Secondary prevention of coronary artery disease in hospital practice over the decade 1996-2006. Results of the Cracovian Program for Secondary Prevention of Ischaemic Heart Disease and Polish parts of the EUROASPIRE II and EUROASPIRE III surveys

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Abstract

Background: Both in the European and Polish guidelines the highest priority for preventive cardiology was given to patients with established cardiovascular disease. The Cracovian Program for Secondary Prevention of Ischaemic Heart Disease was initiated in 1996. The main goal of the program was to assess and improve the quality of clinical care in the secondary prevention of ischaemic heart disease. Later, the same centres joined the EUROASPIRE (European Action on Secondary and Primary Prevention Intervention to Reduce Events) II and III surveys.

Aim: To compare the quality of secondary prevention in Krakow cardiac departments in 1996/1997, 1998/1999 and 2005/2006.

Methods: Five hospitals serving the area of the city of Krakow and surrounding districts (former Krakow Voivodship), inhabited by 1 200 000 persons, took part in the surveys. Consecutive patients hospitalised from July 1, 1996 to September 31, 1997 (first survey), from March 1, 1998 to March 30, 1999 (second survey), and from April 1, 2005 to July 31, 2006 (third survey) due to acute myocardial infarction, unstable angina or for myocardial revascularisation procedures, below the age of < 71 years were recruited and included to the present analysis. All medical records were reviewed by trained reviewers using standardised data collection forms.

Results: Medical records of 536 patients treated in 1996/1997, 515 treated 1998/1999, and 540 treated in 2005/2006 were reviewed and analysed. Proportions of medical records with available information on risk factors prior to hospitalisation as well as proportions of medical records with available information on blood pressure (by 10%, $p < 0.05$) and lipids (by over 30%, $p < 0.05$) measurements during the first 24 h of hospitalisation as well as on weight and height measurements (by 16%, $p < 0.05$) increased significantly from 1996/1997 to 2005/2006. Antiplatelets prescription rate at discharge increased from 87% to 97% ($p < 0.05$), prescription rate for beta-blockers increased from 66% to 91% ($p < 0.05$), ACE inhibitors/sartans from 50% to 89% ($p < 0.05$), and lipid lowering drugs from 27% to 96% ($p < 0.05$) between 1996/1997 and 2005/2006, respectively.

Conclusions: The implementation of secondary prevention guidelines into clinical practice in the Krakow cardiac departments improved in 2005/2006 as compared to 1996/1997 and 1998/1999. Our results suggest that recent decade brought significant improvement in the approach to secondary prevention of ischaemic heart disease in hospital practice.

Key words: coronary artery disease, risk factors, secondary prevention

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Introduction

Coronary artery disease (CAD) is the most common single cause of death in developed countries. The objectives of CAD prevention are to reduce morbidity and mortality, to improve quality of life, and to increase life expectancy. The European Society of Cardiology and other European scientific societies published recommendations on prevention of CAD in clinical practice in 1994 [1] and updated them in 1998 [2] and in 2003 [3]. The recommendations of the Polish Cardiac Society were published in 1997 [4-6] and 2000 [7]. The third European recommendations were endorsed by the Polish Cardiac Society and were translated into Polish in 2004 [8]. The new European Society of Cardiology recommendations were published in 2007 [9].

In all versions of European recommendations the highest priority was given to patients with established cardiovascular disease. Hospitalisation due to CAD is a crucial moment for the initiation of patient education as well as for the initiation of non-pharmacological and pharmacological treatment in the secondary prevention of CAD. If the hospital physician does not initiate the action, the chance that it will be introduced later is low [10, 11]. Primary care physicians may assume that medications not prescribed at discharge were the result of careful consideration by the specialist. It was shown that hospital-initiated prescriptions (particularly those for cardiovascular agents) are responsible for a considerable proportion of general practitioners' prescribing [11, 12].

