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Better knowledge improves adherence to lifestyle changes and medication in patients with coronary heart disease

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Abstract

Background: Many patients with coronary heart disease (CHD) are not managed adequately, and we often fail to reach treatment targets. *Aim*: To investigate if knowledge of risk factors for CHD, measured by a questionnaire, would show any relation to advice to compliance to lifestyle changes to attain treatment goals and adherence to drug therapy. *Method:* Men and women <71 years who had had a cardiac event were screened consecutively (509) from the medical records. Responders (392) were interviewed, examined and received a questionnaire. Three hundred and forty-seven patients answered the questionnaire regarding their general knowledge of risk factors for CHD, compliance to lifestyle changes to attain treatment goals and adherence to drug therapy. *Results:* There were statistically significant correlations between general knowledge about risk factors for CHD and compliance to certain lifestyle changes: weight, physical activity, stress management, diet, attainment of lipid level goals and the likelihood of taking prescribed blood pressure-lowering drugs. General knowledge of risk factors had no correlation to blood glucose or blood pressure levels nor on smoking habits or treatment patterns for prescribed lipid- and blood glucose-lowering drugs. *Conclusion:* Knowledge correlates to patient behaviour with respect to some risk factors, which should be recognised in preventive programs.

Keywords: Knowledge; Education; Compliance; Secondary prevention; Coronary heart disease; Nursing

1. Introduction

Coronary heart disease (CHD) is the leading cause of death in men over 45 years of age and women over 65 years in Sweden [1]. There is now a large body of evidence showing that the risk of CHD events can be significantly reduced through modification of risk factors [2–4]. Recent guidelines have clearly defined the importance of changing the lifestyle and treatment with prophylactic drugs [5–7].

Secondary prevention and rehabilitation of cardiac patients is defined as the sum of all activities required to favourably influence the underlying cause of the disease, as well as to achieve the best possible physical, mental and social condition [5]. It is of great importance that patients with CHD maintain their compliance to lifestyle changes and adherence to drug treatment in order to benefit long term. Therefore, patients should receive proper information, education and support to both change and maintain adequate lifestyle changes and comply with therapeutic interventions.

There are different opinions concerning the relationship between knowledge and compliance. The reason for these different views might be that the concept of knowledge has been used to cover too broad a range of information. Haynes et al. [8] reported no consistent relationship between knowledge and compliance, while Becker [9] reported that under some conditions information may indeed influence compliance.

Despite the existence of guidelines for many years, several surveys have shown that there is a significant gap between what these guidelines recommend and the actual clinical practice [10–14].

The nurse-led rehabilitation and secondary prevention unit at Malmö University Hospital was created to offer health education and behavioural change activities to all patients with CHD. The program includes lectures and

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discussions, both individually and in group sessions, in collaboration with physicians, almoner and physiotherapists. One concern of secondary prevention programs is our lack of data regarding to what degree patients actually follow the given advice. The aim of this study was to investigate if knowledge of risk factors for CHD, measured by a questionnaire, would show any relation to compliance to advice on lifestyle changes. Furthermore, if knowledge would have an impact on reaching defined treatment goals, as well as adherence to treatment with drugs within our program.

2. Methods

2.1. Background

Sweden has a population of approximately 9 million. The city of Malmö is the third largest in Sweden with approximately 260,000 inhabitants [15]. The city is served by only one hospital, and all patients with myocardial infarction, acute myocardial ischaemia and PTCA are treated at the Malmö University Hospital. Patients from Malmö who need bypass surgery are referred to the Lund University hospital about 20 km away. After postoperative care in Lund, all patients are transferred to the cardiac unit in Malmö for further treatment and rehabilitation.

2.2. The rehabilitation and secondary program

All patients <75 years of age with CHD and their relatives were invited to four 1.5-h group sessions for information and discussion. The specialist nurse, physician, almoner and the physiotherapist alternated being in charge of this session. The patients were also offered a 1-h visit to the specialist nurse approximately 2 weeks after discharge from the hospital. This visit was used for medical control, advice and education about lifestyle changes, social and psychological rehabilitation and drug treatment follow-up. Lifestyle management included advice on diet, exercise, smoking habits and how to cope with stress factors. After the first visit to the specialist nurse, the patients were offered an individualised number of visits to the nurse-led unit according to personal needs. All patients were also invited to participate in easy physical exercise 3 1-h classes. After this period, the patients were individually offered more strenuous physical group exercise sessions for 5–10 weeks. Some patients needed to visit the almoner (individual number of visit), and all patients were invited to one or two medical controls to the physician.

