



Differences between Slovak and Dutch patients scheduled for coronary artery bypass graft surgery regarding clinical and psychosocial predictors of physical and mental health-related quality of life

European Journal of Cardiovascular Nursing
2018, Vol. 17(4) 324–335
© The European Society of Cardiology 2017



Reprints and permissions:
sagepub.co.uk/journalsPermissions.nav
DOI: 10.1177/1474515117747571
journals.sagepub.com/home/cnu



Noha El-Baz^{1,2,3}, Daniela Ondusova⁴, Martin Studencan⁵,
Jaroslav Rosenberger⁶, Sijmen A Reijneveld³, Jitse P van Dijk^{3,6}
and Berrie Middel³

Abstract

Background: Differences in health-related quality of life in coronary artery disease patients and associated factors between patients of central and western European descent are rarely investigated. We aim to test differences between Dutch and Slovak health-related quality of life, whether nationality predicted health-related quality of life and if standardised beta weights of health-related quality of life determinants differ across countries.

Design: An observational multicentre study at university cardiac centres in the Netherlands and Slovakia.

Methods: In 226 coronary artery disease patients, health-related quality of life was measured by the Short Form Health Survey 36, anxiety and depression were measured using the Hospital Anxiety and Depression Scale, and type D personality was assessed with the 14-item Type D Scale. Multivariate analysis was used to explore the effect of patient characteristics on the physical and mental component summaries. Estimates of each predictor's beta value of the physical and mental component summaries in the Slovak and Dutch patient sample were separately calculated using the Cummings criterion for comparison of two independent betas.

Results: Stronger predictors of physical health-related quality of life in Slovak patients were educational level, current smoking, poor functional status, history of diabetes and amount of social support. In Dutch patients, only more symptoms of depression was a stronger predictor ($P < 0.05$). Regarding Slovak mental health-related quality of life, stronger predictors were educational level, current smoking and amount of social support. Female gender, history of myocardial infarction and more symptoms of depression were stronger predictors in Dutch patients ($P < 0.05$).

Conclusion: Descent and differences between both populations in determinants of health-related quality of life should be considered while planning care, follow-up, health education and rehabilitation.

Keywords

Quality of life, type D personality, eastern Europe, anxiety, depression, coronary artery disease

Date received: 22 May 2017; revised: 10 October 2017; accepted: 17 November 2017

¹University of Groningen, University Medical Center Groningen, Department of Epidemiology, Groningen, The Netherlands

²Alexandria University, Faculty of Nursing, Department of Emergency and Critical Care Nursing, Alexandria, Egypt

³University of Groningen, University Medical Center Groningen, Department of Community & Occupational Medicine, The Netherlands

⁴East Slovakian Institute for Cardiac and Vascular Diseases, Kosice, Slovakia

⁵Cardiocentre of Teaching Hospital of J.A. Reiman, Prešov, Slovakia

⁶Pavol Jozef Safarik University, Faculty of Medicine, Graduate School Kosice Institute for Society and Health, Kosice, Slovak Republic

Corresponding author:

Noha El-Baz, University of Groningen, University Medical Center Groningen, Department of Epidemiology, PO Box 30.001, 9700 RB Groningen, The Netherlands.

Email: n.elbaz@umcg.nl

Introduction

Coronary artery disease (CAD) is recognised as a major health problem and the leading cause of the death and disease burden, with an increasing prevalence due to the aging population.^{1–3} Compared to western European countries, CAD and related mortality remain rather high in eastern and central Europe, despite the decrease in the general rate of CAD.^{4–7}

Some studies have addressed the difference between western and eastern European countries in the post-Communist era, investigating the factors that lead to higher mortality rates and deterioration in self-rated health.^{8–10} They concluded that the main factors were inequality, lower socioeconomic level and lower education, which had a negative effect on self-perceived health. Furthermore, data have indicated that factors such as smoking,^{11,12} alcohol consumption,^{12,13} unhealthy dietary habits,^{12,14,15} depression,¹⁶ socioeconomic inequalities,^{10,17,18} a lower level of education,¹⁹ a sedentary lifestyle and comorbidities such as high body mass index (BMI), hyperlipidaemia and diabetes have contributed to the difference in CAD rates between western and eastern/central Europe.^{11,20,21}

In the past decades, several studies have investigated the effect of CAD and related risk factors on health-related quality of life (HRQoL), which has been recognised as an important indicator, comparing outcomes^{5–10} before and after any medical intervention or treatment. In other words, the aim of the treatment was not simply targeted at prolonging survival, extending life and relieving symptoms, but also improving physical and mental functioning, performance of daily living activities and, subsequently, promoting HRQoL.^{11,12} Factors that were found to influence HRQoL negatively in CAD patients included sociodemographic variables such as age,^{22–24} not having a partner,^{25,26} female gender,^{23,24,27} lower educational level^{18,28–30} and belonging to a lower socioeconomic strata.^{18,31–33} Simultaneously, the most common clinical and comorbid conditions associated with decreased HRQoL were found to be diabetes mellitus, multivessel disease, hypertension, high triglyceride levels, smoking, degree of angina, a BMI greater than 35 kg/m² and pulmonary diseases.^{22,24,34–37}

Recently, research has started focusing on the factors affecting HRQoL of CAD in central Europe, with psychosocial factors such as psychological wellbeing, vital exhaustion,³⁸ sense of coherence,³⁹ functional status and socioeconomic inequalities^{28,39} found to be the main factors affecting HRQoL in CAD patients in central and eastern Europe.

Studies have further attempted to investigate the difference in HRQoL between CAD patients in different European countries.^{7–9} These studies found that there was a tendency towards poorer HRQoL in patients residing in eastern European countries compared to western Europe. A study by De Smedt and colleagues presented the factors

negatively affecting HRQoL for all patients included in the study and not stratified by region. These factors included being male, older age, educational level, diabetes, smoking, central obesity and physical inactivity.¹ In addition, Kristenson and colleagues, focusing on psychological strain, concluded that Lithuanian men experienced higher job stress, lower social and emotional support, lower social integration, lower coping levels, less self-esteem and sense of coherence, as well as a higher level of depression and vital exhaustion when compared to their Swedish counterparts.⁴⁰

Similarly, it has become evident that psychological distress (i.e. anxiety and depression) are risk factors for CAD,⁴¹ and it has been found that CAD patients with more symptoms of physical and emotional distress experienced a decline in HRQoL in the years they survived.^{1,42–48} Moreover, lack of social support had both a direct and indirect influence through psychological distress on increased comorbid conditions and HRQoL.^{49–52}

