# EVALUATION OF RISK FACTOR MODIFICATION MANAGEMENT IN PATIENTS WITH CORONARY HEART DISEASE AND PATIENTS' EXPERIENCES OF SECONDARY PREVENTION

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Göteborg 2004

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**Akademisk avhandling**

Som för avläggande av medicine doktorsexamen vid
Göteborgs universitet kommer att offentligen försvaras i
Aulan, Sahlgrenska Universitetssjukhuset, Göteborg
torsdagen den 3 juni, 2004, kl 09.00

av

**Mona From Attebring**
Leg. Sjuksköterska

Avhandlingen baseras på följande delarbeten:

I. From Attebring M, Hartford M, Holm G, Wiklund O, Währborg P, Herlitz J. Risk indicators for recurrence among patients with coronary artery disease – Problems associated with their modification. *Scand Cardiovasc J* 1998;32:9-16.

II. From Attebring M, Hartford M, Berndt AK, Herlitz J. Has interest in secondary prevention increased among physicians after the 4S study. *Scand Cardiovasc J* 2000;34:164-167.

III. From Attebring M, Herlitz J, Berndt AK, Karlsson T, Hjalmarson A. Are patients truthful about their smoking habits? A validation of self-report about smoking cessation with biochemical markers of smoking activity amongst patients with coronary heart disease. *J Intern Med* 2001;249:145-151.

IV From Attebring M, Hartford M, Hjalmarson A, Caidahl K, Karlsson T, Herlitz J. Smoking habits and predictors of continued smoking in patients with acute coronary syndromes. *J Adv Nurs* 2004;46:1-10. In press.

V From Attebring M, Herlitz J, Ekman I. Intrusion and confusion – the impact of medication and health professionals after acute myocardial infarction. Accepted for publication in *Eur J Cardiovasc Nurs*.

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**Evaluation of risk factor modification management in patients with coronary heart disease and patients' experiences of secondary prevention**

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**Aim:** To evaluate management of risk factor modification among patients suffering from coronary heart disease and to explore patients' experiences of secondary prevention.
**Methods:** After institution of a secondary prevention programme patients were offered follow up visits to a nurse, one year after the coronary event for evaluation of various risk factors associated with recurrence (I, II). Self-report of smoking cessation was validated against bio-chemical markers for smoking, cotinine in plasma and carbon monoxide in expired air (III). Factors that can predict who will resume smoking after an acute coronary syndrome were identified (IV). An in-depth interview with a narrative approach and hermeneutical analysis was conducted in patients after a myocardial infarction (V).
**Results:** The evaluation showed that 70% of all patients had one or more of the following risk indicators; s-cholesterol >6.5 mmol/l (30%), s-triglycerides >3.0 mmol/l (19%), fasting blood glucose > 6.7 mmol/l (29%), systolic blood pressure >160 mmHg (9%), diastolic blood pressure >90 mmHg (8%) or smoking (36%), compared with 67% at follow up (I). No change in mean body weight was observed (I, II). Over time a substantial lowering of serum lipids was observed parallel to a three-fold increase in the use of lipid-lowering drugs.

Out of 1320 patients, with acute coronary syndromes (IV), 434 (33%) were current smokers. Three months after discharge 51% of those were still smoking. Six factors were independently associated with smoking at follow-up: non-participation in the cardiac rehabilitation programme, treatment with sedatives or antidepressants at time of admission, a previously known cardiac event or cerebral vascular disease, smoking related pulmonary disease and high average cigarette consumption. Of 260 former smokers, 17 (6.5%) had bio-chemical markers that contradicted their self-report.
The experiences of patients following a first myocardial infarction were described as 'impact of medication' and 'impact of health professionals' (V). Patients interpreted bodily symptoms as a consequence of being medicated rather than as a result of their heart attack. The medication led to feelings of being intruded upon but also to feelings of security. The communication with different physicians and other health professionals led to some perplexity about the illness and its treatment. Patients expressed a need of being reassured by the physician regarding their physical health status.
**Conclusions:** The findings indicate difficulties in the management of risk factor modification in secondary prevention. Although there has been a marked improvement in serum lipids levels by increased use of lipid lowering drugs, there are still problems with modification of life style related risk factors, such as overweight and smoking. With even lower treatment targets for hypertension there is a potential for improvement of this risk factor as well. Self-reported smoking cessation and bio-chemical markers corresponded in the majority of cases. Following a first myocardial infarction, care of patients has to be considerated regarding the impact of the pharmacological treatment on patients' life. The point initiation in secondary preventive work must be patients' beliefs about their condition and the treatment they receive.

**Keywords:** Coronary heart disease, myocardial infarction, secondary prevention, risk factor modification, smoking cessation, validation, predictors, patients' experiences, nursing

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ISBN 91-628-6117-4

# ERRATA

**Mona From Attebring**

**Göteborg 2004**

## Evaluation of risk factor modification management in patients with coronary heart disease and patients' experiences of secondary prevention

**Frame work**

1. Page 10, 13 and 35, the reference (The Simvastatin Survival Study Group (4S), 1994), (The 4S-study Group, 1994) should be referred to as; "Randomised trial of cholesterol lowering in 4444 patients with coronary heart disease: the Scandinavian Simvastatin Survival Study (4S)". (1994) *Lancet* 344(8934):1383-9.

2. Page 11, the reference (Second Joint Task Force Report, 1998) should be referred to as; "Prevention of coronary heart disease in clinical practice. Recommendations of the Second Joint Task Force of European and other Societies on coronary prevention". (1998). *Eur Heart J* 19(10):1434-503.

3. Page 13 and 35, the reference (LIPID Study Group, 1998) should be referred to as; The Long-Term Intervention with Pravastatin in Ischaemic Disease (LIPID) Study Group. (1998). "Prevention of cardiovascular events and death with pravastatin in patients with coronary heart disease and a broad range of initial cholesterol levels. *N Engl J Med* 339(19):1349-57.

4. Page 38, the reference (Ellard *et al.* 1996) should be deleted.

**Paper I**

5. Page 11, in the results, second column, first paragraph, line 10; should be..... a mean of 450 days' follow-up.

**Paper IV**

6. Table 4, in the heading; the numbers for Quitters and Non-quitters should be 170 and 178, respectively.

7. The second reference should be replaced by: Hjalmarson, Å., Elmfeldt, D., Herlitz, J., Holmberg, S., Malek, I., Nyberg, G., Ryden, L., Swedberg, K., Vedin, A., Waagstein, F., Waldenstrom, A., Waldenstrom, J., Wedel, H., Wilhelmsen, L. and Wilhelmsson, C. (1981). "Effect on mortality of metoprolol in acute myocardial infarction. A double-blind randomised trial." *Lancet* **2**(8251): 823-7.

# EVALUATION OF RISK FACTOR MODIFICATION MANAGEMENT IN PATIENTS WITH CORONARY HEART DISEASE AND PATIENTS' EXPERIENCES OF SECONDARY PREVENTION

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**Göteborg 2004**

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Printed at Vasastadens Bokbinderi
ISBN 91-628-6117-4

**To my parents Ingemar and Signe who gave me the willpower and energy to write this thesis**

# ABSTRACT

**Aim:** The overall aim of this thesis was to evaluate management of risk factor modification among patients suffering from coronary heart disease and to explore patients' experiences of secondary prevention.

**Methods:** After institution of a secondary prevention program patients were offered follow up visits to a nurse, one year after the coronary event for evaluation of various risk factors associated with recurrence (I, II). At the follow-up visits patients' self-report of smoking cessation was validated against bio-chemical markers for smoking, cotinine in plasma and carbon monoxide in expired air (III). Factors that can predict who will resume smoking after an acute coronary syndrome were identified (IV). To explore patients' experiences after a first myocardial infarction in relation to secondary prevention, an in-depth interview with a narrative approach and hermeneutical analysis was conducted (V).

**Results:** At the evaluation it was found that 70% of all patients had one or more of the following risk indicators; s-cholesterol >6.5 mmol/l (30%), s-triglycerides >3.0 mmol/l (19%), fasting blood glucose > 6.7 mmol/l (29%), systolic blood pressure >160 mmHg (9%), diastolic blood pressure >90 mmHg (8%) or smoking (36%), compared with 67% at follow up one to two years later (I). Thus, the secondary prevention program had a limited effect on the total risk factor pattern. However, over time a substantial lowering of serum lipids was observed parallel to a three-fold increase in the use of lipid-lowering drugs. Mean body weight did not change during the evaluation periods (I, II).

Smoking habits were recorded for 1320 patients hospitalised with a diagnosis of acute coronary syndrome during a period of four years (IV). Of the patients admitted, 434 (33%) reported that they were current smokers. Three months after discharge 51% of these were still smoking. Six factors were independently associated with smoking status at follow-up: non-participation in the cardiac rehabilitation program, treatment with sedatives or antidepressants at time of admission, a previously known cardiac event or cerebral vascular disease, smoking related pulmonary disease and high average cigarette consumption. Presence of any of these factors was associated with a higher risk of continued smoking. Of former smokers who visited the nurse, a total of 260 (84%) were validated by biochemical markers for smoking. The validation revealed that 17 (6.5%) patients had biochemical markers that contradicted their self-report with raised carbon monoxide values and/or raised cotinine levels without alternative nicotine delivery. However, in the vast majority of the patients, self-report regarding smoking cessation corresponded with the biochemical marker (III).

The experiences of patients following a first myocardial infarction was interpreted and described as 'impact of medication' and 'impact of health professionals' (V). Patients interpreted bodily symptoms as a consequence of being medicated rather than as a result of their heart attack. The medication led to feelings of being intruded upon but also to feelings of security. The communication with different physicians and other health professionals led to some perplexity about the illness and its treatment. Patients expressed a need of being reassured by the physician regarding their physical health status.

**Conclusions:** The findings from this study indicate difficulties in implementation of secondary prevention in patients with established coronary heart disease. Although there has been a marked improvement in the management of serum lipids by increased use of lipid lowering drugs, there are still problems with modification of other life style related risk factors, such as overweight and smoking. With even lower treatment targets for hypertension there is a potential for improvement of this risk factor as well. Following a first myocardial infarction, care of patients has to be considered regarding the impact of the pharmacological treatment on patients' life. The point initiation in secondary preventive work must be patients' beliefs about their condition and the treatment they receive.