2.3. Inclusion criteria

The study was carried out at the Malmö University Hospital, Sweden, between 1999 and 2000, as an extension of the EUROASPIRE II survey [11]. The included patients were screened consecutively (n=509) from the hospital medical records. Men and women under 71 years of age at the time of the index event or procedure, after 1 January 1997, were identified. Inclusion criteria are shown in Appendix A.

2.4. Study population and design

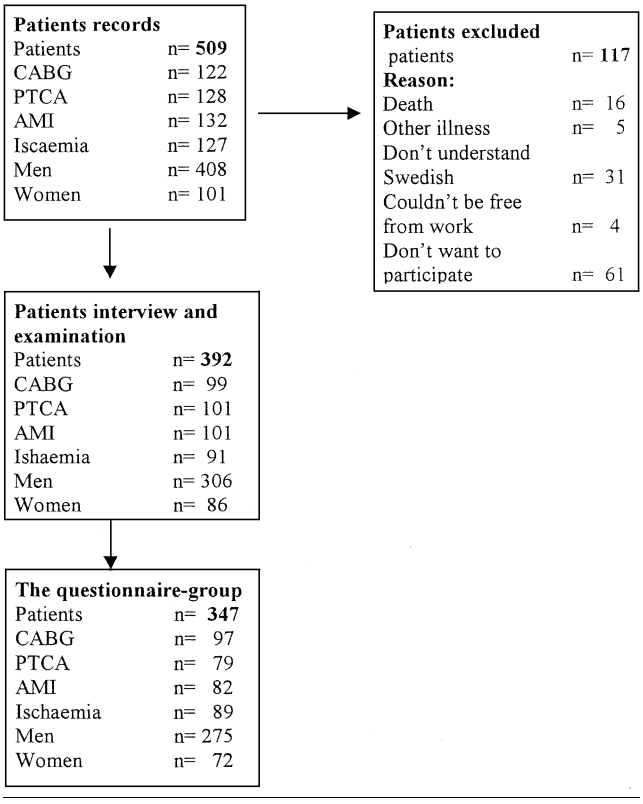
The data collection took place at least 6 months after the date of acute hospital admission or procedure and was based on a review of the medical records (n=509). There were 408 (80%) men and 101 (20%) women. All patients were invited to a structured interview and were offered an examination [11] performed by a specialist nurse, a physician or a medical laboratory technologist. The interview contained questions about education level, sick leave, occupation, present caretaker and the age when CHD was first diagnosed. Additional questions were related to present medication, smoking habits, advice to follow a cardiac rehabilitation programme and if the patients had any relatives suffering from CHD. The patients were also informed to bring all their current medication prescription to the interview and examination.

A total of 392 patients (77%) responded (306 men and 86 women). Sixteen patients (3%) dropped out of the study because of death, 5 patients (0.9%) for other illness, 31 patients (6%) because they did not understand the Swedish language, 4 patients (0.7%) could not be free from work and 61 patients (12%) did not want to participate in the study. Descriptions of the study population and diagnostic categories are presented in Table 1.

2.5. Patient questionnaire

After completing the interview and examination, each patient (n=392) received a questionnaire to answer at home or at the hospital. Both oral and written information were provided in order to ensure correct comprehension of the questions. The questionnaire was composed of several parts. The first two sets of the questions are not reported in this study. The aim of the additional questions was to estimate the patient's general overall knowledge about risk factors for CHD, compliance to lifestyle changes to attain treatment goals and adherence to drug treatment using an ordinal scale 0–9 (Appendix B). Adherence to drug therapy was checked against the prescriptions, but no formal pill counts were done. Patient's knowledge was evaluated by creating questions using a scale from 0 to 9 defined as 0 being less important for the progress of coronary heart disease and 9 being very important for the progress of coronary heart disease. The degree of lifestyle changes to attain treatment goals was investigated by using questions with definition ranging from 0 being ''I have not made any lifestyle chances'' to 9 being ''I have made a lot of lifestyle changes''. Adherence to drug treatment was explored using questions with the following definition: 0 defined as ''I do not take prescribed lipid-, blood pressure- and/or blood

Table 1
Study population (number) enrolled from medical records, patients interview and examination and the questionnaire group:



glucose-lowering drugs", and 9 defined as "I take prescribed lipid-, blood pressure- and/or blood glucose-lowering drugs everyday".