Another important factor affecting HRQoL is possessing a type D personality, which is a combined tendency to experience increased negative emotions (negative affectivity) and feeling inhibited to express those emotions in social interactions (social inhibition). This personality trait is associated with clinical outcomes, physical and mental HRQoL and psychological distress in several patient populations.^{38–41} Having a type D personality was also found to be an important direct and indirect determinant of adverse biological and behavioural outcomes in CAD patients, affecting outcomes such as mortality and the risk of myocardial infarction (MI), and was associated with poor HRQoL, increased symptoms of anxiety and depression^{43–51} and less perceived social support.^{33,52,53}

Following the model of Wilson and Cleary^{54,55} that linking clinical variables and patient-related characteristics with HRQoL and given the evidence, and the fact that Slovakia and the Netherlands are typical examples of central European and western European countries, respectively,⁵⁴ the purpose of this study is: (a) to test differences between Dutch and Slovak coronary artery bypass grafting (CABG) patients (selected using the same inclusion and exclusion criteria and measures) regarding physical and mental HRQoL and the influence of sociodemographic, clinical and psychological factors associated with HRQoL, by conducting univariate analyses; (b) to investigate whether nationality predicted both mental and physical HRQoL after controlling for all predictors, by conducting multiple regression analyses; and (c) to investigate whether the standardised beta weights of these predictors of HRQoL did not differ across countries by sample fluctuation.

Methods

Samples and procedures

The current analysis was based on two multicentre observational studies within specialised university hospital cardiac

centres: (a) the University Medical Center Groningen (UMCG) in the Netherlands and (b) the University Hospital Košice, in Slovakia.

Ethical considerations

The Slovak and Dutch local medical ethics committees approved the study protocols, respectively, and all patients provided written informed consent.

Sampling procedure Slovak and Dutch patients

The Dutch sample comprised 307 patients, referred for coronary angiography (CAG) prior to valve replacement and CABG surgery at the UMCG, while the Slovak study sample consisted of 362 patients referred for CAG prior to CABG at the University Hospital Košice.

Inclusion and exclusion criteria

In both countries, patients meeting the following criteria were included: history of CAD, under 75 years of age, without severe cognitive impairments, no history of severe chronic disease, of Dutch or Slovak descent, and mastery the official language of the country.

Procedure

After assessment of their CAG and employing the inclusion criteria, the Dutch patients ($N=256$) were provided with information about the study by mail and invited to return a signed informed consent form with a completed questionnaire by prepaid mail.

After assessment of their CAG and employing the inclusion criteria, the Slovak patients ($N=254$) were invited for a personal interview with a trained psychologist, who provided information about the study. All patients were asked for written informed consent before administering the questionnaires during this interview.

Non-response Dutch patients

The response rate in Dutch patients was 77.3% ($N=198$). There were no significant differences found between respondents and non-respondents in terms of age, NYHA class (New York Heart Association functional classification of heart disease, left ventricular ejection fraction (LVEF)), history of MI, hypertension and diabetes. However, female patients were overrepresented in the Dutch sample of non-respondents, compared with respondents ($\chi^2=4.85$, $df=1$; $P=0.03$), with 33.3% not participating versus 19.3% participating female patients.

Non-response Slovak patients

Thirty-two Slovak patients did not respond (response rate 87.4%). Patients who agreed ($N=222$) signed an informed

consent statement and completed questionnaires prior to CABG. Respondents and non-respondents did not differ in terms of statistical significance regarding all sociodemographic and clinical characteristics.

Exclusion of valve patients

For valid comparison with Slovak CABG patients, Dutch patients scheduled for valve surgery ($N=86$) were excluded.

Exclusion of Roma patients

For valid comparison with Dutch CABG patients in the current study, Roma patients ($N=108$) were excluded, as patients from this ethnic minority were not represented in the Dutch study population. Moreover, using data from Roma patients would increase the risk of false inferences, because previous studies in Slovakia found higher mortality rates among Roma than among non-Roma, as well as a higher prevalence of cardiovascular medical risk factors^{3,9-13,16-20} and a lower socioeconomic status.^{20,21}

The final samples comprised 114 Slovak and 112 Dutch CABG patients.

Variables and measures

Sociodemographic characteristics

In both samples, the background characteristics included gender, age, educational level, working status and smoking status, as reported by patients in the questionnaire. Work status was categorised as: (a) paid work or housewife, and (b) not working (jobless, retired, work disability). Educational level involved the highest qualification the patient had achieved and, following the International Standard Classification of Education (ISCED),⁵³ was categorised as: (1) elementary schooling, (2) lower professional schooling, (3) secondary schooling, (4) higher professional schooling and (5) college education/university. However, before entering education into the regression analysis, levels 1 to 3 were combined into an indicator of 'lower educational level' and level 4 (higher professional training) and level 5 (college education/university) were combined to indicate 'higher educational level'.

Health-related quality of life

HRQoL was measured using the Short Form Health Survey 36 (SF-36), a reliable and widely used generic measurement of HRQoL, with good psychometric properties in patients with CAD.⁵⁶ We utilised the physical health component summary (PCS), measuring limitations in physical self-care, in physical activities, energy levels, severity of bodily pain and frequency of tiredness, and the mental health component summary (MCS) scale comprising frequency of psychological distress, and social and role

disabilities due to emotional problems.^{57,58} The PCS and MCS scale scores were calculated with the scoring algorithms suggested by Ware and colleagues,^{58,59} where 0% represents the worst state of health and 100% the best state of health possible.

In the current study, Cronbach's alphas for Dutch and Slovak patients, respectively, were 0.87 and 0.88 for the PCS scale, and 0.86 and 0.86 for the MCS scale.

Functional status and medical history

Functional status was assessed in both centres by a cardiologist based on a combination of two parameters: the four NYHA classes of dyspnoea symptoms,⁶⁰ and the four classes identifying the severity of chest pain according to the criteria of the Canadian Cardiovascular Society (CCS).⁶¹ The LVEF was assessed by echocardiography, with patients divided into three groups: (a) LVEF less than 30%; (b) LVEF of 30–50%; and (c) LVEF greater than 50%. The indices of functional status were dichotomised for the regression analysis: NYHA/CCS (class I–II vs. class III–IV), LVEF (<50% vs. ≥50%).

Patient histories and clinical data were retrieved from the medical records in both centres.

Psychosocial characteristics

Symptoms of anxiety and depression were measured using the Hospital Anxiety and Depression Scale (HADS).⁶² The HADS is a 14-item questionnaire with seven items assessing symptoms of anxiety and seven assessing symptoms of depression. All items are answered on a 4-point Likert scale from 0 to 3 (total score range of 0–21).^{63,64} In the current study, the Cronbach's alphas for anxiety for Dutch and Slovak patients, respectively, were 0.83 and 0.81 and for depression, 0.81 and 0.79.