**Keywords:** Coronary heart disease, myocardial infarction, secondary prevention, risk factor modification, smoking cessation, validation, predictors, patients' experiences, nursing.

**ORIGINAL PAPERS**

The thesis is based on the following papers, which will be referred to in the text by their Roman numerals.

I From Attebring M, Hartford M, Holm G, Wiklund O, Währborg P, Herlitz J. Risk indicators for recurrence among patients with coronary artery disease – Problems associated with their modification. *Scand Cardiovasc J* 1998;32:9-16.

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## LIST OF ABBREVIATIONS

AMI Acute myocardial infarction

CABG Coronary artery bypass grafting

CAD Coronary artery disease

CHD Coronary heart disease

4S Scandinavian simvastatin survival trial

HDL High-density lipoprotein

IHD Ischaemic heart disease

LDL Low-density lipoprotein

MI Myocardial infarction

PCI Percutaneous coronary intervention

PTCA Percutaneous transluminal coronary angioplasty

## CONTENTS

# INTRODUCTION

Coronary heart disease (CHD) is a common health problem in all western countries. The number of patients discharged from Swedish hospitals during 2001 with ischaemic heart disease was approximately 50.000, of which 27.000 were after acute myocardial infarction (AMI) (The National Board of Health and Welfare (2003).

**Secondary prevention**

Secondary prevention encompasses all measures taken in order to reduce or alleviate adverse consequences of many important health problems in human beings, for example in persons infected with human immunodeficiency virus, and in persons suffering from cancer (Kelly *et al.* 2002; Khuri 2003; Vainio *et al.* 2003). Secondary prevention of coronary heart disease includes identification and modification of risk factors by the introduction of lifestyle measures and pharmacological and interventional therapy, such as coronary artery bypass grafting (CABG) or percutaneous transluminal coronary angioplasty (PTCA) in patients with established coronary heart disease (Wallentin 2002) According to European and American guidelines on cardiovascular disease prevention, patients with clinically manifest coronary heart disease or other major atherosclerotic diseases, should be given the highest priority regarding intensive life style intervention and, when necessary, drug therapies in order to achieve risk factor goals, as these patients are at high risk for a further major coronary event (Wood 1998; Smith *et al.* 2001; De Backer *et al.* 2003). The strategies in secondary preventive work includes supporting patients in making lifestyle changes, modification of risk factors and medication (De Backer *et al.* 2003), thereby reduce the risk for premature death, further major cardiac events, reduce premature disability and to slow down the progression of the disease. The interest of secondary prevention of coronary heart disease has constantly increased during the last decade. When searching in Medline in the beginning of 2004 with the abbreviation for the various designations of the disease, i.e "IHD, CAD, CHD or MI" and "secondary prevention", the number of articles in this field had increased from 390 hits when the search was limited to the 1980s, to 2495 hits from 1990 to 2004. This indicates a great interest in this field, probably as a result of several studies showing significant benefits, not only for the individual but also for society (McMurray 1999; Unal *et al.* 2004).

**Secondary prevention program at the clinic of Cardiology at Sahlgrenska University Hospital**

During the year 1993 prior to the evaluation in Paper I, a secondary preventive program was introduced in the Division of Cardiology at Sahlgrenska University Hospital. The program was an attempt to improve treatment of traditional risk factors (i.e smoking, hyperlipidemia, high blood pressure and diabetes) in patients with coronary heart disease. Guidelines were given as to when treatment for hyperlipidemia, hypertension and diabetes should be instituted as well as target goals. The author of this dissertation was the nurse designated to work with secondary prevention in the out-patient clinic. The aim was to improve patients' risk factor profile by information, education and counselling regarding lifestyle changes. Nursing intervention also included assisting the patients in setting risk reduction goals. Moreover, together with the patient, make a plan for meeting these goals and also help to identify barriers; such as potential misconceptions and giving support to the patients when they try to make life style changes. When the secondary program started at the beginning of 1993, guidelines on how to define the various risk factors, treatment goals for the various risk factors and when to institute medical treatment were set up. New guidelines were adopted by the clinic in 1995 based on the findings from randomised trials showing beneficial effects of lipid lowering therapy (The Simvastatin Survival Study Group (4S), 1994}. The recommendations stated in our guidelines during 1993 and 1995 are outlined in Table 1.

**Table 1. Guidelines regarding various risk indicators and treatment targets**

| **Risk indicators** | **Elevated levels*** | **Treatment targets** | |
|---|---|---|---|
| | | **1993** | **1995** |
| Hyperlipidemia: | | | |
| Cholesterol (mmol/l) | >6.5 | <5.5 | <5.0 |
| Triglycerides (mmol/l) | >3.0 | <3.0 | <2.0 |
| LDL (mmol/l) | >4.5 | <4.0 | <3.0 |
| Hypertension: | | | |
| Systolic blood pressure (mmHg) | >160 | <160 | <160 |
| Diastolic blood pressure (mmHg) | >90 | <90 | <90 |
| Diabetes: | | | |
| Fasting blood glucose (mmol/l) | >6.7 | <6.7 | <6.7 |

* Definition of elevated levels in Paper I and II

## BACKGROUND

### Etiology and risk factors

The dominating cause of the disease is atherosclerosis (Wallentin 2002). Development of atherosclerosis is regarded as being related to a lifestyle of unhealthy food, physical inactivity and smoking. This type of lifestyle leads, in many individuals, to adverse changes in biochemical and physiological characteristics that enhance the development of atherosclerosis and its associated complications, angina pectoris and myocardial infarction (Second Joint Task Force Report, 1998). Risk factors could be characterised as non-modifiable and modifiable. The non-modifiables are; age, sex, and personal and family history of coronary heart disease. The major modifiable risk factors are; hypercholesterolemia, hypertension and cigarette smoking. Other modifiable determinants are diabetes, obesity and physical inactivity (Assmann *et al.* 1999). With respect to the modifiable risk factors there is an agreement in the literature that causal and preventive risk factors are cigarette smoking, elevated cholesterol, hypertension, obesity, physical inactivity and diabetes as clarified by Hennekens (Hennekens 1998).

### Manifestations of coronary heart disease

The various manifestations of coronary heart disease are angina pectoris, i.e. chest-pain following exercise or eating, myocardial infarction, cardiac arrest and silent myocardial ischaemia, i.e. objective signs of myocardial ischaemia that can be demonstrated without simultaneous subjective physical symptoms. Angina pectoris is often the first symptom of the disease. The onset of a myocardial infarction is often sudden and without previous warning symptoms, and is, in many individuals, the first sign of the disease. Coronary heart disease is a common cause of cardiac arrest, which can also be the first sign of the disease.

### Prognosis

Coronary heart disease is a common cause of premature death and the main cause of death in both men and women in all industrialised countries (Nissinen *et al.* 2001). In Sweden, it is the most common cause of death among middle-aged and older men as well as among older women, and the second most common cause of death among middle-aged women (The National Board of Health and Welfare, 2001). Thus, the long-term mortality in patients with established coronary heart disease has been reported to vary from 20% to 55% in 4.5 to 10 years (Kavanagh *et al.* 2002; Mauri *et al.* 2002; Tyden *et al.* 2002; Spencer *et al.* 2003). Silent myocardial ischaemia is also associated with a greater risk of morbidity and mortality. In the

prospective population study 'Men born in 1914', men with silent ischaemia without a history of ischaemic heart disease had approximately 4 times a greater relative risk of fatal and non-fatal myocardial infarction compared to men without these signs. The risk was 16 times greater if they also had a history of coronary heart disease (Hedblad *et al.* 1989). A greater number of patients will undergo revascularization procedures in the years following hospitalisation for an acute myocardial infarction (Abboud *et al.* 2002), or suffer from recurrent coronary events (Stevenson *et al.* 1994). Similarly, among patients having undergone mechanical revascularisation, the rate of recurrence is not insignificant (Bradshaw *et al.* 2002).

**The concept of risk**

Researchers from various disciplines have been aware of the concept of risk (Beck *et al.* 1992; D'Agostino *et al.* 2000; Momtahan *et al.* 2004). There seems to be a common notion of modern 'Western' society as a risk culture, where many of the risks and hazards of society is a product of civilization itself (Beck *et al.* 1992). There is a great deal of evidence that the standard of living in a modern culture with physical inactivity, a diet rich in saturated fats and calories and tobacco smoking, has played an important role as the contributing factor in the risk of coronary artery disease, and as a cause for the high occurrence of the disease in the population (Yusuf *et al.* 2001).

Risk is, however, a concept with various meanings. Dictionary definitions of risk include: possible harm, chance or possibility of danger. Synonyms are: danger, jeopardy, peril, hazard, menace and threat. Antonyms for risk are conceivability, possibility (Oxford English Dictionary and Thesaurus, 2004). The original meaning of 'risk', as discussed by Adelswärd (Adelswärd *et al.* 1996), is neutral, referring to probability, or the mathematical likelihood of an event occurring. In this usage of the term, the risk of an event occurring could be related to either a negative or a positive outcome (Altman 1991). Accordingly, risks have, to some degree, to do with something that could be expected, with a future component. However, the word "risk" has changed its meaning in today's society and has been associated with danger, a danger that has not yet happened but is threatening (Beck 1992). In this way, the meaning of risk as danger is used within the health care system and consequently 'high risk" has now taken on the meaning of a lot of danger' (Douglas 1992).

Medical science has provided society with information regarding various risks connected with the likelihood of suffering a disease, and also calculates how these risks could be decreased. There is an agreement in the medical literature that patients with established coronary heart disease are regarded as 'high risk' patients (Smith *et al.* 2001; De Backer *et al.* 2003) i.e. they have a high risk of recurrence.

Nursing science is, in many spheres, involved in the risk-concept of the population, such as assessing health risk status, identifying various risk behaviours and development of educational strategies to reduce the risk for diverse health problems (Chyun *et al.* 2003; Miller *et al.* 2003; Niederhauser *et al.* 2004; Whitehead *et al.* 2004).