2.6. Assessment

There is no "gold standard" questionnaire for measuring knowledge of risk factors for CHD, nor is there one to assess compliance to lifestyle changes or adherence to medication after a CHD event. Therefore, the questions in this questionnaire were all developed for this study by a panel of three cardiologists and one nurse specialist in cardiology. To obtain content validity, a matrix, as suggested by Streiner and Norman [16], was constructed as a basis for the questionnaire. An ordinal scale 0–9 was used to illustrate the patients' general knowledge of risk factors for CHD, the degree of achieved lifestyle changes and adherence to medication. The same scales were used to assess the ability to reach treatment target in our program. The first version of the questionnaire was tested in 20 patients <70 years old, visiting the nurse-led secondary prevention and rehabilitation unit following a cardiac event. After the pilot study, the panel evaluated the questionnaire. Some of the questions were reconstructed and others were deleted. The reason for reconstructing certain questions was that more than 25% of the patients had difficulties understanding these questions. The majority of the patients thought that there were too many questions to answer, and therefore, some questions were deleted. Twenty additional patients <70 years tested the new questionnaire. All questions in this third version of the questionnaire were tested for reliability by Cronbach's *a* (alpha), which was 0.73. Cronbach's *a* should be above 0.70 [16] but probably not higher than 0.90 [17]. After a final consideration by the panel, the third version was used in our study. The goal was to have an easily comprehensible, easy to answer questionnaire containing a limited number of questions. At the same, the questions had to be valid for the goals of our investigation.

Knowledge of risk factors for CHD was defined in this study as the patients' general overall knowledge about risk factors for CHD (obesity, lipid levels, blood glucose levels, physical activity, stress, smoking, dietary issuer and blood pressure).

Compliance has been defined in different ways, but the most widely accepted working definition selected for use in our study is that by Haynes [18], "the extent to which a person's behaviour (in terms of taking medications, following diets or executing other lifestyle changes) coincides with medical or health advice. Noncompliance is when a person's behaviour does not coincide with medical or health advice, the extent of which is variable".

Compliance to lifestyle changes and to obtain treatment goals was defined as the patient's own self-reported dietary changes, changes in smoking habits, changes in physical activity, reduction of weight and stress management to decrease lipid, blood glucose and blood pressure levels. European and National lifestyle and therapeutic targets for patients with CHD are shown in Appendix C [5,7].

The definition of *adherence to drug treatment* in our study was measured by the number of patients self-reported use of prescribed drugs (lipid-, blood glucose- and blood pressure-lowering drugs).

All patients were invited to the routine program at the clinic after their cardiac event. They were consecutively included and invited to this study at least 6 months after the cardiac event. The purpose of our study was not to evaluate the routine program for rehabilitation and secondary prevention. It was to investigate the patients acquired knowledge of risk factors for CHD, reflect to the clinic practice, at least 6 month after the cardiac event. We have interview data only on self-reported patients who participated in the physical rehabilitation program (Table 2).

2.7. Statistical analyses

Spearman's rank correlation was used to investigate whether the patient's general knowledge of risk factors for CHD had any relationship to the degree of changing lifestyle for attainment of treatment goals and the degree of prescribed prophylactic drug use. Spearman's rank correlation was also used to investigate the relationship between patients' general knowledge of risk factors for CHD

Table 2
Demographic data of the patients in the questionnaire group (mean and number) and self-reported prescribed medication (number and percent) at time of interview (n=347)

All categories (n=347)	Mean±S.D.	Number	%
Men		275	79
Women		72	21
Age (years)	63.2±8.1		
Total cholesterol (mmol/l)	4.9±1.0		
Triglycerides (mmol/l)	1.7±0.9		
HDL cholesterol (mmol/l)	1.3±0.3		
LDL cholesterol (mmol/l)	2.9±0.9		
Systolic BP (mm Hg)	148.6±22.3		
Diastolic BP (mm Hg)	85.3±11.6		
BMI (kg m^2)	27.8±4.4		
Plasma glucose (mmol/l)	6.7±2.0		
Number patients (%) >6.1 plasma glucose*			46.1
Number patients (%) smoking			19.1
Self-reported participating in physical rehabilitation program		230	67.1
Medication			
Antiplatelets		320	93.2
Beta-blockers		246	70.7
Lipid-lowering drugs		202	58.0
ACE inhibitors		50	14.4
Antidiabetic drugs		32	8.5
Calcium antagonists		65	22.4
Other antihypertensive drugs (except beta-blockers, calcium antagonists, diuretics)		2	0.4
Diuretics		49	16.3

* Prevalence (%) of CHD risk factors in EUROASPIRE II. Diagnose diabetes 26.2%, drug treatment for diabetes 13.0% and self-reported diabetes 14.0%.