The Cracovian Program for Secondary Prevention of Ischaemic Heart Disease was initiated in 1996. The main goal of the programme was to assess and improve the quality of clinical care in secondary prevention of CAD. The first results concerning patients hospitalised in Kraków university and community cardiac departments in 1996 and 1997 showed that implementation of CAD prevention guidelines into daily practice was inadequate and there was considerable potential to further reduce the risk in these patients [13, 14]. Subsequently, the same centres took part in the EUROASPIRE (European Action on Secondary trough Prevention and Primary Intervention to Reduce Events) II survey [15, 16]. This initiative allowed comparison of the implementation of CAD prevention recommendations into everyday clinical practice between Polish and other European centres [15]. In 2005-2007 the same Polish hospitals took part in the EUROASPIRE III survey [17]. Results of the EUROASPIRE surveys showed that there were large areas for improvement throughout Europe.

The aim of the present analysis was to compare the quality of secondary prevention of CAD in Krakow cardiac departments in 1996/1997, 1998/1999 and 2005/2006.

Methods

Study group

Studied groups and methods used were described in detail in previous reports [13-16]. Briefly, five hospitals with departments of cardiology serving the area of the city of Krakow and surrounding districts (former Krakow Voivodship, population of about 1 200 000 inhabitants) took part in the study. At least one department of cardiology in each hospital participated in the surveys. Within each department consecutive patients hospitalised from July 1, 1996 to September 31, 1997 (first survey), from March 1, 1998 to March 30, 1999 (second survey), and from April 1, 2005 to July 31, 2006 (third survey) with the following discharge diagnosis were recruited:

- acute myocardial infarction (MI) [first or recurrent, no prior percutaneous coronary intervention (PCI) or coronary artery bypass grafting (CABG)],
- unstable angina (first or recurrent, no prior PCI or CABG),
- percutaneous coronary intervention (first, no prior CABG),
- qualification for coronary artery bypass surgery (first). Patients selected for CABG combined with valvular surgery were not recruited.

Patients were identified retrospectively excluding those who died during their in-hospital stay. If a patient was hospitalised more than once during the study period, only the first admission was included in the analysis. The first survey was conducted as the Cracovian Program for Secondary Prevention of Ischaemic Heart Disease [13, 14], the second as part of the EUROASPIRE II survey [15, 16] and the third one as part of the EUROASPIRE III survey [17]. In the first and second survey the inclusion criterion was age < 71 years whereas in the third survey patients below the age of 80 were recruited. To ensure comparability of the data only persons of age < 71 years were included in the present analysis.

Data analysis

All medical records were reviewed by trained reviewers using a standardised data collection form that included information about demographics, personal cardiac history, coronary risk factors, and medications. To assure the quality of data, recording a duplicate independent assessment of the first ten medical records by the principal investigator responsible for data collection was undertaken with each research assistant. The study protocol was approved by the Local Ethics Committee (KBET/115/B/2005).

Statistical analysis

Categorical variables are presented as percentages and continuous variables as means ± SD. The Pearson χ^2 test was applied to all categorical variables. Normally distributed continuous variables were compared by using Student's t-test. Variables without normal distributions were evaluated with the Mann-Whitney U test. A two-tailed

Table I. Study groups by survey and by diagnostic group

		Myocardial infarction	Unstable angina	PCI	CABG	Total
1996/1997	n (%)	152 (28.4)	123 (22.9)	132 (24.6)	129 (24.1)	536 (100.0)
1998/1999	n (%)	138 (26.8)	124 (24.1)	127 (24.7)	126 (24.5)	515 (100.0)
2005/2006	n (%)	137 (25.4)	149 (27.6)	158 (29.3)	96 (17.8)	540 (100.0)
Differences (95% CI)						
1998/1999 vs. 1996/1997		–1.6 (–6.9-3.8)	1.1 (–4.1-6.4)	0.0 (–5.3- –5.4)	0.4 (–4.6-5.4)	
2005/2006 vs. 1998/1999		–1.4 (–6.8-3.9)	3.5 (–1.7-8.7)	4.6 (–0.7-9.9)	–6.7 (–11.7- –1.7)	
2005/2006 vs. 1996/1997		–3.0 (–8.3-2.3)	4.6 (–0.5-9.8)	4.6 (–0.6-9.9)	–6.3 (–11.2- –1.3)	

Abbreviations: PCI – percutaneous coronary intervention, CABG – coronary artery bypass grafting

p value < 0.05 was considered statistically significant. A general linear model was used to assess the independent differences between the three surveys and their 95% confidence intervals.