## Risk indicators associated with development and recurrence of coronary heart disease

*Hypercholesterolemia*

High serum cholesterol, i.e. high levels of total serum cholesterol and low-density lipoprotein cholesterol (LDL), is one of the major risk factors for development of coronary heart disease. There is a strong positive association between plasma serum cholesterol and risk for coronary heart disease events (Neaton *et al.* 1992; Smith *et al.* 1992). This association applies to healthy individuals, to patients with established coronary heart disease and to women as well as men, as clarified in the Second Joint Task Force Report of European and other societies on coronary prevention (1998). In addition, several clinical trials demonstrate the benefits of lipid lowering therapy in reducing the risk for coronary heart disease in healthy individuals and in persons with established disease. In primary prevention studies, a significant reduction of relative risk for major coronary events was demonstrated with cholesterol reduction therapy (Shepherd 1995; Downs *et al.* 1998). In secondary prevention trials, treatment with lipid lowering therapy reduced the risk of new coronary heart disease events by up to 42% (The 4S-study Group, 1994; Sacks *et al.* 1996; LIPID Study Group,1998; Heart Protection Study Collaborative Group, 2002; Cannon *et al.* 2004), and a reduction of the risk of dying by 30% (The 4S-Study Group, 1994). There are also indications that intensive lipid lowering is better than moderate lipid lowering (Cannon *et al.* 2004; Nissen *et al.* 2004).

*Hypertension*

Hypertension is one of the major risk factors for coronary heart disease and stroke (Kannel, 2000a; Kannel, 2000b; Psaty, 2001), and the risk of stroke after myocardial infarction is not negligible, with approximately 1 in 40 of elderly patients suffering stroke within 6 months subsequent to discharge following myocardial infarction (Lichtman *et al.* 2002). In primary prevention, data from the Framingham study supports the benefits of treatment of hypertensive patients, with a 60% reduction in absolute risk of cardiovascular mortality (Sytkowski *et al.* 1996). There is, nevertheless, limited information about blood pressure control and outcomes after coronary events. However, following myocardial infarction, angina pectoris or PTCA, blood pressure elevation has been associated with an increased risk of reinfarction and death (Flack *et al.* 1995; Amar *et al.* 2002; Tsang *et al.* 2002). As far as we know, there are no secondary prevention trials evaluating blood pressure reduction after myocardial infarction or coronary intervention, however, several studies with antihypertensive drugs have shown secondary preventive effects when given to patients following myocardial infarction (Hjalmarson *et al.* 1981; Dargie 2001) and after various manifestations of atherosclerotic disease (Yusuf *et al.* 2000). Drugs used were betablockers (Hjalmarson *et al.* 1981; Dargie 2001) and ACE inhibitors (Yusuf *et al.* 2000). However, the reduction of blood pressure was moderate and the association between blood pressure reduction and effect was not clear. Data from Women's Antioxidant Cardiovascular Study, an ongoing randomised secondary prevention trial of antioxidant vitamins, folic acid and vitamins B6 and B12 in 5218 women with cardiovascular disease or three or more risk factors, showed a strong relationship between increasing systolic blood pressure and the risk of secondary cardiovascular events (Mason *et al.* 2004).

*Smoking*

Smoking is one of the major risk factors for the development of cardiovascular disease (Doll *et al.* 1994; Prescott *et al.* 1998), and associated with an adverse prognosis once the disease is established (Wilhelmsen 1988; Parish *et al.* 1995). There is, to our knowledge, no randomised study showing the effect of smoking cessation on health following a coronary event. To set up such a study would require that one group of patients would not be allowed to stop smoking. It is unlikely that the Ethics Committee would ever approve such a study, by reason of the already well-known associations between smoking cessation and the outcome following a cardiac event, and the very strong association between smoking and cardiovascular disease. Consequently, the evidence on the effects of smoking cessation after a cardiac event is based

on observational studies only. Thus, several observational studies have shown that patients who quit smoking following myocardial infarction have a marked improvement in prognosis compared with those who continue (Daly, 1983; Wilhelmsen, 1988; Wilhelmsson, 1975; Åberg, 1983). Similar observations were made on patients who have undergone CABG (van Domburg *et al.* 2000) and PTCA (Ashby *et al.* 2002). It was also observed that following CABG, re-infarction as well as new infarctions and angina pectoris were less common among patients who stopped smoking than they were among those who continued to smoke as was concluded in a review analysis conducted by Wilhelmsen (Wilhelmsen 1998).

In a meta-analysis by Wilson and colleagues, the odds ratio of death for smokers who stopped smoking after an MI was 0.54, i.e a reduction in mortality by 46% (Wilson *et al.* 2000). In another meta-analysis of observational studies that included patients diagnosed with coronary heart disease (previous myocardial infarction or stable or unstable angina pectoris), conducted by the Cochrane Library, a 36% reduction in relative risk of all cause mortality was found in patients who quit compared with those who continued smoking (Critchley *et al.* 2003). Thus, as clarified by Richard Edwards, smoking cessation may be even more protective than conventional standard treatments for myocardial infarction, including thrombolysis, aspirin, beta-blockers and statins (Edwards 2004).

*Diabetes*

Diabetes is associated with a marked increase in the risk of coronary heart (Kannel *et al.* 1979; Stamler *et al.* 1993). There are also indications of an elevated risk of cardiovascular disease even before the clinical diagnosis of diabetes (Coutinho *et al.* 1999). Diabetes is also an unfavourable prognostic factor following myocardial infarction (Zuanetti *et al.* 1993), invasive therapy of unstable coronary heart disease (Norhammar *et al.* 2004), CABG (Herlitz *et al.* 1996) or PTCA (Mathew *et al.* 2004). Furthermore, diabetic patients without previous myocardial infarction have as high a risk of myocardial infarction as non-diabetic patients with previous myocardial infarction (Haffner *et al.* 1998).

*Sedentary lifestyle factors and effects of physical training*

The hazards of being physically inactive are clearly demonstrated (US department of Health and Human Services,1996) and a sedentary lifestyle is considered one of the five major risk factors for development of cardiovascular disease (Myers 2003). In healthy people, regular physical activity is linked to a significant reduction in this risk (Pate *et al.* 1995). In a

coronary population, there is consistent evidence of the benefits of exercise training as reviewed by the Agency for Health Care Policy and Research (Wenger 1995). According to that review, exercise training decreases both angina pectoris in patients with coronary heart disease and symptoms of heart failure in patients with left ventricular systolic dysfunction. In a meta analysis conducted by the Cochrane Library (Jolliffe *et al.* 2003), exercise-based interventions reduced cardiac mortality by 31% in patients with coronary heart disease. There was no evidence of an effect of the interventions on the occurrence of non-fatal myocardial infarction (Jolliffe *et al.* 2003).

*Psychosocial factors*

The evidence for linking psychosocial factors to development of coronary heart disease is composed of data largely related to specific psychosocial domains such as depression, anxiety, personality factors and character traits, social isolation and chronic life stress (Rozanski *et al.* 1999). These factors can significantly contribute to development of coronary artery disease as pointed out in the review by Rozanski (1999). In another review of prospective cohort studies by Alboni (2003), a low socioeconomic status was associated with more advanced disease as shown by a significantly higher prevalence of heart failure and of recurrent coronary events in patients hospitalised for acute coronary infarction. The mortality was significantly higher in the most deprived group (Alboni *et al.* 2003). Further, in a systematic review of prospective studies Hemingway and co-workers (1999) concluded that there is evidence for an association between depression, social support, and psychosocial work characteristics among patients with cardiovascular heart disease, etiology and prognosis, but there are, however, conflicting data from randomised studies whether psychosocial interventions reduce mortality after myocardial infarction (Hemingway *et al.* 1999).

*Dietary factors*

Epidemiological (Kromhout *et al.* 1995; Joshipura *et al.* 2001) studies have shown that diet has a correlation with development of coronary heart disease and that the risks associated with a high fat diet remains even after the disease is established (Wong *et al.* 1989) . It is difficult to conduct controlled dietary intervention studies because of the difficulties of controlling peoples' food choices. Results of dietary interventions in secondary prevention have not been conclusive. In the Diet and Reinfarction Trial (DART) (Burr *et al.* 1989) for example, no effect was demonstrated on re-infarction or death from coronary heart disease in men

recovering from a myocardial infarction. However, an independent dietary effect was indicated in the patients advised to eat fatty fish on all-cause mortality, which was 29% lower at 2 years compared to a control group. However, in a 10-year follow-up of participants in the DART study no substantial survival benefits were observed (Ness *et al.* 2002). A lack of benefits of dietary advice was also shown in a study on men with angina pectoris (Burr *et al.* 2003).

However, in a study (Singh *et al.* 1992) on patients in coronary care units with the diagnoses of definite or possible myocardial infarction and unstable angina pectoris, patients were randomised to add fruit, vegetables, nuts and fish to a fat reduced diet. The incidence of new cardiac events was significantly reduced in the intervention group compared to a fat reduced diet only and cardiac mortality was reduced by 42%.

In the Lyon Diet Heart Study, patients were followed after their first myocardial infarction (de Lorgeril *et al.* 1999), the intervention group was recommended a Mediterranean type of diet comprising more bread, more root vegetables and green vegetables, bird meat, more fish, rapeseed oil, fruit and vegetables and less meat, butter and cream. After four years, the rate of cardiac death and non-fatal reinfarction in the experimental group was significantly lower than in the control group, which was recommended a diet usually prescribed after myocardial infarction. Similar benefits after dietary intervention have been demonstrated in studies that also included healthy subjects at high risk for coronary heart disease (Singh *et al.* 2002).

*Other factors associated with outcome*

There are several other factors associated with a clinical outcome e.g. the size of the heart muscle damage, remaining myocardial ischaemia and severe arrhythmias that are probably linked to recurrence, this is not however, encompassed in this thesis.