and the degree of lifestyle change to attain treatment goals and prescribed prophylactic drug use. Self-reported knowledge of risk factors for CHD, such as obesity, lipid levels, blood glucose levels, physical activity, stress, smoking, diet and blood pressure, were correlated to the value entered by the patients, in a scale (0–9) to lifestyle changes to obtain treatment goals and the use of prescribed prophylactic drugs. This also to the value entered by the patients, in a scale 0–9. Variables of lifestyle changes to attain treatment goals included weight, physical activity habits, stress management, smoking, diet and attainment of treatment goals of lipid, blood glucose and blood pressure levels. Variables of the use of prescribed prophylactic drugs included lipid-, blood glucose- and blood pressure-lowering drugs. Data are presented as median and interquartile ranges, with a lower quartile (Q1) and an upper quartile (Q3), with the minimum value equal to 0 and the maximum value equal to 9. The upper quartile is the point below which 75% of the cases fall. The lower quartile encompasses the lowest 25% of the scores (Table 4). A p value <0.05 was considered statistically significant.

The Ethics Research Committee, Faculty of Medicine, University of Lund (LU 485-99) approved the study, and the investigation conforms to the principles outlined in the Declaration of Helsinki.

3. Results

Three hundred and forty-seven patients (88.5%) out of 392 patients completed the questionnaire on general knowledge about risk factors for CHD and compliance to lifestyle changes and drug treatment. Most of the patients (n=296) answered the questionnaire at home and returned it by mail. Forty-six patients required a second reminder to return the questionnaire. The response rates were between 326 and 338. The lowest response rates were seen in questions regarding elevated blood glucose/diabetes and obesity as risk factor for CHD, and reduced smoking and weight loss as lifestyle changes. Questions about elevated lipid levels, stress and smoking habits, as risk factors for CHD, and questions about reduction of lipid levels and increase of exercise habits, as lifestyle changes, showed the highest response rates. Self-reported participation in physical rehabilitation program after the cardiac event was 67.1%.

Demographic data for the patients in the questionnaire group and self-reported prescribed medication at the time of interview are presented in Table 2.

The mean age of the patients was 63.2±8.1 and 79% were men. The mean values of total cholesterol, triglycerides, LDL cholesterol, HDL cholesterol and diastolic blood pressure were below those recommended by European guidelines [5], but the mean values of systolic blood pressure 148.6±22.3, BMW 27.8±4.44 and plasma glucose 6.7±2.0 were higher then recommended values. Forty-six percent of the patients had blood glucose levels >6.1 mmol/l, and 19.1% were current smokers (Table 2) [19–20].

Table 3
The median and interquartile ranges (Q1 and Q3) of general knowledge and compliance to lifestyle changes to obtain treatment goals in different domains (n=347)

Domain	General knowledge		Compliance	
	Median	Quartiles (Q1–Q3)	Median	Quartiles (Q1–Q3)
Lifestyle changes				
Obesity	7	(5–9)	0	(0–5)
Lipid levels	8	(6–9)	6	(3.5–9)
Blood glucose levels	6	(4–8)	0	(0–5)
Physical activity habit	7	(5–9)	5	(0–7)
Stress management	8	(6–9)	4	(0–7)
Smoking	9	(7–9)	0	(0–9)
Dietary changes	7	(5–9)	5	(0–7)
Blood pressure levels	7	(5–8)	0	(0–4.5)

The majority of patients in our study were treated with antiplatelet agents (93.2%), and large proportions also use prescribed beta-blockers (70.7%). Approximately, half of the patients were treated with lipid-lowering drugs (58%). Only 14.4% of the patients took ACE inhibitors. A minor fraction of the patients were treated with other antihypertensive drugs (except beta-blockers, calcium antagonists and diuretics; 0.4%), calcium antagonists (22.4%), diuretics (16.3) and antidiabetic drugs (8.5%; Table 2).

The highest self-reported median levels of general knowledge were observed regarding smoking habits (median 9), stress (median 8) and increased lipid levels (median 8) as risk factors to CHD. The lowest self-reported median level of general knowledge was found regarding increased blood glucose (median 6). Table 3 describes the median and the interquartile ranges of general knowledge and compliance to lifestyle changes to obtain treatment goals in different domains.