Results

Medical records of 536 patients treated in 1996/1997, 515 treated in 1998/1999, and 540 treated in 2005/2006 were reviewed and analysed (Table I). A relatively smaller group of patients qualified for CABG was included in the third survey. Mean age and sex distribution by survey are presented in Table II. A small but significant increase in the mean age was observed whereas gender distribution did not differ significantly between the three surveys. Proportions of medical records with available information on risk factors, prior to hospitalisation are presented in Table III. Although the proportions of records with available notes increased significantly for all main risk factors, the largest increase was found for diabetes and hyperlipidaemia. The percentage of medical records with available information on blood pressure and lipid measurements during the first 24 h of hospitalisation as well as on weight and height measurements increased significantly from 1996/1997 to 2005/2006 (Table IV).

Cardioprotective drug prescription rates at discharge are shown in Table V. The use of antiplatelets, diuretics, lipid-lowering drugs and antidiabetic agents increased from 1996/1997 to 2005/2006 whereas the use of anticoagulants decreased. A significant increase in the prescription rates of beta-blockers and ACE inhibitors/sartans in 2005/2006 as compared with the previous surveys can also be seen (Table V). On the other hand, the use of calcium antagonists decreased significantly in patients participating in the third survey. No single patient was prescribed nicotine replacement therapy, bupropion, or varenicline.

Table II. Mean age and gender distribution by survey

	Mean age [years ± standard deviation]	Men/women [%]
1996/1997	56.6 ± 8.4	73.9/26.1
1998/1999	57.6 ± 8.2	69.5/30.5
2005/2006	58.7 ± 7.7	72.0/28.0
Differences (95% CI)		
1998/1999 vs. 1996/1997	1.0 (0.0-2.0)	–4.4 (–9.8-1.1)
2005/2006 vs.1998/1999	1.1 (0.1-2.1)	2.5 (–2.9-8.0)
2005/2006 vs. 1996/1997	2.1 (1.1-3.1)	–1.8 (–7.2-3.5)

Discussion

In this report the first Polish analysis assessing temporal changes in secondary prevention guidelines implementation in patients hospitalised due to CAD is presented. Our results showed an improvement in the management of patients hospitalised due to ischaemic heart disease in cardiac departments over the last 10 years. The proportion of hospital records with available information on risk factors can be considered as a measure of physicians' attitude to specific risk factors as well as to prevention as a whole. Our results suggest that in the nineties only smoking and hypertension were considered as important risk factors by the overwhelming majority of physicians. Proportions of records with available information on all main risk factors increased significantly in the subsequent years. However, there is still a lot of room for further improvement.

Similarly, the proportions of medical records with available information on blood pressure, lipids, weight and height measurements increased. However, cholesterol level had not been measured during the first 24 h of hospitalisation in about 36% of the third survey participants. Although statins were prescribed at discharge in the majority of patients, such practice (prescription of a statin without determination of cholesterol level) should not be considered correct.

The proportion of medical records with available information on smoking was higher compared to hyperlipidaemia and diabetes in all surveys as well as to hypertension in 1996/1997 and 1999/2000. However, no patient was prescribed nicotine replacement therapy, bupropion, or varenicline in any of the surveys. Indeed, this could represent failure in the treatment of smoking in coronary patients.