Type D personality

Type D personality describes people who are likely to experience increased negative emotions and who do not express these emotions during social interactions. This was assessed with the 14-item Type D Scale (DS14).⁶⁵ A cut-off score of 10 or greater on both subscales denotes those with a type D personality.^{65,66} In the Dutch sample, the DS14 has adequate reliability, with Cronbach's alphas of 0.89 and 0.88 for the NA and the SI subscales, respectively. In the Slovak sample, Cronbach's alphas for NA and SI were 0.80 and 0.71, respectively.

Social support measure

Social support was measured with the 12-item Perceived Social Support Scale (PSSS).^{67,68} The scale yields three subscale scores for family, friends and significant others,

and a total score which was used in the current study. Respondents answered each question using a 7-point rating scale ranging from very strongly disagree to very strongly agree. Higher scores indicate that subjects perceive more social support. Cronbach's alphas for Dutch and Slovak patients, respectively, were 0.90 and 0.92 for social support from family, 0.89 and 0.92 from friends, and 0.87 and 0.82 from significant others.

Translation of questionnaires

Measures of educational level, type D personality, anxiety and depression, social support and HRQoL were translated into Slovak according to the procedure proposed by Guillemin and colleagues.⁶⁹ First, the original English versions of the questionnaires were translated into Slovak by two certified translators working independently of each other. Second, two other certified translators each translated these Slovak translations back into English. The resulting English versions were compared with the originals and all discrepancies were discussed by three researchers who spoke both Slovak and English. The remaining discrepancies were discussed with a native English speaker from the University of Groningen Language Centre.

Statistical analyses

Bivariate analysis. In the case of categorical data, we used the chi-square test (Fisher's exact tests for 2 × 2 contingency tables) and the difference between proportions test.⁷⁰ For continuous variables, Student's *t*-tests for independent samples were used with 95% confidence intervals (CIs).

Multivariate analysis. Multiple regression analyses were employed to explore the effect of nationality on PCS and MCS (both crude and adjusted for demographic and clinical data, anxiety and depression, social support and personality) in a pooled sample of Slovak and Dutch CABG patients. Furthermore, we investigated the estimates of each predictor's beta value for PCS and MCS separately in the Slovak and Dutch patient samples, to test the null hypothesis $\beta_{\text{Slovak}} = \beta_{\text{Dutch}}$ using a 95% CI overlap in relation to *P* values. Therefore, we used Cummings' criterion for comparison of the two independent betas: a two-tailed $P < 0.05$ in cases in which the overlap with 95% CIs is no more than half the average arm length (meaning the average of the two CI arms that overlap) and $P \leq 0.01$ when two CIs do not overlap (in cases in which the overlap is approximately 0, or when there is a positive gap). To do this analysis, the point estimates of beta for each predictor in the regression equation was estimated via bias corrected bootstrap (1000 re-samples). Statistical analyses were performed using Statistical Product and Service Solutions 240 for Windows.

Table 1. Sociodemographic and clinical characteristics, symptoms of psychological distress, social support, personality type D and self-reported health-related quality of life across Slovak and Dutch CABG patient samples.

Patient characteristics (total)	Dutch (112)	Slovak (114)	P value*	95% CI
Age (mean±SD)	64.12±9.14	58.18±6.03	0.001 [§]	3.9–7.9
Male gender	88 (78.9%)	92 (80.7%)	ns	
Educational level (N, %)				
Lower education	87 (77.7%)	87 (76.3%)	ns	
Higher education	25 (22.3%)	27 (23.7%)		
Employment (not employed) (N, %)	74 (66.1%)	77 (67.5%)	ns	
Smoking (current smokers) (N, %)	24 (21.4%)	40 (35.1%)	0.0 ^β	12.1–24.9% ^Δ
Functional status (N, %)				
Class I–II	36 (32.1%)	58 (50.9%)	0.003 ^β	5.9–30.7% ^Δ
Class III–IV	76 (67.9%)	56 (49.1%)		
LVEF (N, %)			0.001 [#]	
<30–≤50%	23 (17.0%)	84 (73.6%)		38.5–60.4% ^Δ
>50%	89 (79.4%)	30 (26.4%)		41.0–62.8% ^Δ
COPD (N, %)	9 (8.0%)	11 (9.6%)	ns	
History of CHD (N, %)	81 (72.3%)	106 (93.0%)	0.001 ^β	11.0–30.2% ^Δ
Previous myocardial infarction (N, %)	34 (30.3%)	64 (56.1%)	0.001 ^β	12.9–37.5% ^Δ
Hypertension (N, %)	43 (38.4%)	94 (82.4%)	0.001 ^β	31.8–54.4% ^Δ
Diabetes mellitus (N, %)	21 (18.7%)	43 (37.7%)	0.01 ^β	7.25–30.0% ^Δ
Personality type D (N, %)	29 (25.9%)	40 (35.1%)	ns	–2.81–20.8% ^{NS}
Anxiety (mean±SD)	6.28±4.20	7.04±3.76	ns	
Depression (mean±SD)	5.01±3.73	4.96±3.16	ns	
Social support (mean±SD)	47.93±9.73	65.38±11.94	0.001 [§]	14.44–20.43
PCS (mean±SD)	39.43±9.53	34.19±9.21	0.001 [§]	2.71–7.76
MCS (mean±SD)	48.27±11.09	47.02±8.71	ns	

CABG: coronary artery bypass grafting; CI: confidence interval; LVEF: left ventricular ejection fraction; COPD: chronic obstructive pulmonary disease; CHD: coronary heart disease; PCS: physical health component summary; MCS: mental health component summary.

*Significance of difference adjusted for age and gender.

^ΔDifference between proportions test with continuity correction.

[§]t-test.

[#]chi square.

^βFisher's exact test.

Results

Table 1 shows that Slovak patients were, on average, 6 years younger and the population value for this difference was estimated to vary between 4 to 8 years (95% CI). We found 14% more Slovak patients who reported that they smoked (35.1% Slovak vs. 21.4% Dutch patients), which was estimated to vary from 12% to 25% in the population.

Moreover, the proportion of patients with a worse functional status (class III–IV), as classified by the cardiologist, was 19% greater in Dutch patients (67.9% vs. 49.1%), but there were approximately 56% more Slovak CABG patients with a poor LVEF (73.6% vs. 17%). Furthermore, in the Slovak CABG patient group, there was evidence of higher prevalence rates of CAD-related morbidity: history of CAD, previous MI, hypertension and diabetes. Slovak patients reported a poorer physical HRQoL and more social support from relatives and significant others. The statistical significance of differences was adjusted for age and gender.