## RATIONALE FOR THE STUDY

This study was conducted in light of convincingly scientific evidence of the benefits of risk factor modification in people with coronary heart disease. In addition, coronary heart disease is also a widespread health problem in the entire Western world (Yusuf *et al.* 2001). Furthermore, the care for patients with this diagnosis has changed towards shorter hospital

stays in Sweden (Stenestrand 2002) as in other countries (Spencer *et al.* 2004), which is why risk factor modification often becomes a task for the out-patient care. Against this background, it seemed important to evaluate the management of risk factors in patients who had been hospitalised with coronary heart disease and also to what extent these factors could be reduced. To obtain this knowledge it was necessary to have an outside perspective; i.e examine the medical records to find patient' characteristics and use measurements to define the various risk factors.

However, modification of risk factors involves not only medical evaluation and prescription of medicine by the physicians, counselling and providing information by the nurses. It also involves patients and their view of the different treatments and their response to this treatment, which is why it is also important to learn about patients' experiences'. To learn about risk factor modification from this perspective it was important to apply an inside perspective, namely attempting to learn how the patients experience secondary prevention. Information regarding this perspective makes it possible to adapt the information and counselling to the patient's point of view.

## AIMS OF THE STUDY

The **overall purpose** of this thesis was to evaluate management of risk factor modification in patients with coronary heart disease and to explore patients' experiences of secondary prevention.

The **specific aims** of the study were:

- To describe the occurrence of traditional risk indicators associated with recurrence of an ischaemic event among patients with various manifestations of coronary heart disease, and to evaluate the impact of the implementation of a secondary preventive program on such risk indicators (I)
- To evaluate to what extent increased knowledge of the beneficial values of lipid lowering treatment influenced lipid levels and the use of lipid lowering drugs after a coronary event (II)
- To establish the reliability of self-report about smoking cessation amongst patients with coronary heart disease (III)
- To identify factors that can predict who will resume smoking after hospitalisation for an acute coronary syndrome (IV)
- To explore patients' experience of secondary prevention after a first AMI (V)

## METHODS

### Methodological considerations

In the present study, both quantitative and qualitative research methods are used. The questions that guided this study were; what is the occurrence of traditional risk indicators in patients with established coronary heart disease and how health professionals succeed in managing the modification of these risk factors. Quantitative research methods are useful when the researcher wants to describe variables, examine relationships and determine causality among variables (Burns *et al.* 1997). Traditionally researchers in this area raise questions about different characteristics that are measurable in some way, and assign these characteristics a numerical value (Hartman 1998). A quantitative approach seemed therefore appropriate in directing the study. Qualitative research methods are useful when the

researchers wish to explore meanings of social phenomena as experienced by individuals themselves. As it was not possible to gain knowledge of patients' experiences with quantitative methods, it was necessary to complement with a qualitative method.

Although quantitative and qualitative methods are derived from different traditions of thoughts, in theoretical science (Hartman 1998) quantitative and qualitative research methods may be seen as complementary (Malterud 2001) as they generate different kinds of knowledge that are useful in clinical practice (Burns, 1997; Boyd, 1993). According to Boyd (1993) it is possible to combine these methods when the purpose is "to achieve a more comprehensive understanding of a phenomenon that has multiple perspectives to consider". In this study the qualitative method was used to achieve a more complete understanding of the two perspectives described above. Application of qualitative methods in medical research can also broaden the understanding of clinical realities (Malterud 2001).

**Participants**

All the participating patients were followed up after hospitalisation at the outpatient clinic at the Division of Cardiology, Sahlgrenska University Hospital, Göteborg, Sweden.

All patients living in the catchment area of Sahlgrenska Hospital in the municipality of Göteborg who were under the age of 70 years and had either developed acute myocardial infarction or had undergone PTCA or CABG between 1st January and 31st December 1993 and discharged from the hospital, were evaluated regarding various risk indicators at event and one year later (**Paper I**). Those who had had an event between 1st September 1995 and 31st August 1996 (**Paper II**) were evaluated one year thereafter. In **Paper III**, 556 consecutive patients under the age of 75 years, who visited the nurses (from 6th January 1997 to 5th February 1998) at the outpatient clinic for a routine follow-up 3 or 12 months after hospitalisation for a coronary heart event, were included in the study. Of these, 308 reported that they were former smokers and thereby formed the study population. **Paper IV** dealt with 348 current smokers below the age of 75 years, admitted to the coronary care unit of Sahlgrenska University Hospital, with a diagnosis of acute coronary syndrome, between September 1995 and September 1999.

In **Paper V**, consecutive patients with a first myocardial infarction, who visited the cardiac preventive nurse at the outpatient clinic during March to September 2002, were asked to

participate in the interview. The nurse asked patients that had no communication problem, if they were willing to narrate their experiences. Since the purpose was to explore patients' experiences after a first myocardial infarction in relation to secondary prevention, we therefore included all relevant patients.

A sample of 20 patients (12 men and 8 women) were selected and interviewed. Another four patients were selected but they were unwilling to participate because of emotional reasons or lack of time. None of the patients was previously treated for coronary heart disease except for one that had a history of angina pectoris. Patients that had undergone CABG during hospitalisation were not considered.

**Table 1. A summary of the participating patients in the studies**

| **Patients** | **n** | **Paper** |
|---|---|---|
| Patients under the age of 70 years with AMI, CABG and PTCA | 293<br>284 | I<br>II |
| Patients under the age of 75 years with AMI, CABG and PTCA | 308 | III |
| Patients under the age of 75 years with acute coronary syndromes | 348 | IV |
| Patients between 34 and 79 years with a first time AMI | 20 | V |

## Methods in the quantitative studies

*Data collection and procedure*

To gain a systematic understanding of the occurrence of risk factors, a data questionnaire was developed in the evaluation studies (**Paper I and II**). This tool was designed to obtain information on any previous history of diabetes, hypertension, and hyperlipidemia, as well as serum lipid levels, blood glucose values, smoking habits and blood pressure values. Data regarding previous history was based on interviews in combination with audit of the medical records. Patients were screened on two occasions regarding their risk factors. The first screening was made at onset of the event and the second screening at a mean time of 450 days later. This second screening is also referred to as period I in **Paper II**. In the second

evaluation study (**Paper II**), patients were approached by the outpatient clinic 1 year after the event for collection of the data. Data from this screening is referred to as period II.

Blood samples were drawn for measurements of blood glucose and serum lipids including serum cholesterol, triglycerides, low-density lipoprotein (LDL) and high-density lipoprotein (HDL). All determinations of serum lipids and blood glucose were made in a fasting state. Smoking habits were based on patients' self-reports (**Paper I, II, IV**). Self-reports were validated with biochemical markers in **Paper III**.

By using a structured questionnaire the nurse at the out-patient clinic interviewed the patients regarding out their smoking habits (**Paper III**). Based on the answers in this interview they were classified as smokers, former smokers or non-smokers. Former smokers were asked to complete the self-report with samples of blood for measurements of cotinine levels and carbon monoxide in expired air for validation.

**Validation of smoking status**

*Plasma cotinine*

Cotinine is the major metabolite of nicotine with a half-life in the blood of about 20 hours. The presence of nicotine, through its metabolite cotinine, was measured by capillary gas chromatography after a single-step liquid-liquid extraction of the plasma samples. Cotinine was detected by means of a nitrogen-sensitive detector giving high selectivity and sensitivity. In an earlier validation of the method, the limit of quantification had been set to 3.8 ng $mL^{-1}$ (Olsson P *et al.* 1991). The accuracy and precision of the method and instrumentation was checked by means of quality control samples, which were analysed together with the study samples.

*Carbon monoxide (CO) in expired air*

CO is present in tobacco smoke and has a half-life in the body of about 4 hours. The concentration in expired air was measured using a portable CO analyser (Bedfont EC50 Carbon Monoxide Monitor). The monitor was standardized and calibrated against a control gas as recommended by the manufacturer. CO-values equal to or greater than 10 p.p.m. were considered to be an indicator of active smoking.

*Blood pressure measurement*

Data regarding blood pressure were drawn from measurements at the clinic. Blood pressure was measured in supine position after 5 minutes rest, mostly one measurement, however, if values deviated from previous observation, a mean from two or three measurements was used.

*Identifying predictive factors concerning continuation of smoking*

Data were collected from the hospital medical records and included information on previous clinical history and various health complications during hospitalisation (**Paper IV**). During hospitalisation, a research nurse interviewed the patients by using a structured questionnaire in order to obtain additional information. The patients were asked to fill in the questionnaire about motivation to quit and health risks during hospitalisation. The nurse at the outpatient heart clinic then followed patients for 3 months after discharge. Those who continued to smoke (non quitters) were compared with those who had stopped smoking (quitters) with regard to age, sex, medical history, clinical course and intention to stop smoking.

*Questionnaire*

The questionnaire (**Paper IV**) contained five items concerning motivation to quit smoking and health-evaluated beliefs about smoking. (For more details see **Paper IV**, Table 4). The idea behind the questionnaire was to change behaviour, such as to quit smoking - an individual often does this gradually, from contemplation to action. The first two questions, adapted from the stage of change theory (Prochaska *et al.* 1983), intended to mirror their motivation or readiness to quit smoking, i.e. their stage of change. This theory suggests that behavioural change is a process that unfolds over time through a series of stages starting with contemplation, through preparation and culmination into action. In the contemplation stage, a smoker may have a slight intention to change behaviour and quit smoking, while in the preparation and action stages he/she already has taken some steps towards such a change or have quit smoking. A final step is maintenance where the individual makes an effort to maintain the new habit. The other three questions related to health-evaluated beliefs about smoking and its effect on health in general and on the heart in particular.

**Statistics**

A linear non-parametric permutation test for paired observations (one sample case) was used to determine differences between various measurements (Bradley 1968) in Paper I. In Paper II, Pitman's non-parametric test for difference between groups was used. In the evaluation of

proportions, Fisher's exact test was used, which is a special form of Pitman's test when the variables are dichotomous. To compare non-smokers, former smokers and current smokers in **Paper III**, Kruskal-Wallis test and Fisher's exact test were used, and for two-group comparisons Mann-Whitney U test and Fisher's exact test were used. In **Paper IV**, for differences between groups, Fisher's exact test was used for proportions and the Mann-Whitney U test for continuous/ordered variables. To identify factors independently related to continued smoking, a logistic regression in a stepwise mode was performed. All p-values were two tailed and considered significant if less than 0.05. No correction for multiple comparisons has been made. P-values of borderline significance should therefore be treated with caution. In **Paper V**, only demographic and clinical factors are reported for the interviewed participants. A summary of the statistical analyses is outlined in Table 2.