Table III. Temporal changes in proportion of hospital records with available information on risk factors prior to hospitalisation

	Smoking [%]	Hypertension [%]	Hyperlipidaemia [%]	Diabetes [%]
1996/1997	89.4	80.0	10.6	41.2
1998/1999	90.7	85.6	20.6	62.3
2005/2006	93.7	93.9	58.7	73.0
Differences adjusted for age, gender, and diagnostic group (95% CI)				
1998/1999 vs. 1996/1997	1.3 (–2.1-4.7)	5.6 (1.5-9.7)	9.9 (5.0-14.9)	21.1 (15.4-26.8)
2005/2006 vs. 1998/1999	3.0 (–0.4–6.4)	8.2 (4.2-12.3)	38.1 (33.2-43.0)	10.6 (4.9-16.3)
2005/2006 vs. 1996/1997	4.3 (1.0-7.7)	13.8 (9.8-17.9)	48.1 (43.2-52.9)	31.7 (26.1-37.4)

Table IV. Temporal changes in proportion of hospital records with available information on measurement of risk factors during hospitalisation

	Blood pressure* [%]	Total cholesterol* [%]	HDL cholesterol* [%]	Triglycerides* [%]	Weight and height [%]
1996/1997	88.8	32.8	30.2	32.3	54.3
1998/1999	94.2	45.1	41.9	44.5	61.7
2005/2006	99.7	64.4	64.1	64.1	69.8
Differences adjusted for age, gender, and diagnostic group (95% CI)					
1998/1999 vs. 1996/1997	5.4 (2.5-8.2)	12.2 (6.4-18.0)	11.7 (6.0-17.5)	12.2 (6.4-18.0)	7.5 (1.6-13.3)
2005/2006 vs. 1998/1999	4.5 (1.7-7.4)	19.4 (13.6-25.2)	22.1 (16.4-27.9)	19.6 (13.8-25.4)	8.1 (2.3-13.9)
2005/2006 vs. 1996/1997	9.9 (7.1-12.7)	31.6 (25.9-37.3)	33.9 (28.2-39.5)	31.8 (26.1-37.5)	15.5 (9.8-21.3)

** during first 24 h of hospitalisation*

Table V. Temporal changes in prescription rates of cardioprotective drugs at discharge

	Antiplatelets [%]	Beta-blockers [%]	ACE inhibitors/ sartans [%]	Calcium antagonists [%]	Diuretics [%]	Lipid lowering drugs [%]	Anticoagulants [%]	Antidiabetic agents [%]
1996/1997	86.7	66.4	50.2	30.4	12.8	27.1	15.0	9.9
1998/1999	90.7	61.9	52.8	36.5	19.4	41.6	6.0	13.2
2005/2006	97.4	90.6	88.7	20.9	33.2	95.9	3.9	21.7
Differences adjusted for age, gender, and diagnostic group (95% CI)								
1998/1999 vs. 1996/1997	4.0 (0.7-7.3)	–4.4 (–9.5-0.7)	2.6 (–2.7-8.0)	6.1 (0.6-11.5)	6.6 (1.8-11.4)	14.5 (9.7-19.3)	–9.0 (–12.3- –5.7)	3.3 (–0.9-7.6)
2005/2006 vs. 1998/1999	6.7 (3.4-10.8)	24.4 (19.4-29.4)	35.7 (30.4-41.0)	–15.8 (–21.2- –10.4)	14.1 (9.3-18.9)	54.2 (49.4-56.0)	–2.1 (–5.4-1.1)	8.5 (4.2-12.7)
2005/2006 vs. 1996/1997	10.8 (7.5-15.0)	28.8 (23.8-33.8)	38.3 (33.1-43.6)	–9.7 (–15.1- –4.4)	20.7 (16.0-25.5)	68.7 (63.9-73.4)	–11.1 (–14.4- –7.9)	11.8 (7.6-16.0)

The observed improvement in the implementation of secondary prevention in everyday hospital practice could be caused by several factors. Among them publication and promotion of the European and Polish guidelines is the most important factor. Also, the requirements of the National Health Fund could participate in the improvement of quality of hospital records. Another cause could be the unrecognised differences between the studied samples. The difference in mean age could not be responsible for the considerable differences as we adjusted all differences for age and gender.