Predictors of physical and mental HRQoL

First, to investigate whether nationality (Dutch or Slovak descent) is a predictor of physical and mental HRQoL before CABG, both patient samples were merged into a single database. The results presented in Table 2 show that Slovak descent had a crude statistically significant association with poorer physical HRQoL, and did not decrease after adjusting for other statistically significant predictors (male gender, older age, current smoker, poorer functional status, history of MI, more symptoms of depression, less social support and type D personality). Higher educational level and a better LVEF were associated with better self-reported physical HRQoL. Nationality, in contrast, had no crude effect on mental HRQoL, which did not change after entering variables stepwise in the regression model. Compared with the predictors of physical HRQoL, only functional status and LVEF were not predictors of mental HRQoL. Symptoms of anxiety and depression, type D personality and social support were predictors of both poorer physical and mental HRQoL, and increased the percentage of explained variance

Table 2. Predictors of physical and mental quality of life in a cross-cultural sample: standardised regression coefficients (β), crude and after adjusting for socioeconomic characteristics, co-morbidity, disease severity, psychological distress, amount of social support and personality type D.

SF-36	PCS (β)		MCS (β)	
Model 1				
R ²		0.07**		0.01
ΔR^2		0.07		0.01
Country	0.27***		0.07	
Model 2				
R ²		0.13**		0.15***
ΔR^2		0.06*		0.14***
Country	0.32***		0.03	
Gender	-0.15*		-0.31***	
Age	-0.22*		-0.19*	
Education	0.17*		-0.18*	
Smoking status	-0.13*		-0.11*	
Model 3				
R ²		0.19***		0.18***
ΔR^2		0.06*		0.04
Country	0.25**		-0.01	
Gender	-0.16*		-0.31***	
Age	-0.22*		-0.19*	
Education	0.17*		-0.18*	
Smoking status	-0.14*		-0.12*	
NYHA	-0.16*		0.05	
LVEF	0.29*		0.07	
History of MI	-0.14*		-0.12*	
History of hypertension	-0.13		-0.05	
History of diabetes	-0.09		-0.06	
Model 4				
R ²		0.35***		0.57***
ΔR^2		0.16**		0.39***
Country	0.24*		0.09	
Gender	-0.15*		-0.17*	
Age	-0.21*		-0.18*	
Education	0.17*		-0.17*	
Smoking status	-0.14*		-0.14*	
NYHA	-0.17*		0.04	
LVEF	0.31*		0.05	
History of MI	-0.15*		-0.11*	
History of hypertension	-0.12		-0.07	
History of diabetes	-0.08		-0.06	
Symptoms of depression	-0.18*		-0.32***	
Symptoms of anxiety	-0.15*		-0.41***	
Social support	0.17*		0.17*	
Type D personality	-0.25**		-0.31**	

SF-36: Short Form Health Survey 36; PCS: physical health component summary; MCS: mental health component summary; NYHA: New York Heart Association; LVEF: left ventricular ejection fraction; MI: myocardial infarction.
 * $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$.

by 16% ($\Delta R^2 = 0.16$; $P = 0.01$) up to 35% ($R^2 = 0.35$; $P = 0.001$) in physical HRQoL, while these psychosocial characteristics increased the explained variance in mental HRQoL by 39% ($\Delta R^2 = 0.39$; $P = 0.001$) up to 57% ($R^2 = 0.57$; $P = 0.001$).

Second, to investigate whether predictors of physical or mental HRQL were similar in both countries, or were country specific, we applied the same regression models stratified by country. The results are presented in Table 3.

Table 3. Predictors of physical and mental quality of life (PCS, MCS) in hierarchical regression analysis across independent Dutch and Slovak CABG patient samples.

SF-36	Slovak			Dutch			Slovak			Dutch		
	PCS β	R ² / Δ R ²	smc	PCS β	R ² / Δ R ²	smc	MCS β	R ² / Δ R ²	smc	MCS β	R ² / Δ R ²	smc
Model 1												
Gender	-0.39***			-0.21*			-0.19*			-0.23*		
Age	-0.30**			-0.23*			-0.24*			-0.21*		
Education	0.17*			0.14			0.20*			0.09		
Smoking status	-0.14*			-0.07			-0.24*			-0.03		
		0.22/0.22 ***			0.06/0.06 ns			0.10/0.10 ns		0.11/11 ns		
Model 2												
Gender	-0.22*			-0.21*			-0.18*			-0.39***		
Age	-0.23*			-0.22*			-0.25*			-0.28*		
Education	0.17*			0.14			0.22*			0.06		
Smoking status	-0.13*			-0.01			-0.20*			-0.01		
Functional status	-0.36***			-0.19*			-0.14			-0.13		
LVEF	0.19*			0.21*			0.04			0.03		
History of MI	-0.23*			-0.24*			-0.18*			-0.11*		
History of diabetes	-0.21*			-0.17*			-0.10			-0.09		
		0.41/0.19 **			0.20/0.14 *			0.16/0.06 ns		0.17/0.06 ns		
Model 3												
Gender	-0.30**			-0.22*			-0.03			-0.37**		
Age	-0.25*			-0.23*			-0.27*			-0.28*		
Education	0.29**			0.09			0.21*			0.02		
Smoking status	-0.15*			-0.04			-0.21*			-0.01		
Functional status	-0.40***			-0.28**			-0.09			-0.03		
LVEF	0.23*			0.25**			0.04			0.02		
History of MI	-0.22*			-0.24*			-0.11*			-0.12*		
History of diabetes	-0.23*			-0.15*			-0.11			-0.03		
Symptoms of depression	-0.19*			-0.39**			-0.22*			-0.35**		
Symptoms of anxiety	-0.08			-0.02			-0.42***			-0.45***		
Social support	0.23*			0.06			0.22*			0.02		
Type D personality	-0.25*			-0.23*			-0.26*			-0.31**		
		0.56/0.15 **			0.48/0.28 **			0.60/0.44 ***		0.52/0.35 ***		

smc: significance of model change for the added variables to the preceding model (F change test); CABG: coronary artery bypass grafting; SF-36: Short Form Health Survey 36; PCS: physical health component summary; MCS: mental health component summary; LVEF: left ventricular ejection fraction; MI: myocardial infarction.

Statistically significant values are in bold.

* $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$.

Generic and country-specific determinants of physical HRQoL (PCS)

In the Slovak CABG patient sample, older age, female gender, lower education and being a smoker were significant predictors of the lower range of physical HRQoL and explained 22% of the variance. However, in Dutch patients, educational level and smoking status had no impact on physical HRQoL (model 1). In model 2, the statistically significant predictors were more severe dyspnoea and angina or poor functional status (NYHA/CCS), a lower LVEF, a history of MI and a history of diabetes, all of which were strong predictors of poorer physical HRQoL.

In the Slovak sample, these characteristics increased R², explaining up to 41% of the variance, thus adding 19% ($\Delta R^2 = 0.19$). In the Dutch sample, however, ΔR^2 yielded 0.14, increasing the explained variance in PCS to 20% ($P < 0.05$).