There was a statistically significant correlation between general knowledge about risk factors for CHD and the degree of self-reported lifestyle changes [reduced weight (p=0.040), increased physical activity (p=0.005), better stress management (p=0.004), dietary changes (p<0.001)] and reaching treatment goals for lipid levels (p=0.018). The study also showed that better knowledge influenced the patients' likelihood to take prescribed blood pressure-lowering drugs (p=0.003; Table 4).

However, in three areas of lifestyle changes and reaching treatment goals [reduction of smoking (p=0.703), decreased blood pressure (p=0.098) and decreased blood glucose (p=0.112) levels], there was no such correlation. There was also no correlation between knowledge of secondary prevention and increased adherence to treatment of prescribed lipid- (p=0.460) and blood glucose-lowering drugs (p=0.578).

The correlation between self-reported general knowledge of risk factors for CHD, changing lifestyle to obtain treatment goals and prescribed prophylactic drug therapy are presented as median, lower (Q1) and upper (Q3) quartiles in Table 4.

Table 4
Correlation (Spearman rank correlation) between self-reported general knowledge about risk factors to CHD, changing lifestyle to obtain treatment goals and treatment with prophylactic drugs, median and lower(Q1) and upper(Q3) quartiles (n=347)

Variable	General knowledge		
	Median	Quartiles (Q1–Q3)	P*
Lifestyle changes			
Obesity	0	(0–5)	0.040*
Lipid levels	6	(3–9)	0.018*
Blood glucose levels	0	(0–5)	0.112
Physical activity habit	5	(0–7)	0.005**
Stress management	4	(0–7)	0.004**
Smoking	0	(0–9)	0.703
Dietary changes	5	(0–7)	<0.001***
Blood pressure levels	0	(0–5)	0.098
Drug treatment			
Lipid-lowering drug	8	(5–9)	0.460
Drug treatment/diabetes	0	(0–0)	0.578
Drug treatment/blood pressure	5	(5–5)	0.003**

* P<0.05.
** P<0.01.
*** P<0.001.

4. Discussion

This study suggests that the patient's ability, based on self-reported lifestyle changes to obtain treatment goals and to adhere to prophylactic drug therapy, may be related to better general knowledge of risk factors for CHD. However, general knowledge seems to have no significant relation to smoking habits, blood glucose levels, blood pressure levels or treatment with lipid- and blood glucose-lowering drugs.

4.1. Statistics

The lack of simple and accurate methods for measuring compliance is the major problem in research on patient adherence both with respect to lifestyle changes and drug treatment. There are a number of traditional measures of patients' compliance, both direct and indirect [21,22]. None of these measures are ideal with respect to reliability and validity. Today, there is no ''gold standard'' for assessing compliance and noncompliance.

The questionnaire in our study does not measure absolute general knowledge of risk factors for CHD nor absolute change in lifestyle. It measures the relative general knowledge or change in lifestyle compared between patients taking part in the study.

To assess knowledge and identification of risk factors for CHD, multiple-choice tests can be used as a tool [23]. However, multiple-choice tests do not measure the degree of change. Instead different scales should be used [24–29].

There are different opinions regarding the optimal choice of the number of steps or boxes in a scale. Some evidence shows that people are unable to discriminate much beyond seven levels [30,16]. A common problem in use of ratings is that people seldom use the extreme positions on the scale. Reliability drops as fewer categories are used and the result is a loss of information [16]. Consequently, a 0–9 scale is probably the best choice.

The patient's self-reported general knowledge of risk factors for CHD, lifestyle changes to obtain treatment goals and medication created an ordinal scale between 0 and 9. The variables in this ordinal scale were ranked between 0 and 9. The response values have an ordered structure but not a numerical value in the mathematical sense. The median level with an interquartile range can

well describe the response alternatives given in the instrument in an ordinal scale. This is in contrast to the mean with standard deviation, which requires a scale with interval [31].

4.2. Knowledge

This study has shown that a relatively higher degree of knowledge about risk factors for CHD may in some areas be a factor contributing to better compliance to lifestyle changes and treatment with prophylactic drugs after a cardiac event. A study done in five European countries evaluated the response of CHD patients to lifestyle changes and found that only about half of the subjects actually implemented the changes [32]. Other studies have shown that only 50% (actually 30% to 80%) of patients comply with their medical treatment. The lowest rates are seen for patients with chronic disease [33]. Earlier studies have shown that anxiety [34,35], health beliefs [36–39], social support [40–43] and coping style [44,45] are important for compliance. Later studies have shown that patients want more information and education from health care professionals and wish to take an active part in decisions about their own health [46,47]. Most patients probably need both information and education to obtain knowledge of risk factors for CHD and ways to reach and maintain treatment goals. Education rather than information may give patients a deeper knowledge of risk factors for CHD, which can lead to improvement of compliance.