Our results indicate that although a considerable improvement in compliance with secondary prevention recommendations was achieved in 2005/2006, there is still potential to further improve the quality of medical care in the secondary preventions of CAD. The EUROASPIRE surveys showed large variations between participating centres but the compliance with European Society of

Cardiology guidelines was similar in Krakow compared to the mean of all participating European countries [15, 16]. The EUROASPIRE surveys as well as the Euro Heart ACS Survey showed increasing prescription rates of cardioprotective medications at discharge. The increase in Krakow hospitals was greater when compared with the average increase in Europe [15, 17-19].

Other evidence of the quality of medical care in the field of secondary prevention in Polish hospitals is rather scarce. In 2002 a report from Białystok (north Poland) was published [20]. No later study outside of Krakow was designed specifically to assess secondary prevention of ischaemic heart disease in Polish hospitals. However, data from several registries of patients hospitalised due to acute coronary syndromes were published recently [21, 22]. In a nationwide registry of acute coronary syndrome hospitalisations it was estimated that the average proportion of patients with aspirin prescribed at discharge is below 90%, with lipid-lowering drugs also < 90%, whereas beta-blockers and ACE inhibitors are below 80% [21]. In 3564 patients hospitalised due to MI with ST-elevation within 24 hours from symptoms onset in Wielkopolska Region, the prescription rates were 96% for antiplatelet agents, 74% for beta-blockers, 58% for ACE inhibitors and 90% for statins [22]. The differences between our data and data from other Polish studies can partially be explained by the differences in the methodology. The other studies relied on the physicians' declarations and we collected data by independent reviews of the hospital records.

Limitations of the study

The main limitation of our study was that the quality of analysed data depended on the accuracy of information contained in the medical records. We could not assess the impact of changes in the implementation of secondary prevention on cardiovascular complications during and after hospitalisation. Nevertheless, it is expected that the changes in the quality of clinical care during hospitalisation favourably influence the patient's survival. There may have been some unrecognised differences in the patient populations served by the hospitals, or across diagnostic groups, that could have influenced the approach to secondary prevention. It has to be recognised that the study group was not representative for all CAD patients, because they were hospitalised for acute coronary events or for revascularisation procedures. However, the majority of secondary prevention recommendations are essentially the same for all ischaemic heart disease patients. Anyway, no firm data from Poland suggest that the changes in compliance with the preventive guidelines in patients hospitalised for other forms of CAD are different. We were not able to analyse doses of cardioprotective drugs. It is possible that although the lipid-lowering drug prescription rate is now quite satisfactory, the doses are lower than those proven in large clinical trials to reduce cardiovascular mortality and morbidity. This may also be the case with other cardioprotective medications. We could not analyse the frequency of lifestyle recommendations provided to hospitalised patients. Another limitation is that medical records of patients aged below 71 years were reviewed, therefore, our results may not apply to older patients.

Conclusions

The implementation of CAD prevention guidelines into clinical practice in the Krakow cardiac departments improved in 2005/2006 as compared to 1996/1997 and 1998/1999: information on risk factors in the hospital notes was found more frequently, risk factors were measured more often, and the prescription rates of cardioprotective drugs increased. The largest improvement was found in the management of hypercholesterolaemia. Our results suggest that the last decade has brought significant improvement in the approach to secondary prevention of CAD in everyday hospital practice.

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Wtórna prewencja choroby niedokrwiennej serca w praktyce szpitalnej w latach 1996–2006. Wyniki Krakowskiego Programu Wtórnej Prewencji Choroby Niedokrwiennej Serca oraz polskich części badań EUROASPIRE II i EUROASPIRE III

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Streszczenie

Wstęp: Zgodnie z aktualnymi wytycznymi Europejskiego Towarzystwa Kardiologicznego za najważniejszą grupę docelową działań profilaktycznych uważa się osoby z chorobami układu krążenia na podłożu miażdżycowym. Najważniejszym celem rozpoczętego w 1996 r. Krakowskiego Programu Wtórnej Prewencji Choroby Niedokrwiennej Serca była ocena jakości postępowania medycznego w zakresie wtórnej prewencji u osób w trakcie i po hospitalizacji z powodu choroby niedokrwiennej serca. Ośrodki uczestniczące w Krakowskim Programie Wtórnej Prewencji wzięły następnie udział w prowadzonych pod auspicjami Europejskiego Towarzystwa Kardiologicznego badaniach EUROASPIRE (*European Action on Secondary and Primary Prevention through Intervention to Reduce Events*) II i III.