Adding the indicators of psychological distress, social support and type D personality to model 3, the explained variance in PCS increased by 15% ($P < 0.01$) in the Slovak sample, and it was almost double that (28%, $P < 0.01$) in the Dutch sample. Symptoms of anxiety had no impact on physical HRQoL in both countries, while in Slovak patients only, more social support predicted better physical HRQoL.

Generic and country-specific determinants of mental HRQoL (MCS)

Female gender, older age, lower education and current smoking yielded similar betas in Dutch and Slovak patients compared with PCS, but did not explain the variance in mental HRQoL (model 1). After adding clinical and comorbidity variables to model 2, functional status (NYHA/CCS), LVEF and history of diabetes were not predictors of mental HRQoL in the independent study populations. Only history of MI had an impact on mental HRQoL, but this life event did not contribute to the explained variance in MCS in either country. In model 3, fewer symptoms of depression and anxiety, more social support and non-type D personality all had a statistically significant and substantial influence on better mental HRQoL in Slovak patients (increased R^2 by 44%). In the Dutch sample, better mental HRQoL was associated with less psychological distress and non-type D personality, explaining 35% of the variance. More social support predicted better mental HRQoL in Slovak patients only.

Table 3 shows that certain characteristics appear to have a greater impact on physical or mental HRQoL in both countries, but evaluation based solely on the betas^{71–74} can be misleading. To avoid biased conclusions based on inference, we tested the overlap of the 95% CI of betas in Slovak and Dutch patients and found that, after adjusting for medical and psychological variables in model 3, the statistically significant stronger predictors of physical HRQoL in the Slovak sample were educational level, current smoking, poor functional status, history of diabetes and amount of social support. By contrast, in the Dutch patients, only more symptoms of depression was a stronger predictor ($P < 0.05$). The impact of gender, age, LVEF, history of MI and type D personality on physical HRQoL showed minor differences between countries, which were, after testing, due to sample fluctuation.

In the Slovak sample, the statistically significant stronger predictors of mental HRQoL were educational level, current smoking and amount of social support, while female gender, history of MI and more symptoms of depression were stronger predictors in Dutch patients ($P < 0.05$). Despite the differences between statistically significant predictors of mental HRQoL across countries, the impact of age, symptoms of anxiety and type D personality on mental HRQoL were equivalent in both countries.

Furthermore, equally strong predictors of both physical and mental HRQoL in Slovak patients were educational level, smoking status and social support; while in Dutch patients they were gender, history of MI and symptoms of depression.

Discussion

The purpose of this study was to investigate predictors of physical and mental HRQoL across Dutch and Slovak

patients scheduled for CABG, testing differences between the standardised beta weights of these predictors by estimating the amount of overlap between CIs across countries of origin. Our findings regarding age and comorbidities are in line with other studies that have investigated the differences between patients of central/eastern and western Europe. A study by Daly and colleagues,⁷⁵ which compared medical outcomes of CAD patients in Poland and the UK using a design concentrating on demographic and medical data, found that patients presenting to cardiology services in Poland (representing a central European country) were younger and had more adverse clinical risk predictors on presentation, and more advanced cardiovascular disease than their counterparts from the UK. However, they did not study patients' self-rated HRQoL.

The higher age and better overall health status of the Dutch sample seems to be in line with the greater life expectancy of the Dutch population compared to that of the Slovak population (80.3 vs. 74.8 years in 2008), as well as the overall higher estimated expected healthy years in the Netherlands compared to Slovakia (65.7 vs. 55.4 years for men). In addition, in our study we found that 35.1% of the Slovak sample were smokers, which was significantly higher than in the Dutch group (21.4%), which is in line with one large-scale European population survey that reported a high prevalence of smoking in Slovakia (39.2%).⁷⁶

This health-endangering behaviour has been identified as an important risk factor for coronary heart disease (CHD).^{12,77–79} Smoking status was not associated with physical HRQoL in the Dutch patients but was a predictor of poorer physical and mental health in Slovak patients. This may indicate that a longer history of smoking cessation in the Netherlands has led to health improvements, which may have provided considerable benefit to Dutch patients with CHD.^{80–82} In Slovakia, health professionals could strengthen prevention and cardiac rehabilitation programmes to encourage changes to lifestyle-related cardiovascular risks.

These differences can also be attributed to socioeconomic inequalities, in terms of accessibility, utilisation and quality of healthcare services.^{17,75} All sociodemographic factors, medical indicators and psychological determinants (except symptoms of anxiety) were predictors of poorer physical HRQoL in all patients, while in Dutch patients, educational level, symptoms of anxiety and amount of social support were not predictors of physical HRQoL. In former communist societies, social cohesion differed from western countries due to, for example, no freedom of speech and scarcity of products necessary for everyday life. Only symptoms of depression and type D personality increased the percentage of explained variance in PCS in Dutch patients by 28%, while these characteristics, combined with social support, were responsible for an increase of 15% in Slovak patients. These findings may indicate that in the populations of western European countries such as

the Netherlands, social support does not affect perceived physical and mental HRQoL. As expected, the betas for psychological distress (symptoms of anxiety and depression) and type D personality contributed substantially more to the percentage of explained variance in mental HRQoL in both countries compared to their impact on physical HRQoL. A study by Dragomirecká and colleagues comparing HRQoL between the Czech Republic and western countries concluded that the Czech sample suffered a lower HRQoL and higher scores of depression. Depression was the strongest determinant of lower HRQoL and, as depicted in our study, one of the differences between eastern and western European samples was stronger social support among the former, in this case, the Czech sample.⁸³

Although we found that several sociodemographic and clinical factors, for example gender, education, smoking, low social support and functional status, had a greater influence on poor PCS in Slovak patients compared to the Dutch patients ($P < 0.05$), it is worth mentioning that while the effect seemed equal at first glance in both groups, upon testing we found that these factors had a greater influence on PCS in Slovak patients. Moreover, although the regression analysis produced different statistically significant betas across countries in relation to the impact of age, LVEF, history of MI and type D personality, their effect on PCS was found to be equal in both countries.

Concerning mental HRQoL, beta estimates of female gender and older age were statistically significant stronger predictors of poor MCS in the Dutch sample. Other characteristics, such as lower education, smoking and lower social support, had a statistically significant higher impact on MCS in Slovak patients. These findings were in line with other studies confirming that education, socioeconomic status and social support affect psychological well-being and HRQoL.^{28,80} Although a history of MI, diabetes, symptoms of depression and anxiety, and type D personality yielded different betas, which were statistically significant in each separate country sample, after testing the 95% CI overlap between countries, they did not reveal a different impact on MCS in either sample.

