setting (outpatient clinics: 1, other practice settings: 0)	–0.07 ± 0.05	0.18
Specialization of the physician (cardiologist: 1, general practitioner: 0)	0.06 ± 0.05	0.24

smoked less frequently compared to patients aged < 60 [15]. On the other hand, fewer patients aged ≥ 70 years had blood pressure < 140/90 mm Hg when compared with younger subjects. No major age-related difference in respect to the other main risk factors or prescriptions rates of cardioprotective medications was found [15]. Indeed, the present results confirm that in general, older age (at least up to 80 years) is not related to lower standard of medical care in the field of secondary prevention.

It should be emphasized that the present results still suggest insufficient control over all main cardiovascular risk factors. As one of the important determinants of reaching the treatment targets is participation in the secondary prevention/cardiac rehabilitation programs, the finding that the low and decreasing proportion of patients had been advised to participate in the secondary prevention program/cardiac rehabilitation does not allow being optimistic. Indeed, in the previous report we showed that the proportion of patients who were advised to participate in such programs was 53.9% in 2005–2006 and 47.1% in 2010–2011, whereas the proportions of patients who finally participated in a rehabilitation/secondary prevention program were 35.9% and 33.3%, respectively [11]. It was shown that such programs result in better control of risk factors and improve prognosis [16–18]. Indeed, it seems that a higher participation rate in the secondary prevention/cardiac rehabilitation programs could result in better control of risk factors. Itshould be also stressed that the improved cooperation between hospital and outpatient clinic staff, as well as better access to a cardiologist in case of any suspicion of heart-related problems could further improve the patients' prognosis. Recently, experts from the Polish Cardiac Society described the "Optimal Model of Comprehensive Rehabilitation and Secondary Prevention", wide implementation of which in Poland could be related to a decrease in the number of deaths by 3,389, in the number of MIs by 3,872, in the number of myocardial revascularization procedures by 13,499, and in the number of cardiac hospitalizations by 23,182 yearly [19].

Limitations of the study

The present study has some limitations. Firstly, we were unable to assess the impact of secondary prevention guidelines on the risk of cardiovascular complications. Secondly, our study participants were not representative of all CAD patients. Participants were limited to those who had experienced an acute CAD event or had undergone a revascularization procedure. Therefore, our results should not be directly applied to other CAD patients. Finally, we did not analyze the doses of cardioprotective drugs taken by the patients. It is possible that blood pressure, cholesterolemia, and glycemia were not controlled in some cases due to insufficient doses of the drugs prescribed. It should also be pointed out that we had no information on the patients' compliance with instructions regarding prescriptions. It is reasonable to suspect that some patients had been taking their medications irregularly.

Conclusions

Our data provide evidence that there is a considerable potential for further reduction of cardiovascular risk in CAD patients. Our results suggest that increasing the participation rate in rehabilitation/secondary prevention programs may improve the implementation of the secondary prevention guidelines.

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Conflict of interest: None declared

References

1. WHO, World Health Organization. The World Health Report. WHO, Geneva 2008. http://www.who.int/whr/2008/whr08_en.pdf.
2. World Health Organization Regional Office for Europe (HFA-DB), European health for all database. April 2014.
3. Rządowa Rada Ludnościowa. Sytuacja Demograficzna Polski. Raport 2011–2012. Warszawa 2012.
4. De Bacquer D, Dallongeville J, Kotseva K et al. Residual risk of cardiovascular mortality in patients with coronary heart disease: The EUROASPIRE Risk Categories. Int J Cardiol, 2013; 168: 910–914.
5. Simpson CR, Buckley BS, McLernon DJ, Sheikh A, Murphy A, Hannaford PC. Five-year prognosis in an incident cohort of people presenting with acute myocardial infarction. PLoS One, 2011; 6: e26573.
6. European Guidelines on cardiovascular disease prevention in clinical practice (version 2012). The Fifth Joint Task Force of the European Society of Cardiology and Other Societies on Cardiovascular Disease Prevention in Clinical Practice. Eur Heart J, 2012; 33: 1635–1701.
7. Kawecka-Jaszcz K, Pająk A, Jankowski P. Krakow Program for Secondary Prevention of Ischaemic Heart Disease. Part I. Genesis and objectives. Przegl Lek, 2001; 58: 953–955.
8. Jankowski P, Kawecka-Jaszcz K, Pająk A et al. Cracovian program for secondary prevention of ischemic heart disease. Secondary prevention of ischemic heart disease after discharge in 1997–1998 and 1999–2000. Przegl Lek, 2003; 60: 142–146.
9. Kotseva K, Wood D, De Backer GD, De Bacquer D, Pyörälä K, Keil U; The EUROASPIRE Study Group. EUROASPIRE III: A survey on the lifestyle, risk factors and use of cardioprotective drug therapies in coronary patients from 22 European countries. EJCPR, 2009; 16: 121–137.
10. Pajak A, Jankowski P, Kawecka-Jaszcz K et al. Changes in secondary prevention of coronary artery disease in the post-discharge period over the decade 1997–2007. Comparison of Cracovian Program for Secondary Prevention of Ischaemic Heart Disease and Polish parts of EUROASPIRE II and EUROASPIRE III surveys. Kardiol Pol, 2009; 67: 1353–1359.
11. Jankowski P, Czarnecka D, Łysek R et al. Secondary prevention in patients after hospitalization due to coronary artery disease: What has changed since 2006? Kardiol Pol, 2014; 72: 355–362.
12. Poloński L, Gasior M, Gierlotka M et al. Polish Registry of Acute. Coronary Syndromes (PL-ACS). Characteristics, treatments and outcomes of patients with acute coronary syndromes in Poland. Kardiol Pol, 2007; 65: 861–872.
13. Grajek S, Lesiak M, Araszkiewicz A et al. Short- and long-term mortality in patients with ST-elevation myocardial infarction treated with different therapeutic strategies. Results from WIelkopolska REgional 2002 Registry (WIRE Registry). Kardiol Pol, 2008; 66:154–163.
14. Yusuf S, Islam S, Chow CK et al. Use of secondary prevention drugs for cardiovascular disease in the community in high-income, middle-income, and low-income countries (the PURE Study): A prospective epidemiological survey. Lancet, 2011; 378: 1231–1243.
15. Jankowski P, Czarnecka D, Wolfshaut-Wolak R et al. Age, sex, and secondary prevention of ischaemic heart disease in everyday practice. Kardiol Pol, 2013; 71: 1251–1259.
16. Heran BS, Chen JM, Ebrahim S et al. Exercise-based cardiac rehabilitation for coronary heart disease. Cochrane Database Syst Rev, 2011; 7: CD001800.
17. Brown JP, Clark AM, Dalal H, Welch K, Taylor RS. Patient education in the management of coronary heart disease. Cochrane Database Syst Rev, 2011; 12: CD008895.
18. Wood DA, Kotseva K, Connolly S et al. Nurse-coordinated multidisciplinary, family-based cardiovascular disease prevention programme (EUROACTION) for patients with coronary heart disease and asymptomatic individuals at high risk of cardiovascular disease: A paired, cluster-randomised controlled trial. Lancet, 2008; 371: 1999–2012.
19. Jankowski P, Niewada M, Bochenek A et al. Optimal model of comprehensive rehabilitation and secondary prevention. Kardiol Pol, 2013; 71: 995–1003.