**Table 2. Statistical analyses used in Papers I-IV in the thesis**

| | Paper I | Paper II | Paper III | Paper IV |
|---|---|---|---|---|
| **Comparison between groups** | | | | |
| **Proportions** | | | | |
| Fisher's exact test | | X | X | X |
| Linear non-parametric permutation test | X | | | |
| **Continuous ordered variables** | | | | |
| Mann Whitney U test | | | X | |
| Kruskal-Wallis test | | | X | X |
| Pitman's non-parametric test | | X | | |
| **Multivariate Analysis** | | | | |
| Stepwise logistic regression | | | | X |

## Method in the qualitative study

*Data collection*

An in-depth face-to-face interview with a narrative approach (Mishler 1986) (V) was conducted. The following is an account of the procedure used to collect data for the study. The nurse at the outpatient clinic informed the patients, orally and in writing, about the aim of the study and how the interview would be conducted. The patients were then asked if they agreed to allow the nurse give his or her name and telephone number to the interviewer.

When permission was granted the interviewer contacted the patients about a week later, asking if they agreed to participate in the interview study. The interviewer also explained that the purpose of the study was to obtain knowledge and understanding regarding secondary prevention from the patients' perspective after discharge from hospital. During the telephone call, details about the study were explained and also how the interview would be conducted. After giving informed consent, time and place for the interview was set up, according to the patients' wishes. At the time of the interview, a written informed consent was obtained. The author of this dissertation conducted all the interviews. Everything was tape-recorded and before the recorder was switched on, it was emphasised to the patient that at any moment they could discontinue their participation. The patients' were also assured of confidentiality. Each patient was interviewed once. The interviews were performed between 4 – 24 weeks (median 7 weeks) after the infarction and each interview lasted between 30 and 80 minutes (median 50 minutes).

*The interviews*

The patients were encouraged to speak freely about their heart attack and how the period after discharge was experienced. No specific questions were asked. In order to reveal what is unknown, the focus was on the patients' narratives. The opening question was: "Could you please tell me what you think about when you reflect upon your heart attack." The narrative was then followed and only clarifying questions such as "Can you give me a specific example" were asked where it was thought necessary. An interview conducted in this way is created as a conversation between the interviewee and the interviewer (Mishler 1986; van Manen 1990).

*Analysis of the interviews*

All interviews were transcribed verbatim. An hermeneutic approach was used to analyse the interviews i.e the text that contained patients' experiences was interpreted in an attempt to grasp the meaning of these experiences (van Manen 1990). The interpretation is seen as a process that has three phases; *naive reading* where the whole interview text was read many times for a global understanding, *structural analysis*, where the whole text is examined and divided into meaning units, i.e. parts of sentences, one sentence or several sentences that are related through their content in order to explain what it is saying. The third phase is a comprehensive understanding of what the text is about. The text from all the interviews is seen as a whole and the understanding is developed from, and supported by, the other phases

(Benner 1994). This method has been used to illuminate the meaning of living with heart failure as narrated by elderly people (Ekman *et al.* 2000), and to illuminate womens' and their partners' experiences in connection with myocardial infarction (Svedlund *et al.* 2004).

## ETHICAL CONSIDERATIONS

The local Ethics Committee at Göteborg University approved the studies presented in **Papers III, IV** and **V**. In the study presented in **Paper III**, there was a dilemma as to if it was ethically correct to check the validity of the patients' statement about their ex-smoking status. The local Ethics Committee approved the study on condition that the patients were informed of the test in advance. Information about the study was included in the letter informing the patients of the appointed time. The ethical demand of informing the patients was thereby met. The study presented in **Paper IV** was part of a prospective risk stratification study of patients with coronary syndromes, with patients giving their informed consent before participating in the main study. The studies presented in **Papers I and II** were initiated and performed as a quality assurance of secondary prevention at the out-patient clinic of cardiology and as such, approval was not applied for.

## RESULTS

**Evaluation of risk factor modification management** *(Paper I and II)*

*Occurrence of various risk indicators*

The proportion of the various risk indicators in patients at first screening is shown in Fig.1 and 2.

**Fig 1**

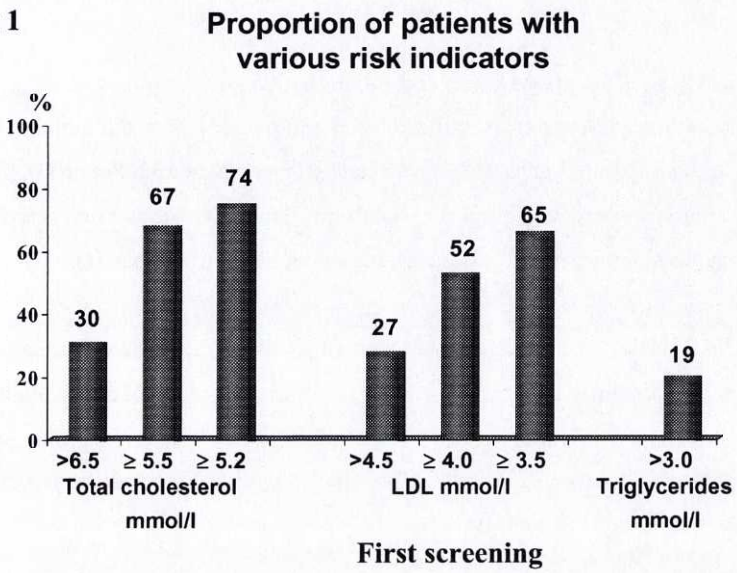
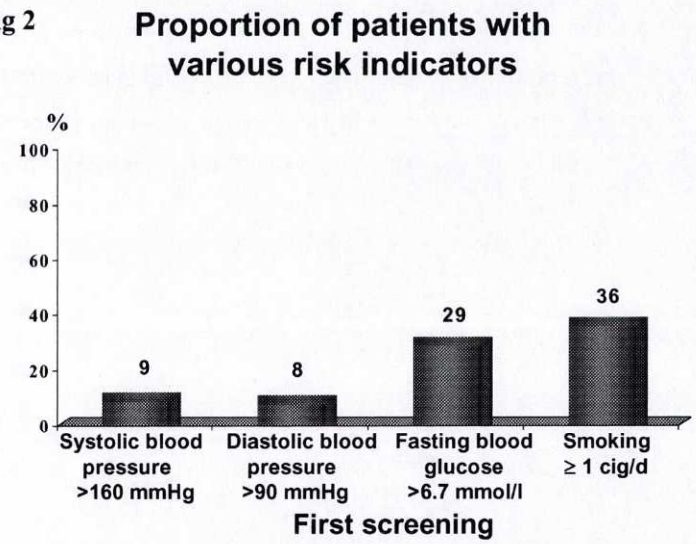



**Fig 2**



The results at the second screening appeared to be very similar to findings at the first event, with the exception that the proportion of smokers was significantly lower at the second screening. In all, 70% of all patients had one or more of the following risk indicators at first screening: serum total cholesterol > 6.5 mmol/l, LDL-cholesterol > 4.5 mmol/l, serum triglycerides > 3.0 mmol/l, fasting blood glucose > 6.7 mmol/l, Systolic blood pressure > 160 mm/Hg, Diastolic blood pressure > 90 mm/Hg or smoking as compared with 67% one to two years after the initial event (**Paper I**).

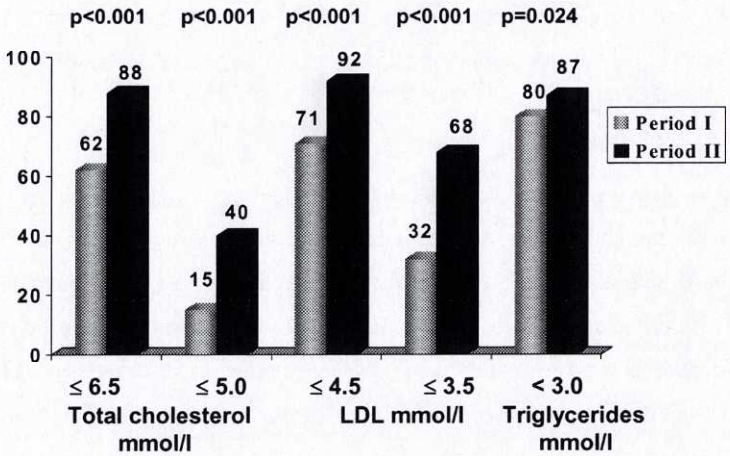
**Evaluation of changes in serum lipid levels and other risk factors**

*Cholesterol:* The mean total serum cholesterol levels fell significantly from 6.2 mmol/l at the second screening in period I to 5.3 mmol/l at the screening during period II (**Paper II**). The mean values for LDL-cholesterol were quite similar, just below 4.0 mmol at the two first screenings but had significantly decreased to 3.2 mmol/l at the evaluation in period II (**Paper II**).

The proportion of patients with lipid values below certain levels during the two evaluation periods is shown in Figure 3. The proportion of patients with total serum cholesterol of ≤ 5.0 mmol/l increased significantly from 15 % at second screening in period I to 40 % at the evaluation in period II and for LDL-cholesterol ≤ 3.5 mmol/l there was a significant increase from 32% during period I to 68% during period II (**Paper II**).

*Triglycerides:* The mean serum triglycerides decreased from 2.4 mmol/l to 1.9 mmol/l from the second screening in period I to the evaluation in period II. The proportion of patients with triglycerides < 3.0 mmol/l increased from 80% during period I to 87% during period II (Figure 3).
*Weight:* Body mass index (BMI) remained similar at first and second screenings (**Paper I**). The mean body weight did not change during the two periods; it was 80.2 kg and 81.2 kg respectively (**Paper II**).