In conclusion, our findings confirm that there is a difference in HRQoL between CAD patients from eastern/central Europe compared to western Europe. These differences are attributed to sociodemographic factors (age, gender, education, social support), unhealthy lifestyle (smoking), clinical characteristics (functional status, LVEF, history of MI and diabetes), emotional distress (depression) and type D personality. The greater influence of some risk factors, such as smoking, poorer LVEF and functional status, is mainly related to the difference in healthcare systems and the advanced prevention programmes and awareness in the Netherlands regarding smoking cessation and adopting a healthier lifestyle, in which nurses play a key role. In the past decades, new opportunities have emerged for nurses to work as

sovereign healthcare specialists, with several universities in Europe starting advanced nursing practice programmes. Nurse practitioners have been successful in following up cardiac patients, providing education through the nurse-led clinics.^{84,85} This system could be adopted as a measure to improve healthcare education, healthcare access and quality of care for Slovak patients.

Limitations of the study

Our findings indicate that the outcomes of studies investigating the predictors of HRQoL in CAD patients in different populations should not be taken at face value. To enable comparisons with other studies, authors need to report the 95% CIs for each beta, which will then provide an answer to the question of whether the impact of factors varies across different study populations. Furthermore, the differences in clinical indicators, such as NYHA and LVEF, between both patient groups should be interpreted with caution.⁸⁶ Factors such as method of measurement and the training of personnel might affect the accuracy of LVEF or NYHA values, and might explain the difference between both samples.

This study has several implications for clinical and nursing practice. The discrepancy in HRQoL and unhealthy habits between both populations, in particular, and between eastern/central and western Europe, in general, indicate that there is a greater need for health awareness programmes and more intensive follow up for CAD patients. Nurses are in a unique position to provide this care to patients and improve healthcare accessibility in Slovakia. With the current modernising of nursing education in Slovakia⁸⁷ and the introduction of the role of the nurse practitioner in the healthcare system, there is an excellent opportunity to improve and extend healthcare to these patients.⁸⁸ Further research is also required to explore these differences between patient populations and the effect of such programmes on HRQoL.

Implications for practice

- Nurses are in the unique position in detecting coronary artery disease patients who need most support.
- Expanding the role of nurses to be used more effectively in prevention, health promotion and follow-up.
- Modernising nursing education and specialisation by introducing the nurse care practitioner which has proved successful in many countries.
- When planning patient treatment and care in central and eastern Europe, factors such as female gender, functional status, smoking, lower education and lower social support should be considered.

Acknowledgements

The authors would like to thank Helena Vargova, Adriana Sudzinova, Zuzana Skodova, Barbora Silarova, Diana Matlakova and Cecilia Bukatova for their substantial support in the data collection.

Declaration of conflicting interests

The authors declare that there is no conflict of interest.

Funding

The authors disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This work was supported by a grant from the Slovak Society of Cardiology (2005) and by the Slovak Research and Development Agency under contract no. APVV-0220-10 (80%). In addition, this work was supported by the Slovak Ministry of Education, Science, Research and Sport of the Slovak Republic through its agency for the structural funds of the EU, under project no. ITMS: 26220120058 (20%).

References

- De Smedt D, Clays E, Annemans L, et al. Health related quality of life in coronary patients and its association with their cardiovascular risk profile: results from the EUROASPIRE III survey. *Int J Cardiol* 2013; 168: 898–903.
- Allender S, Scarborough P, Peto V, et al. *European cardiovascular disease statistics*. Brussels, Belgium: European Heart Network, 2008.
- Roger VL, Go AS, Lloyd-Jones DM, et al. Heart disease and stroke statistics – 2012 update: a report from the American Heart Association. *Circulation* 2012; 125: e2–e220.
- Bobak M and Marmot M. Coronary heart disease in Central and Eastern Europe and former Soviet Union. In: Marmot MG and Elliot P (eds) *Coronary heart disease epidemiology: from aetiology to public health*. Oxford: Oxford University Press, 2005, pp. 83–110.
- Townsend N, Wilson L, Bhatnagar P, et al. Cardiovascular disease in Europe: epidemiological update 2016. *Eur Heart J* 2016; 37: 3232–3245.
- Nichols M, Townsend N, Scarborough P, et al. Cardiovascular disease in Europe: epidemiological update. *Eur Heart J* 2013; 34: 3028–3034.
- Nichols M, Townsend N, Scarborough P, et al. Cardiovascular disease in Europe 2014: epidemiological update. *Eur Heart J* 2014; 35: 2950–2959.
- Carlson P. Self-perceived health in East and West Europe: another European health divide. *Soc Sci Med* 1998; 46: 1355–1366.
- Carlson P. The European health divide: a matter of financial or social capital? *Soc Sci Med* 2004; 59: 1985–1992.
- Bobak M, Pikhart H, Rose R, et al. Socioeconomic factors, material inequalities, and perceived control in self-rated health: cross-sectional data from seven post-communist countries. *Soc Sci Med* 2000; 51: 1343–1350.
- Eurostat statistics explained: Tobacco consumption statistics*. Luxembourg: Statistical office of the European Union, 2017.
- Wilkins E, Wilson L, Wickramasinghe K, et al. *European Cardiovascular Disease Statistics 2017*. Brussels, Belgium: European Heart Network, 2017.
- Hu Y, Pikhart H, Maljutina S, et al. Alcohol consumption and physical functioning among middle-aged and older adults in Central and Eastern Europe: results from the HAPIEE study. *Age Ageing* 2015; 44: 84–89.
- Stefler D, Pikhart H, Jankovic N, et al. Healthy diet indicator and mortality in Eastern European populations: prospective evidence from the HAPIEE cohort. *Eur J Clin Nutr* 2014; 68: 1346–1352.
- Boylan S, Welch A, Pikhart H, et al. Dietary habits in three Central and Eastern European countries: the HAPIEE study. *BMC Public Health* 2009; 9: 439.
- Kozela M, Bobak M, Besala A, et al. The association of depressive symptoms with cardiovascular and all-cause mortality in Central and Eastern Europe: prospective results of the HAPIEE study. *Eur J Prev Cardiol* 2016; 23: 1839–1847.
- Kunst AE. Socioeconomic inequalities in health in Central and Eastern Europe: synthesis of results of eight new studies. *Int J Public Health* 2009; 54: 197–200.
- Skodova Z, Nagyova I, van Dijk JP, et al. Socioeconomic differences in psychosocial factors contributing to coronary heart disease: a review. *J Clin Psychol Med Settings* 2008; 15: 204–213.
- Boylan S, Lallukka T, Lahelma E, et al. Socio-economic circumstances and food habits in Eastern, Central and Western European populations. *Public Health Nutr* 2011; 14: 678–687.
- Movsisyan NK, Vinciguerra M, Lopez-Jimenez F, et al. Kardiovize Brno 2030, a prospective cardiovascular health study in Central Europe: methods, baseline findings and future directions. *Eur J Prev Cardiol* 2017; 2047487317726623.
- Kromhout D, Menotti A, Kesteloot H, et al. Prevention of coronary heart disease by diet and lifestyle: evidence from prospective cross-cultural, cohort, and intervention studies. *Circulation* 2002; 105: 893–898.
- Bengtsson I, Hagman M and Wedel H. Age and angina as predictors of quality of life after myocardial infarction: a prospective comparative study. *Scand Cardiovasc J* 2001; 35: 252–258.
- Heller RF, Lim L, Valenti L, et al. Predictors of quality of life after hospital admission for heart attack or angina. *Int J Cardiol* 1997; 59: 161–166.
- Jamieson M, Wilcox S, Webster W, et al. Factors influencing health-related quality of life in cardiac rehabilitation patients. *Prog Cardiovasc Nurs* 2002; 17: 124–131; 154.
- Rankin SH and Fukuoka Y. Predictors of quality of life in women 1 year after myocardial infarction. *Prog Cardiovasc Nurs* 2003; 18: 6–12.
- Christian AH, Cheema AF, Smith SC, et al. Predictors of quality of life among women with coronary heart disease. *Qual Life Res* 2007; 16: 363–373.
- Duenas M, Ramirez C, Arana R, et al. Gender differences and determinants of health related quality of life in coronary patients: a follow-up study. *BMC Cardiovasc Disord* 2011; 11: 24.
- Skodova Z, Nagyova I, van Dijk JP, et al. Socioeconomic inequalities in quality of life and psychological outcomes among cardiac patients. *Int J Public Health* 2009; 54: 233–240.
- Drory Y, Kravetz S and Florian V. Psychosocial adjustment in patients after a first acute myocardial infarction: the