Cel: Porównanie realizacji wtórnej prewencji w klinikach i na oddziałach kardiologicznych pięciu krakowskich szpitali w latach 1996/1997, 1998/1999 oraz 2005/2006.

Metody: W badaniu wzięło udział pięć krakowskich szpitali, w których strukturze znajduje się co najmniej jeden oddział kardiologii. Do badania kwalifikowano kolejnych chorych w wieku ≤ 71 lat, zamieszkałych na terenie byłego województwa krakowskiego, hospitalizowanych od 1 lipca 1996 r. do 31 września 1997 r. (pierwsze badanie), od 1 marca 1998 r. do 30 marca 1999 r. (drugie badanie) oraz od 1 kwietnia 2005 r. do 31 lipca 2006 r., z powodu ostrego zespołu wieńcowego, w celu wykonania angioplastyki wieńcowej lub operacji pomostowania aortalno-wieńcowego. Na podstawie standaryzowanego kwestionariusza dokonano systematycznego przeglądu dokumentacji szpitalnej chorych zakwalifikowanych do badania.

Wyniki: Do analizy włączono dane 536 osób hospitalizowanych w latach 1996/1997, 515 osób hospitalizowanych w latach 1998/1999 oraz 540 osób hospitalizowanych w latach 2005/2006. Badane grupy nie różniły się pod względem rozkładu płci, natomiast średnia wieku osób hospitalizowanych w latach 2005/2006 była istotnie wyższa w porównaniu z latami 1996/1997 oraz 1998/1999 (58,7 ± 7,7 *vs* 57,6 ± 8,2 *vs* 56,6 ± 8,4 roku, $p < 0,05$). W historiach chorób pacjentów hospitalizowanych w latach 2005/2006 istotnie częściej odnotowywano informacje o obecności czynników ryzyka w okresie przed hospitalizacją niż w latach 1996/1997 (palenie tytoniu: 94 *vs* 89%, $p < 0,05$; nadciśnienie tętnicze 94 *vs* 80%, $p < 0,05$; hiperlipidemia 59 *vs* 11%, $p < 0,05$; cukrzyca 73 *vs* 41%, $p < 0,05$). Wzrosła również częstość odnotowywania informacji o wartości ciśnienia tętniczego w pierwszej dobie hospitalizacji (o 10%, $p < 0,05$), częstość odnotowywania stężeń lipidów (o ponad 30%, $p < 0,05$), a także częstość odnotowywania wzrostu i ciężaru ciała (o 16%, $p < 0,05$). Częstość zalecania leków przeciwpłytkowych przy wypisie ze szpitala wzrosła z 87 do 97% ($p < 0,05$), beta-blokerów z 66 do 91% ($p < 0,05$), inhibitorów enzymu konwertującego i sartanów z 50 do 89% ($p < 0,05$), diuretyków z 13 do 33% ($p < 0,05$), leków hipolipemizujących z 27 do 96% ($p < 0,05$) oraz leków przeciwcukrzycowych z 10 do 22% ($p < 0,05$), natomiast

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częstość zalecania antagonistów wapnia zmniejszyła się z 30 do 21% ($p < 0,05$). Powyższe różnice pozostały istotne po uwzględnieniu w analizie wieloczynnikowej wpływu płci i wieku. Nie zmieniła się częstość zalecania leków wspomagających rzucanie palenia – we wszystkich badaniach wyniosła 0%.

Wnioski: Realizacja zaleceń dotyczących wtórnej prewencji w klinikach i na oddziałach kardiologicznych krakowskich szpitali znacząco się poprawiła. Przedstawione wyniki sugerują, że w ostatnich latach poprawił się stosunek osób pracujących w ośrodkach uczestniczących w badaniu do wtórnej prewencji choroby niedokrwiennej serca.

Słowa kluczowe: choroba niedokrwienna serca, czynniki ryzyka, wtórna prewencja

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