**Fig 3 Proportion of patients with lipid values below certain levels**




*Smoking:* Among patients with acute myocardial infarction, 47% smoked at onset compared with 30% at second screening of period I. The corresponding figures for CABG patients were 9% and 7%, respectively, and for patients who had undergone PTCA, 30% and 33%, respectively. The proportion of smokers in the whole group fell significantly from 36 % at first screening to 26% at the second screening and had further decreased to 18% at the evaluation in period II (**Paper I** and **II**).

*Use of Medication*

The proportion of patients receiving pharmacological treatment for hyperlipidemia had doubled at the second screening as compared with the first screening in period I (**Paper I**), which further increased more than twofold, to 57% during period II after presentation of the 4S-study (**Paper II**). During the same period, in patients using lipid-lowering drugs, the use of statins increased from slightly more than half to 94%. The proportion of patients being treated with anti hypertensive drugs was 71% and 76% (including treatment for other reasons than hypertension) at first and second screening, respectively (period I). During the same period, the proportion of patients who were on treatment for diabetes was slightly above ten percent (**Paper I**).

**The impact of the secondary prevention programme** *(Paper I)*

Only 39 patients (13%) approached the nurse involved in the secondary prevention program. The principal reason for visiting the nurse was hyperlipidemia. In the group that underwent nursing intervention, there were favourable results with regard to blood lipids but not, however, for the remaining risk factors such as fasting blood glucose, blood pressure or smoking (see Table V, **Paper I,** for further details).

**Validation of smoking cessation with bio-chemical markers** *(Paper III)*

Of former smokers, 260 (84 %) were validated by biochemical markers for smoking, i.e. cotinine in plasma or carbon monoxide in expired air. Cotinine in plasma was analysed in 206 patients. Fifty subjects had more than 14ng $ml^{-1}$ cotinine in plasma that was the cut-off point for smoking but 37 of these used some kind of nicotine replacement therapy or moist snuff. Thirteen patients had concentrations of cotinine in plasma above 14ng $ml^{-1}$ (median 53.9, range 14.3 – 313) without the intake of any nicotine replacement therapy or snuff. Carbon monoxide in expired air was measured in 247 patients. Six subjects had carbon monoxide that exceeded the cut-off point for smoking (i.e. CO $\geq$10 ppm). Both markers were elevated in two subjects. Thus, 17 (19-2) patients contradicted their self-report of having stopped smoking. This implies that 6.5 percent (17/260) or every fifteenth ex-smoker misrepresented their smoking habits.

**Smoking habits and predictors for continued smoking** *(Paper IV)*

*Smoking habits*

Data regarding smoking habits were available from 1320 patients admitted to the hospital for acute coronary syndromes, 557 (42%) of whom were ex-smokers, 329 (25%) non-smokers and 434 (33%) were current smokers. At follow-up, three months after discharge, smoking habits were available for 85% (n=348) of smokers who survived. At that point, 51% reported that they were still smoking, 49% that they had quit smoking.

*Health beliefs and motivation to quit smoking*

Only 54% (189/348) of the smokers available for follow-up had responded to the questionnaire they had received during hospitalisation regarding motivation to quit smoking and health beliefs. Of those who continued to smoke (non-quitters), 94% had thought of quitting and 72% had tried to quit. The majority had a strong (quite a lot or very much) belief that smoking had affected their health or was related to their heart problem. Sixty-seven percent believed that it was possible to

avoid heart problems in the future by quitting. There were no significant differences between non-quitters and quitters in the variables measuring motivation and health beliefs.

*Predictors for continued smoking*

Factors that were independently associated with smoking status at 3 months follow-up were; non-participation in the cardiac rehabilitation programme, treatment with sedatives or anti-depressants at the time of admission, a known cardiac event prior to hospital admission, a history of either cerebral vascular disease and/or smoking-related pulmonary disease and a higher average cigarette consumption prior to the event. Presence of any of these factors was associated with a higher risk of continued smoking.

**Patients' experiences of secondary prevention** *(Paper V)*

Two themes were identified in the analysis. The themes were described as; *'the impact of medication'* and *'the impact of health care professionals'*.

The theme *'the impact of medication'* was further described in three sub-themes: *dealing with symptoms related to the medication, feeling intruded upon and feeling safe,* reflecting different dimensions of being medicated after the heart attack. Patients had to deal with manifestations of different symptoms, such as bloated stomach, tiredness and dizziness, which occurred after the heart attack. These symptoms, described as a consequence of being medicated rather than as a result of having had a heart attack, forced the patients to return to the hospital and also to be readmitted. Information about the specific side effects led to patient expectations of their manifestations. Patients questioned whether the medication was good for them and how they could obtain information regarding this. By taking medicines daily and the information that the treatment would last a lifetime, patients were continuously reminded of the fact that they were heart attack victims. On the other hand, the patients' narratives indicated feelings of security and confidence and a belief that taking medicines regularly reduced the risk of a new heart attack.

The theme *'impact of health care professionals'* was further described in three sub-themes reflecting different aspects connected with communication with health care professionals during the process of care; *'Receiving conflicting information', 'wanting reassurance from the physician'* and *'experiencing the period after discharge as uncertain and precarious'*. Communication with different health professionals led to feelings of uncertainty and worries about the condition of the disease. The patients wanted a dialog with the physician about the implications of the heart attack

and about what the different treatments meant. A feeling of uncertainty about the future and to what extent they could resume normal activities was described. Being examined by a physician after discharge was important as a mean of reducing feelings of uncertainty.

# DISCUSSION

## Discussion of the use of methods

*Blood pressure measurement*

In this study, conventional clinic measurement of blood pressure was used to define the level of blood pressure, mostly by one reading, but if values deviated from previous readings mean value of two or three measurements was recorded. Blood pressure measured at the clinic may be unrepresentative of the patients' average blood pressure as it is usually higher than readings taken at home or by ambulatory monitoring (Mancia *et al.* 2002). The literature about blood pressure measurements show that ambulatory blood pressure is lower than clinical blood pressure by about 5-15 mmHg as pointed out by Muldoon (Muldoon *et al.* 2003). However, home readings or ambulatory monitoring do not seem to provide a useful alternative to the conventional clinic measurement, which, according to Stergiou, was due to disagreement between methods to diagnose hypertension (Stergiou *et al.* 2000). On the other hand, there can be a prognostic value of ambulatory blood pressure recordings in patients with treated hypertension (Clement *et al.* 2003). As blood pressure levels tend to decline with repeated readings obtained at the clinic (Stergiou *et al.* 2000), measurements from multiple occasions are essential. Clinical guidelines about blood pressure recommends that at least two measurements should be made and the average recorded (Chobanian *et al.* 2003).

*Validation of smoking status*

To measure the presence of any substance it is necessary to use a method that is specific for that substance. To measure the presence, if any, of nicotine a method that is specific for nicotine, i.e. cotinine in plasma was used. Measurements based on cotinine are regarded as the most reliable method to validate smoking status, although it is not possible to differentiate between those who are using nicotine replacement therapy or snuff (Jarvis *et al.* 1987; Gilbert 1993). Carbon monoxide is not specific for tobacco smoke; it is also a component of air pollution caused by exhaust fumes from vehicles. In this study, we measured CO in expired air as a complement. This kind of test has been evaluated in several studies and found to be an acceptable validation method of smoking status (Gilbert 1993) and is to be preferred if the subjects are using any kind of nicotine replacement therapy. Apart from asking the patients about their smoking habits, there is at the present time, to our knowledge, no other way of detecting smoking than by biochemical markers.

*Questionnaire about motivation and health beliefs*

The questionnaire, containing five questions aimed at measuring motivation and beliefs, used in this study was constructed before the study in an attempt to gain knowledge about patients' motivation to quit smoking and whether the patients' beliefs regarding smoking do matter. Though the stage of change model, where smokers are assigned to one of five stages of motivation as previously described, has been widely adopted in measuring motivation to stop smoking, no evidence exists that this method predicts smoking cessation better than other method assessing a smokers' motivation to stop smoking. Most smokers admitted for an acute coronary syndrome may pass through the previous stages to the stage of action (trying to stop) immediately, which is why it may not be appropriate to ask if they are planning to stop in the near future. According to West (West 2004), motivation to stop smoking can also be assessed by means of simple questions, the patients' interest and intention to quit or by asking the smoker to rate a degree of desire to stop on a scale from "not at all" to "very much". Unfortunately there were only 54% of the patients that responded to our questionnaire, which was why it was difficult to draw any conclusions regarding its usefulness.

*The interview in the qualitative study and interpretation of the data*

In the in-depth interview, patients were asked to reflect upon the heart attack and the time after discharge. Efforts were made to let the patients direct the narrative and to encourage, by nods and sometimes clarifying questions, a rich and profuse narration of their experiences in relation to secondary prevention. Due to the fact that the interviewer had an extensive clinical knowledge about the study field, efforts to allow the patient to narrate fully were made without the interviewers own point of view being apparent. There can be a problem in qualitative research in that a researcher already has some knowledge about the phenomenon being studied, but according to van Manen (van Manen 1990) we can not simply try to ignore what we already know, instead we can try to make explicit our understandings and beliefs so that we are conscious of them.

Validity and reliability are criteria in both quantitative and qualitative studies. Validity ensures that the researcher measures what is intended to be measured and reliability ensures the quality of the method used to collect data. According to Guba (Guba 1985), the term "trustworthiness" is more useful than "validity" in relation to qualitative work. Trustworthiness involves credibility, transferability and conformability, all of which were taken into account in this study. Credibility was ensured in that patients who participated in

the interviews were identified and described accurately. Further, the findings are transferable, relevant and applicable to other contexts. A clear description of the analytical process was achieved: data were linked to their sources so the reader could establish that the interpretation was derived from the original sources and thus credible. Other researchers can also be helpful to validate the interpretation of the data; in this case, the supervisor helped to do this.