- contribution of salutogenic and pathogenic variables. Israel Study Group on First Acute Myocardial Infarction. *Arch Phys Med Rehabil* 1999; 80: 811–818.
30. Drory Y, Kravetz S and Hirschberger G. Long-term mental health of men after a first acute myocardial infarction. *Arch Phys Med Rehabil* 2002; 83: 352–359.
 31. Govil SR, Weidner G, Merritt-Worden T, et al. Socioeconomic status and improvements in lifestyle, coronary risk factors, and quality of life: the Multisite Cardiac Lifestyle Intervention Program. *Am J Public Health* 2009; 99: 1263–1270.
 32. Janati A, Matlabi H, Allahverdipour H, et al. Socioeconomic status and coronary heart disease. *Health Promot Perspect* 2011; 1: 105–110.
 33. Sudzinova A, Nagyova I, Studencan M, et al. Roma coronary heart disease patients have more medical risk factors and greater severity of coronary heart disease than non-Roma. *Int J Public Health* 2013; 58: 409–415.
 34. Lindsay GM, Hanlon P, Smith LN, et al. Assessment of changes in general health status using the short-form 36 questionnaire 1 year following coronary artery bypass grafting. *Eur J Cardiothorac Surg* 2000; 18: 557–564.
 35. Oldridge N, Gottlieb M, Guyatt G, et al. Predictors of health-related quality of life with cardiac rehabilitation after acute myocardial infarction. *J Cardiopulm Rehabil* 1998; 18: 95–103.
 36. Uchmanowicz I, Lobo-Grudzien K, Jankowska-Polanska B, et al. Influence of diabetes on health-related quality of life results in patients with acute coronary syndrome treated with coronary angioplasty. *Acta Diabetol* 2013; 50: 217–225.
 37. Welke KF, Stevens JP, Schults WC, et al. Patient characteristics can predict improvement in functional health after elective coronary artery bypass grafting. *Ann Thorac Surg* 2003; 75: 1849–1855.
 38. Skodova Z, Nagyova I, Rosenberger J, et al. Vital exhaustion in coronary heart disease: the impact of socioeconomic status. *Eur J Cardiovasc Prev Rehabil* 2008; 15: 572–576.
 39. Silarova B, Nagyova I, Rosenberger J, et al. Sense of coherence as an independent predictor of health-related quality of life among coronary heart disease patients. *Qual Life Res* 2012; 21: 1863–1871.
 40. Kristenson M, Kucinskiene Z, Bergdahl B, et al. Increased psychosocial strain in Lithuanian versus Swedish men: the LiVicordia study. *Psychosom Med* 1998; 60: 277–282.
 41. Rozanski A, Blumenthal JA and Kaplan J. Impact of psychological factors on the pathogenesis of cardiovascular disease and implications for therapy. *Circulation* 1999; 99: 2192–2217.
 42. Covinsky KE, Lin F, Bittner V, et al. Health-related quality of life following coronary artery bypass graft surgery in post-menopausal women. *J Gen Intern Med* 2008; 23: 1429–1434.
 43. De Smedt D, Clays E, Annemans L, et al. Self-reported health status in coronary heart disease patients: a comparison with the general population. *Eur J Cardiovasc Nurs* 2015; 14: 117–125.
 44. Oldridge N, Saner H and McGee HM. The Euro CardioQoL Project. An international study to develop a core heart disease health-related quality of life questionnaire, the HeartQoL. *Eur J Cardiovasc Prev Rehabil* 2005; 12: 87–94.
 45. Smedt DD, Clays E, Annemans L, et al. The association between self-reported lifestyle changes and health-related quality of life in coronary patients: the EUROASPIRE III survey. *Eur J Prev Cardiol* 2013; 21: 796–805.
 46. Pragodpol P and Ryan C. Critical review of factors predicting health-related quality of life in newly diagnosed coronary artery disease patients. *J Cardiovasc Nurs* 2013; 28: 277–284.
 47. Höfer S, Doering S, Rumpold G, et al. Determinants of health-related quality of life in patients with coronary artery disease. *Eur J Cardiovasc Prev Rehabil* 2006; 13: 398–406.
 48. Staniute M, Brozaitiene J, Burkauskas J, et al. Type D personality, mental distress, social support and health-related quality of life in coronary artery disease patients with heart failure: a longitudinal observational study. *Health Qual Life Outcomes* 2015; 13: 1.
 49. Barth J, Schneider S and von Känel R. Lack of social support in the etiology and the prognosis of coronary heart disease: a systematic review and meta-analysis. *Psychosom Med* 2010; 72: 229–238.
 50. Mookadam F and Arthur HM. Social support and its relationship to morbidity and mortality after acute myocardial infarction: systematic overview. *Arch Intern Med* 2004; 164: 1514–1518.
 51. Lee GA. Determinants of quality of life five years after coronary artery bypass graft surgery. *Heart Lung* 2009; 38: 91–99.
 52. Staniute M, Brozaitiene J and Bunevicius R. Effects of social support and stressful life events on health-related quality of life in coronary artery disease patients. *J Cardiovasc Nurs* 2013; 28: 83–89.
 53. UNESCO Institute for Statistics. *ISCED 2011: International Standard Classification of Education*. May 2006 Re-edition. UNESCO, 2013. Montreal, Quebec, Canada. Available at: <http://uis.unesco.org/sites/default/files/documents/international-standard-classification-of-education-isced-2011-en.pdf>
 54. Wilson IB and Cleary PD. Linking clinical variables with health-related quality of life. A conceptual model of patient outcomes. *JAMA* 1995; 273: 59–65.
 55. Ferrans CE, Zerwic JJ, Wilbur JE, et al. Conceptual model of health-related quality of life. *J Nurs Scholarship* 2005; 37: 336–342.
 56. Failde I and Ramos I. Validity and reliability of the SF-36 Health Survey Questionnaire in patients with coronary artery disease. *J Clin Epidemiol* 2000; 53: 359–365.
 57. Ware JE, Kosinski M and Keller SD. *SF-36 Physical and Mental Health Summary Scales*. Boston, Massachusetts: The Health Institute, New England Medical Center, 1994.
 58. Ware JE, Gandek B, Kosinski M, et al. The equivalence of SF-36 summary health scores estimated using standard and country-specific algorithms in 10 countries: results from the IQOLA Project. International Quality of Life Assessment. *J Clin Epidemiol* 1998; 51: 1167–1170.
 59. Aaronson NK, Muller M, Cohen PD, et al. Translation, validation, and norming of the Dutch language version of the SF-36 Health Survey in community and chronic disease populations. *J Clin Epidemiol* 1998; 51: 1055–1068.