In our study, we have no measurement of the absolute level of knowledge among our patients. Therefore, we can only assess the impact of the relative degree of knowledge. This may mean that our findings are difficult to reproduce. However, our patients were not selected, they were consecutively included, and the result should therefore be valid to the questions involved.

4.3. Areas related to the degree of general knowledge about risk factors for CHD

Five areas of lifestyle changes to obtain treatment goals and one area of adherence to medical treatment were all related to the degree of general knowledge of risk factors for CHD.

Despite the fact that the mean level of total cholesterol in our study was 4.9 mmol/l (Table 2), 40.4% of the patients in EUROASPIRE II did not reach the goal <5.0 mmol/l for total cholesterol [5]. Fifty-eight percent of the patients (Table 2) in our study (n=347) were treated with lipid-lowering drugs compared with 76.5% for the Swedish patients in EUROASPIRE II (n=392). In other countries participating in EUROASPIRE II, the mean for not reaching the goal for total cholesterol was 58.3%. [9]. The mean BMI in this study was 27.8 (Table 2). One reason for not reaching the European Guidelines goal for BMI [5] is that the goal for BMI in the Malmö care program is 27.0. Another reason is that it often takes a long time for patients to lose weight. The mean value of triglyceride levels was below the recommended guidelines [5]. This may indicate a positive change in diet and physical activity. In addition, HDL cholesterol, which was above the recommend value, may indicate a higher level of physical activity (Table 2). You cannot however leave out the possible effect of lipid-lowering drugs on these lipid levels.

General knowledge of risk factors for CHD was statistically related to the adherence to drug treatment of blood pressure (Table 3), but the patients' mean systolic blood pressures were higher than recommended. In contrast, the mean diastolic blood pressures were below the level recommended by the guidelines ([5]; Table 2).

4.4. Areas not related to the degree of general knowledge of risk factors for CHD

There was no statistical correlation between general knowledge of risk factors for CHD and the degree of smoking cessation, the reduction in blood pressure or the change in blood glucose levels. Nor was there any correlation with reported drug treatment for diabetes or the use of lipid-lowering drugs.

The prevalence of smoking was 19.1% in our patients, and the mean systolic blood pressure was 148.6±22.3 (Table 2). The prevalence of diabetes in EUROASPIRE II (n=392) was 26.2% (glucose ≥7.0 mmol/l, and/or history of diabetes, in patients fasting ≥6 h), but self-reported diabetes was only 14% [9]. Thirteen percent of the patients in EUROASPIRE II [9] were treated with drugs for diabetes (Table 2), compared to 8.5% in this questionnaire group (n=347; Table 3). One reason why the mean blood glucose level was high (6.7±2.0) and 46.1% of the patients had blood sugar levels >6.1 might be the low attention from the profession to educate them about the importance of lifestyle chances, to diagnose the patient's diabetes and to initiate drug treatment early if necessary. Obviously, drug prescription may not be primarily influenced by the patient and depends on the doctor's ability and interest in using drugs for the treatment of lipids and glucose. Therefore, it is not surprising that our findings do not show the relation of knowledge on the use of certain drugs.

There are probably several reasons for the gap between guidelines recommendation and clinical practice. Possible reasons for this apparent shortfall include the following [48,49]:

- lack of physician awareness of evidenced-based guidelines
- insufficient focus on preventive care in the health care system
- patient's noncompliance to advice on lifestyle changes and medication

– lack of developed nurse-led secondary prevention units for long-term management of risk factors in CHD patients
– lack of comprehensive shared care management programs

4.5. Limitations of the study

The result may not be applicable to women with CHD because only 21% of the patients in this study belong to this group. Another relevant issue, which perhaps influences the result of this study, is if the group of patients who did not take part in the routine secondary prevention program is the same group of patients who did not participate in this study.

5. Conclusion

Many patients do not receive adequate lifestyle advice or proper pharmacological therapy after a cardiac event. Despite evidence that such actions reduce the further risk of morbidity and mortality, we do not reach our goals as defined in the guidelines. This study suggests that improved knowledge of risk factors for CHD correlate to compliance to some lifestyle changes, such as weight loss, increased physical activity, stress management and dietary changes. Furthermore, the ability to reach set targets for lipids are also related to the level of general knowledge as well as the use of blood pressure-lowering drugs. This study has also shown that general knowledge of risk factors for CHD is not enough to change the behaviour of patients with elevated blood glucose levels, high blood pressure or smokers postcardiac event. In these domains, the targets defined in the guidelines are not obtained. Nor is there any significant correlation between knowledge and the number of patients treated with lipid- and blood glucose-lowering drugs. Finally, patient education must be formalised and acknowledged as an official part of the health care system [50]. Compliance to lifestyle changes and treatment with prophylactic drugs after a cardiac event is a very complex and multifaceted problem. Further research is needed to better understand and deal with compliance behaviours. Whether specific knowledge of individual risk factors will correlate with outcome is not known. This aspect will be the focus of future research.