## Discussion of the results

### Evaluation of risk factor modification management

*Lipid levels and blood pressure*

The occurrence of traditional risk factors in out-patients with established coronary heart disease was described in 1993 and 1996. We found that the majority of patients had at least one modifiable risk factor with only minor changes over time. Other contemporary studies (Qureshi *et al.* 2001) also shown a high prevalence of various risk factors in this group of patients.

Over time there were improvements in serum lipid levels due to an increased knowledge from secondary prevention trials about the benefits of lipid-lowering treatment (The 4S-study Group, 1994; Sacks *et al.* 1996; LIPID Study Group,1998; Heart Protection Study Collaborative Group, 2002; Cannon *et al.* 2004), which is a trend that can be seen in other studies as well (Vale *et al.* 2002).

The treatment targets for plasma lipids have successively decreased. In general the goal for total cholesterol should be below 5 mmol/l, and LDL below 3 mmol/l, but for patients with clinically established coronary heart disease and for patients with diabetes the treatment goals should be below 4.5 mmol/l and 2.5 mmol/l for total- and LDL-cholesterol, respectively according to the latest European guidelines (De Backer *et al.* 2003).

More recent published studies from Europe (De Backer 2002) and Australia (Vale *et al.* 2002) report that there is still a high prevalence of modifiable risk factors among coronary patients. The Euroaspire II cohort study (De Backer 2002) provided a comprehensive view on the management of patients with established coronary heart disease during the period 1999-2000 in fifteen European countries on patients with established coronary heart disease. This study demonstrated that one out of five patient smoked, about one third was diagnosed as obese,

almost half of the patients being overweight, more than half had raised blood pressure and elevated serum total cholesterol at a median of 1.4 years of follow up. In overweight or obese patients, the control of raised blood pressure was significantly worse, with more than half of those using blood pressure-lowering medication having a blood pressure over the treatment target. The same result was obtained for the control of total cholesterol with 52% having more than or equal to $\geq 5$ mmol/l (De Bacquer *et al.* 2004).

The secondary prevention trial from Australia (Vale *et al.* 2002) also conducted during 1999-2000, showed that only about half of the patients reached the target value for total cholesterol of less than 4.5 mmol/l. With an even lower limit of less than 4.0 mmol, almost three quarters of patients did not achieve that target.

How many patients not achieving targets for blood pressure control as well as for lipid values, is a matter of at which level the targets is set. The most recent European guidelines on cardiovascular disease prevention in clinical practice recommends a goal for blood pressure of less than 140/90 mmHg in all high risk subjects, in patients with diabetes the goals are even lower (De Backer *et al.* 2003). When we applied the recent recommendations for therapeutic target for blood pressure of less than 140/90 mmHg on our data from 1993, we found that 50% had a blood pressure above this level (unpublished data).

Similarly, data from the above-mentioned studies from Australia and Europe revealed that about 40% to 50% of the patients in secondary prevention do not achieve their target goals for blood pressure control (Vale *et al.* 2002; Boersma *et al.* 2003). The Euroaspire II study (Boersma *et al.* 2003) also revealed that 86% of the patients were taking blood pressure-lowering medication (not necessarily taken as an antihypertensive treatment), but only half of them achieved recommended goals for blood pressure control. A very high prevalence of elevated blood pressure was observed in this study among patients with other cardiac risk factors such as diabetes, high cholesterol and obesity, suggesting that the concept of total risk management is insufficiently implemented in clinical practice. The presence of other cardiovascular risk factors and the under use of combination medical therapy may contribute to the poor blood pressure control according to Amar and colleagues (Amar *et al.* 2003), as well as under use of other blood pressure lowering therapies, including diet (Boersma *et al.* 2003).

It has also been observed that in treated hypertensive patients, systolic blood pressure control was less frequent than diastolic blood pressure control (Mancia *et al.* 2002). This may be related to a less effectiveness of current hypertensive drugs in lowering systolic blood pressure than diastolic blood pressure as suggested by Mancia (2002). Further, physicians may titrate antihypertensive treatment on the results of diastolic blood pressure and terminate further therapeutic efforts once diastolic blood pressure values are lower than 90 mmHg (Mancia *et al.* 2002). The same authors suggested that systolic blood pressure control might require more aggressive drug treatment than diastolic blood pressure control (Mancia *et al.* 2002). Apart from physician-related and drug-related factors, patients' non adherence to hypertensive therapy has also been discussed to explain the problem of uncontrolled hypertension in clinical practice (Lindholm 2002). Other factors such as a lack of consciousness among patients regarding their hypertensive status and miscommunication between doctors and patients have been suggested to, at least partly explain, why so many patients have high blood pressure in secondary prevention. For example, in the Euroaspire II study (Boersma *et al.* 2003), about one third of the patients who believed that they had never been diagnosed with hypertension, actually had a blood pressure above 140/90 mmHg and thus were unaware of their hypertensive status. In this study, a number of patients with elevated blood pressure remembered their latest blood pressure as 'normal' indicating that health care professionals erroneously had judged the measured blood pressure as normal. Accordingly, patients who are unaware of their hypertensive status and patients who think that their blood pressure is 'normal' despite an elevated measurement, might be less likely to use a specific diet or to comply to the recommended treatment.

Thus, it appears as though even today a very high proportion of patients with established coronary heart disease have elevated lipid levels and blood pressure amenable to treatment.

*Smoking*

The findings in this study showed that a high proportion of smokers continue to smoke after having suffered an acute coronary syndrome. The strongest predictor for continued smoking was non-participation in the heart rehabilitation programme. The programme (i.e. five group information lectures followed by physical training twice a week) is offered to every heart patient during hospitalisation. Approximately 80% of all patients participate in the group lectures of which 70% continue with the physical training. (Personal communication with the heart rehabilitation clinic at Sahlgrenska University Hospital. Unpublished data). In this study

only 56% of quitters and 34% of non-quitters participated in the group lectures (Table 3, **Paper IV**). Unfortunately, there was no information on how many continued with the physical training. However, the low participation rate by the smokers as a group may indicate that those who did not participate may be a very selected group of less motivated patients, which might partly explain the association between continued smoking and non-participation in the rehabilitation programme. It is most likely that the information given in the programme did help to support smoking cessation. The finding in this study is supported by other studies, which showed that non-participation in cardiac rehabilitation was also a predictor of current smoking (Tzou *et al.* 2004).

In general, smokers state health reasons as a motive to quit smoking. Why patients with previously known cardiovascular health problems continued to smoke also after yet another event, is presumably associated with the selection of patients with less motivation to quit smoking. Those who are motivated may give up smoking the first time they suffer a serious health problem.

Some patients do not admit their smoking status to health professionals. Do they fear to be blamed by the health professionals to have caused their health problem? Do health professionals unconsciously blame the patients for having caused their health problem themselves? However, smokers hospitalized with a diagnosis of coronary heart disease are being informed of smoking as a strong contributing factor for the cause of their disease and the benefits of quitting smoking for their prognosis. Their knowledge of the harmful effects of smoking and a strong pressure from health professionals to quit smoking may also have encouraged them to under-report their smoking status. If they then not succeed in doing this and continue smoking, they may feel shame and guilt. An under-report of smoking status has also been seen among patients with other health problems such as diabetes (Ellard *et al.* 1996; Smith *et al.* 1998), hypertension (Agewall *et al.* 2002), respiratory disease (Lewis *et al.* 2003) and cancer (Sandhu *et al.* 2004). Expectations from health care professionals for patients to quit smoking may be a reason why they would underreport their smoking status. Patients may therefore wish to give a more socially desirable response concerning their smoking habits as they have been hospitalised for an illness that may be regarded as smoking-related.

To summarize the discussion about smoking and validation of patients smoking status, patients who did not succeed to quit smoking do not always admit this, but testing their

reliability by biochemical markers would not produce better results. Routine use of such testing is not recommended due to the ethical dilemma involved when finding high levels of biochemical markers in patients who do not admit smoking. Accepting information about smoking habits offered by the patients in secondary prevention provides a good starting point for health professional to motivate and support their patients towards a healthy change.

**Patients' experiences after a first myocardial infarction in relation to secondary prevention**

*Impact of medication*

Findings in this study revealed that patients after a first myocardial infarction had to deal with symptoms that were more or less related to the medication (Paper V). The patients, who in many cases were not used to a regular use of medication before the infarction, also had mixed feelings about the medication they were ingesting. These findings indicate that the medication had a great impact on patients' life after a first myocardial infarction. Therefore, the most important information to give to the patients in secondary prevention is to explain that the medication is protecting the heart and the vascular system against complications in the future. According to others, knowing the beneficial effects of the medication, also knowing side effects, if any, in the long term seems to be important to patients (Bailey *et al.* 1997; Lisper *et al.* 1997). However, the patients in this study described that there were few opportunities to ask about the medication at discharge, due to an often stressful situation at that time. Although information about medication later in the rehabilitation period was given to the patient's it does not seem to be sufficient. In other studies dealing with hypertensive patients, little effort was made on discussing the effect and goal of therapy, which led to an incomplete understanding among the patients of the functional nature of their antihypertensive medication (Kjellgren *et al.* 1998). Benson and Britten (Benson *et al.* 2002) found that patients' ideas about drugs, may not be related to the drugs' pharmacology which is why it becomes important to personalise information about the medication. As many patients are active in searching information from other sources other than from health professionals about their medicines, they also need to discuss this information so misconceptions can be avoided. This is of special importance in the prospect of a life-long treatment such as in patients with coronary heart disease. Other studies, mostly qualitative, in this field have demonstrated that patents with various chronic conditions have several tensions and ambivalence in relation to drug use (Britten 1994; Townsend *et al.* 2003), and furthermore, concerns over the medication and the effect it may have on their body in the long term (Jaarsma *et al.* 1995; Roebuck *et al.*

2001). Despite these concerns, the medication was seen as a security and a protection for future complications by the patients. From the perspective of the patients the benefits of the medication, the eventual side effects as well as their concerns and beliefs about the medication, have to be taken into account when educating the patients after a heart attack.