60. Campeau L. Grading of Angina Pectoris: letter. *Circulation* 1976; 54: 522–523.
61. Dolgin M (ed). Nomenclature and Criteria for Diagnosis of Diseases of the Heart and Great Vessels (9th edn). In: *Criteria committee of the New York Heart Association, functional capacity and objective assessment*, 9th edn. Boston, MA: Little, Brown and Company, 1994, pp. 253–255.
62. Zigmond AS and Snaith RP. The Hospital Anxiety and Depression Scale. *Acta Psychiatr Scand* 1983; 67: 361–370.
63. Snaith RP and Zigmond AS. *The Hospital Anxiety and Depression Scale manual*. The NFER–NELSON Publishing Company Ltd., 1994. Windsor, Ontario, Canada.
64. Snaith RP. The Hospital Anxiety And Depression Scale. *Health Qual Life Outcomes* 2003; 1: 29.
65. Denollet J. DS14: Standard Assessment of Negative Affectivity, Social Inhibition, and Type D Personality. *Psychosom Med* 2005; 67: 89–97.
66. Kupper N and Denollet J. Type D personality as a prognostic factor in heart disease: assessment and mediating mechanisms. *J Pers Assess* 2007; 89: 265–276.
67. Zimet GD, Dahlem NW, Zimet SG, et al. The Multidimensional Scale of Perceived Social Support. *J Pers Assess* 1988; 52: 30–41.
68. Lett HS, Blumenthal JA, Babyak MA, et al. Dimensions of social support and depression in patients at increased psychosocial risk recovering from myocardial infarction. *Int J Behav Med* 2009; 16: 248–258.
69. Guillemin F, Bombardier C and Beaton D. Cross-cultural adaptation of health-related quality of life measures: literature review and proposed guidelines. *J Clin Epidemiol* 1993; 46: 1417–1432.
70. Newcombe RG. Interval estimation for the differences between independent proportions: comparison of eleven methods. *Stat Med* 1998; 17: 873–890.
71. Cumming G. Inference by eye: reading the overlap of independent confidence intervals. *Stat Med* 2009; 28: 205–220.
72. Jain R, Duval S and Adabag S. How accurate is the eyeball test?: a comparison of physician's subjective assessment versus statistical methods in estimating mortality risk after cardiac surgery. *Circ Cardiovasc Qual Outcomes* 2014; 7: 151–156.
73. Brueren BR, ten Berg JM, Suttorp MJ, et al. How good are experienced cardiologists at predicting the hemodynamic severity of coronary stenoses when taking fractional flow reserve as the gold standard. *Int J Cardiovasc Imaging* 2002; 18: 73–76.
74. Newcombe RG and Altman DG. Proportions and their differences. In: Altman DG, Machin D, Bryant TN, Gardner MJ (eds) *Statistics with confidence*, 2nd edn. Bristol: British Medical Journal, 2005, pp. 45–56.
75. Daly CA, Stepinska J, Deptuch T, et al. Differences in presentation and management of stable angina from East to West in Europe: a comparison between Poland and the UK. *Int J Cardiol* 2008; 125: 311–318.
76. Zatonski W, Przewozniak K, Sulkowska U, et al. Tobacco smoking in countries of the European Union. *Ann Agric Environ Med* 2012; 19: 181–192.
77. Stirbu I, Kunst AE, Bopp M, et al. Educational inequalities in avoidable mortality in Europe. *J Epidemiol Commun Health* 2010; 64: 913–920.
78. Hawkes A, Patrao T, Ware R, et al. Predictors of physical and mental health-related quality of life outcomes among myocardial infarction patients. *BMC Cardiovasc Disord* 2013; 13: 69.
79. Pedersen SS and Denollet J. Type D personality, cardiac events, and impaired quality of life: a review. *Eur J Prev Cardiol* 2003; 10: 241–248.
80. Albus C, De Backer G, Bages N, et al. [Psychosocial factors in coronary heart disease – scientific evidence and recommendations for clinical practice]. *Gesundheitswesen* 2005; 67: 1–8.
81. Beaglehole R. Global cardiovascular disease prevention: time to get serious. *Lancet* 2001; 358: 661–663.
82. Schane RE, Ling PM and Glantz SA. Health effects of light and intermittent smoking: a review. *Circulation* 2010; 121: 1518–1522.
83. Dragomirecká E, Bartonová J, Eisemann M, et al. Demographic and psychosocial correlates of quality of life in the elderly from a cross-cultural perspective. *Clin Psychol Psychother* 2008; 15: 193–204.
84. Broers CJ, Hogeling-Koopman J, Burgersdijk C, et al. Safety and efficacy of a nurse-led clinic for post-operative coronary artery bypass grafting patients. *Int J Cardiol* 2006; 106: 111–115.
85. Broers CJ, Sinclair N, van der Ploeg TJ, et al. The post-infarction nurse practitioner project: a prospective study comparing nurse intervention with conventional care in a non-high-risk myocardial infarction population. *Neth Heart J* 2009; 17: 61–67.
86. Foley TA, Mankad SV, Anavekar NS, et al. Measuring left ventricular ejection fraction – techniques and potential pitfalls. *Eur Cardiol* 2012; 8: 108–114.
87. Matišáková I, Gerlichová K and Knápková D. Education in master study program nursing in Slovakia. *University Rev* 2012; 6: 54–59.
88. Javor M. Nursing in territory of Slovakia – institutional changes. *Eur J Bioethics JAHR* 2013; 4: 405–415.