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Appendix A. Inclusion criteria's for the EUROASPIRE II trial. Men and women < 71 years of age at the time of the index event or procedure, with the following diagnoses or treatments for coronary disease after 1 January 1997

1. Coronary artery bypass graft (CABG)

   Consecutive patients having their first elective or emergency CABG operation, including emergency CABG for acute myocardial infarction.
2. Percutaneous transluminal coronary angioplasty (PTCA)

   Consecutive patients following their first elective or emergency PTCA, including emergency PTCA for acute myocardial infarction. Patients with history of CABG were excluded.
3. Acute myocardial infarction (AMI: ICD-9 410)

   Consecutive patients with a hospital diagnosis of first or recurrent acute myocardial infarction but no history of CABG or PTCA.
4. Acute myocardial ischaemia (ischaemia: ICD-9 411)

   Consecutive patients with a hospital diagnosis of first or recurrent myocardial ischaemia but no evidence of infarction and no history of CABG, PTCA or no previous acute myocardial.

Appendix B. Questionnaire. General and specific knowledge to risk factors to CHD, lifestyle changes and treatment with prophylactic drug

1. Do you think obesity influences the progress of coronary heart disease? Award points to a scale between 0 and 9. 0 being less important for the progress of heart disease. . . . . .9 being very important for the progress of coronary heart disease.
   Points □
2. Do you think high lipid levels influence the progress of coronary heart disease? Award points to a scale between 0 and 9. 0 being less important for the progress of coronary heart disease. . . . . .9 being very important for the progress of coronary heart disease.
   Points □
3. Do you think high blood glucose levels/diabetes influence the progress of coronary heart disease? Award points to a scale between 0 and 9. 0 being less important for the progress of coronary heart disease. 9

being very important for the progress of coronary heart disease.

Points ☐

4. Do you think exercise habits influence the progress of coronary heart disease? Award points to a scale between 0 and 9. 0 being less important for the progress of coronary heart disease. . . . . .9 being very important for the progress of coronary heart disease.

   Points ☐

5. Do you think stress influences the progress of coronary heart disease? Award points to a scale between 0 and 9. 0 being less important for the progress of coronary heart disease. . . . . .9 being very important for the progress of coronary heart disease.

   Points ☐

6. Do you think smoking habits influence the progress of coronary heart disease? Award points to a scale between 0 and 9. 0 being less important for the progress of coronary heart disease. . . . . .9 being very important for the progress of coronary heart disease.

   Points ☐

7. Do you think diet influences the progress of coronary heart disease? Award points to a scale between 0 and 9. 0 being less important for the progress of coronary heart disease. . . . . .9 being very important for the progress of coronary heart disease.

   Points ☐

8. Do you think hereditary influences the progress of coronary heart disease? Award points to a scale between 0 and 9. 0 being less important for the progress of coronary heart disease . . . . . .9 being very important for the progress of coronary heart disease.

   Points ☐

9. Do you think high blood pressure influences the progress of coronary heart disease? Award points to a scale between 0 and 9. 0 being less important for the progress of coronary heart disease. . . . . .9 being very important for the progress of coronary heart disease.

   Points ☐

10. Do you think obesity influences or has influenced the progress of *your* coronary heart disease? Award points to a scale between 0 and 9. 0 being less important for the progress *of my* coronary heart disease. . . . . .9 being very important for the progress *of my* coronary heart disease.

    Points ☐

11. Do you think high lipid levels influence or have influenced *your* coronary heart disease? Award points to a scale between 0 and 9. 0 being less important for the progress *of my* coronary heart disease. . . . . .9 being very important for the progress *of my* coronary heart disease.

    Points ☐

12. Do you think high blood glucose levels/diabetes influence or have influenced *your* coronary heart disease? Award points to a scale between 0 and 9. 0 being less important for the progress *of my* coronary heart disease. . . . . .9 being very important for the progress *of my* coronary heart disease.

    Points ☐

13. Do you think exercise habits influence or have influenced *your* coronary heart disease? Award points to a scale between 0 and 9. 0 being less important for the progress *of my* coronary heart disease. . . . . .9 being very important for the progress *of my* coronary heart disease.

    Points ☐

14. Do you think stress influences or has influenced *your* coronary heart disease? Award points to a scale between 0 and 9. 0 being less important for the progress *of my* coronary heart disease. . . . . .9 being very important for the progress *of my* coronary heart disease.

    Points ☐

15. Do you think smoking habits influence or have influenced *your* coronary heart disease? Award points to a scale between 0 and 9. 0 being less important for the progress *of my* coronary heart disease. . . . . .9 being very important for the progress *of my* coronary heart disease.

    Points ☐

16. Do you think diet influences or has influenced *your* coronary heart disease? Award points to a scale between 0 and 9. 0 being less important for the progress *of my* coronary heart disease. . . . . .9 being very important for the progress *of my* coronary heart disease.

    Points ☐

17. Do you think high blood pressure influences or has influenced *your* coronary heart disease? Award points to a scale between 0 and 9. 0 being less important for the progress *of my* coronary heart disease. . . . . .9 being very important for the progress *of my* coronary heart disease.

    Points ☐

18. Have you lost weight with lifestyle changes after your coronary heart disease and/or after your coronary heart operation? Award points to a scale between 0 and 9. 0—I have not done any lifestyle changes to lose weight . . . .9—I have done a lot of lifestyle changes to lose weight.

    Points ☐

19. Have you reduced your lipid levels with lifestyle changes after your coronary heart disease and/or your coronary heart operation? Award points to a scale between 0 and 9. 0—I have not done any lifestyle changes to reduce my lipid levels . . . .9—I have done a lot of lifestyle changes to reduce my lipid levels.

    Points ☐

20. Have you reduced your blood glucose levels/diabetes with lifestyle changes after your coronary heart

disease and/or your heart operation? Award points to a scale between 0 and 9. 0—I have not done any lifestyle changes to reduce my blood glucose levels/ diabetes . . . .9—I have done a lot of lifestyle changes to reduce my blood glucose levels/ diabetes.

Points □

21. Have you increased your exercise habits after your coronary heart disease and/or your coronary heart operation? Award points to a scale between 0 and 9. 0—I have not increased my exercise habits. . . . .9—I have done a lot of lifestyle changes to increase my exercise habits.

Points □

22. Have you reduced your stress level with lifestyle changes after your coronary heart disease and/or your coronary heart operation? Award points to a scale between 0 and 9. 0—I have not reduced my stress level . . . .9—I have reduced my stress level.

Points □

23. Have you changed your smoking habits after your coronary heart disease and/or your heart operation? Award points to a scale between 0 and 9. 0—I have not stopped smoking . . . .9—I have stopped smoking.

Points □

24. Have you made any dietary changes after your coronary heart disease and/or your heart operation? Award points to a scale between 0 and 9. 0—I have not done any dietary changes . . . .9—I have done a lot of dietary changes.

Points □

25. Have you reduced your blood pressure level with lifestyle changes after your coronary heart disease and/ or your coronary heart operation? Award points to a scale between 0 and 9. 0—I have not reduced my blood pressure level . . . .9—I have reduced my blood pressure level.

Points □

26. Do you take prescribed lipid-lowering drugs? Award points to a scale between 0 and 9. 0—I do not take prescribed lipid-lowering drugs. . . . . ..9—I take prescribed lipid-lowering drugs everyday.

Points □

27. Do you take prescribed antidiabetic medication? Award points to a scale between 0 and 9. 0—I do not take prescribed antidiabetic medication. . . . . ..9—I take prescribed antidiabetic medication everyday.

Points □

28. Do you take prescribed blood pressure-lowering drugs? Award points to a scale between 0 and 9. 0—I do not take prescribed blood pressure-lowering drugs . . . .9—I take prescribed blood pressure-lowering drugs everyday.

Points □

Appendix C. European and National lifestyle and therapeutic goals for patients with CHD:

Lifestyle and other risk factors
Stop smoking
Make healthy food choices
Be physically active
Achieve ideal weight, BMI <25
Total cholesterol <5.0 mmol/l
LDL cholesterol <3.0 mmol/l
Blood pressure <140/90 mm Hg
Optimise blood sugar control
When these risk factor goals are not achieved by lifestyle changes, blood pressure and cholesterol-lowering drug therapies would be used
Prophylactic drug therapies
Statins
Aspirin
Beta-blockers
ACE inhibitors

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