*Impact of health professionals*

This study revealed that how health professionals communicate with the patients had a great impact on patients' life after a heart attack. Also shown was that patients had feelings of uncertainty, a finding also described in other studies (Jackson *et al.* 2000; Jensen *et al.* 2003). The uncertainty patients described in this study were often related to symptoms they observed and their physical function after the heart attack. The communication with different health professionals, who in some cases gave information that was difficult for the patients to interpret, or sometimes also conflicting, may also have contributed to the uncertainty. Other studies have reported an unmet need for reliable information among women (Jackson *et al.* 2000). Following a heart attack, people try to regain control over their life situation and also try to become independent (Johnson 1991; Sutherland *et al.* 2000). They also try to structure their environment differently to facilitate lifestyle changes, a process where they integrate their beliefs and attitudes into changed behaviour (Frenn *et al.* 1989). As patients did not seem to trust their own observations or even when to resume their normal activities, reassurance by health professionals to reduce the uncertainty and to help patients to regain control over their situation and become independent, is of importance. Patients' perception of their illness influences their functioning and has been shown to play an important part in determining whether patients resume their work after a myocardial infarction or CABG (Petrie *et al.* 1996; Mittag *et al.* 2001). It is, therefore, important to take this into account when communicating with patients. Providing information that is relevant and also possible for the patients to understand was underscored in this study.

## Limitations and considerations

The two first studies (**Paper I, II**) were conducted in an early era of secondary prevention where the routines in the clinic not were yet developed, so there were many problems in implementing secondary prevention in daily practice. The problems in our study were apart from inadequate risk factor control also incomplete risk factor recording in patients' medical journal. There are other difficulties to overcome when implementing evidence and clinical guidelines into routine daily practice, of which some have been suggested to relate to practitioners in hospital or primary care, others to patients and their relatives (Shepherd 1999).

There was no active referral to the nurse who was involved in the secondary prevention programme (I). It was left instead to the responsible physician to refer the patients. Only a small number of the patients were referred to the nurse, which hampered an evaluation of the programme. More effort should have been made to actively recruit all eligible patients to the secondary programme in order to make it possible for evaluation. To evaluate the impact of the programme on the pattern of risk indicators even more efficiently, we could have involved a control group with standard care and one secondary preventive nurse care group. This type of study design with a control group would have improved the possibilities to evaluate the programme.

A limitation of validation of patients smoking status with biochemical marker may have been the fact that patients knew of the test beforehand, which may have influenced how they were going to answer the question about their smoking status. Those who had thought of not claiming that they smoked had maybe changed their mind due to this. In that case there is an under estimation of smokers who do not admit smoking. Among the patients who fulfilled inclusion criteria there was quite a large amount of withdrawals of patients who failed to come, and patients who were unwilling to give samples to prove their ex-smoking status. Of the former smokers who came to the nurse, about 20% (60/286) did not want to give blood samples for measurements of cotinine, of whom 26 did not want to give breath CO either. It is unknown why they were unwilling to be tested but one can suspect that the decision was associated with their smoking status. If all these 26 patients were telling the truth about their ex-smoking status it only changed the proportion of smoking deceivers marginally to 5.9%. On the other hand, if more than one of the patients had been classified as a smoker by the

biochemical marker, the proportion of those who contradicted their self-report would increase. Thus, one can surmise that the estimated proportion is reasonable accurate.

The evaluation of the secondary prevention programme only encompassed patients below 70 years of age. This age limitation was made due to practical reasons in the clinic. Further, we do not know anything about patients who were unwilling to participate. This is a problem shared by all clinical studies.

In this study we did not associate the various risk indicators and their management with the clinical events during follow up. We considered that the study population was too small to estimate such an association in a meaningful way.

We did not address psychosocial factors such as depression, social support and work characteristics or physical inactivity, which also have been associated with an adverse prognosis in patients with various manifestations of coronary heart disease (Wenger *et al.* 1995; Hemingway *et al.* 1999; Frasure-Smith *et al.* 2003). We understand the value of these risk factors but measurements of these variables may be more difficult to obtain, and may also be more difficult to redress.

## Aims, main results and conclusions

The aims of this study, as described in the beginning of this thesis, are written in italic font style, together with main results and conclusions.

- *What is the occurrence of traditional risk indicators associated with recurrence in outpatients with established coronary heart disease?*

A high proportion of traditional risk indicators associated with recurrence were found. Among those who had developed myocardial infarction and among those in whom CABG or PTCA were undertaken the proportion appeared to be similar except from smoking habits, which was lower after by-pass operation. Nonetheless, a high proportion of patients with established coronary heart disease have risk factors amenable to treatment.

- *Does increased knowledge about the beneficial value of lipid lowering treatment influence secondary prevention in coronary artery disease?*

Increased knowledge about the benefits of lipid lowering levels led to an increased use of lipid lowering drugs and improved lipid levels, and thereby influenced secondary prevention.

- *What is the reliability of self-report with respect to smoking cessation?*

Some contradictions (< 10 % of cases) were found in former smokers between self-report of smoking cessation and biochemical markers for smoking. However, in the vast majority of former smokers, self-reported smoking cessation corresponded with the bio-chemical markers.

- *What predicts continued smoking in patients with acute coronary syndromes?*

Predictive factors for continued smoking were; whether the patients did not participate in the heart rehabilitation programme, whether they used sedatives or antidepressants or whether they had a history of cerebral vascular disease, a cardiac event or smoking-related pulmonary disease. If patients had a high level of cigarette consumption also predicted a continuation in smoking. These findings may guide the identification of patients at high risk for continued smoking.

- *What are the experiences of secondary prevention from the patients' perspective?*

Patients interpreted bodily symptoms as a consequence of being medicated rather than as a result of the heart attack. Regarding the medication, there were indications that patients had feelings of being intruded upon, but also to positive feelings of security and confidence. Communication with different health professionals gave the patients an ambiguous perception of the disease and its treatment. From the patients perspective there was a need of being reassured of the physical function by the physician.

## Implications

The management of risk factor modification in patients with established coronary heart disease have to be improved. Information from further clinical trials will influence the future risk factor modification.

In the vast majority of patients with established coronary heart disease, self-report about smoking cessation is reliable. Routine use of testing the reliability of smoking cessation by biochemical markers is not recommended due to the ethical dilemma involved when finding high levels of these markers who do not admit to smoking.

It is possible to identify factors associated with an increased risk of continuation in smoking. Patients who suffer from any of these risk indicators might deserve specific treatment.

From the patients' perspective, the benefits of the medication, the eventual side effects as well as patients' concerns and beliefs about the medication have to be taken into account when educating the patients after a heart attack.

Clinical guidelines on how to improve information, education and counselling in secondary prevention have to be developed.

## Future aspects

*How should we improve smoking cessation rates?*

In helping patients to stop smoking, it is important to consider his or her degree of dependence on cigarettes as well as motivation to stop smoking as these two factors often are related to each other (Russell 1977). These factors can be assessed by simple questions. The point of why we should assess motivation is to identify those who are ready to make a quit attempt. It has been suggested that the main value of measuring dependency is the choice of pharmacotherapy (West 2004). Theoretically the level of physical dependence on nicotine determines the dosage of nicotine replacement therapy, but results from studies to prove this have been conflicting (Herrera *et al.* 1995; Garvey *et al.* 2000). According to West (2004), when an individual is motivated and has made a decision to quit, the success of that quit attempt may be determined more by the degree of dependence than to the level of motivation.

The most effective interventions combine behaviour support with drug treatment as highlighted by Coleman (Coleman 2004). Research has shown that smoking cessation advice and support from health professionals and pharmacotherapy (Nicotine replacement therapy or Buproprion), can enhance the chances of success (Cochrane Reviews: Silagy *et al.* 2004; Rice *et al.* 2004). Starting already during hospitalization with repeated brief and supportive advice on smoking cessation should therefore be given and reinforced by the doctors and other health professionals engaged in the aftercare of the patients. Behavioural support to prevent relapse along with follow up should also be considered (Rigotti *et al.* 2003).

Buprion (Zyban), which is a non-nicotine based treatment for use in smoking cessation treatment has been shown to be a valuable medication for smoking cessation in smokers with cardiovascular health problems (Tonstad *et al.* 2003). Using this drug, more than twice as many smokers had quit smoking at one year compared with placebo.

Use of nicotine replacement therapy is also an effective component of smoking cessation strategies and should be recommended routinely to heavier smokers (defined as those smoking more than 10 cigarettes daily), as a smoking cessation therapy according to a review conducted by the Cochrane Library. (Silagy *et al* 2004) . I believe, however, that health professionals should recommend this therapy to all smokers. As no smoking cessation devices are a panacea, the patients' have to make strong efforts to quit smoking and to sustain a smoke-free status. Patients' have a tendency to overestimate their ability to quit smoking and underestimate the difficulties.

As cigarette dependency is a chronic relapsing condition (Jarvis 2004), patients that have made a quit attempt may struggle over years to achieve long-term abstinence. They should therefore be asked about their current smoking status at any encounter with all health professionals and, if needed, referred to a nurse dedicated to secondary prevention for further help. The challenge for health professionals will be to incorporate smoking cessation efforts as part of standard practice, so that all patients are given an opportunity to be asked about their tobacco use and to be given advice and/or counselling to quit along with reinforcement and follow-up, as concluded by Rice (Rice *et al.* 2004).

Strategies that may help patients to stop smoking can be summarized into the following A's as underlined in the European guidelines on cardiovascular disease prevention (De Backer *et al.* 2003) outlined in the box below.

A – ask: systematically identify all smokers at every opportunity
A – assess: determine the patient's degree of addiction and her/his readiness to cease smoking
A – advice: urge strongly all smokers to quit
A – assist: agree on a smoking cessation strategy including behavioural counseling, nicotine replacement therapy and/or pharmacological intervention
A – arrange a schedule of follow up visits

*How can blood pressure control in patients be improved in secondary prevention?*

Lifestyle modifications such as weight loss, sodium reduction, increased physical activity, and limited alcohol intake can lower blood pressure directly or indirectly (Appel *et al.* 2003), and should be recommended to all hypertensive persons according to Appel (Appel 2003). In a meta-analysis of randomized controlled trials done by Neter and co-workers (2003), it was estimated that a weight reduction by means of energy restriction and increased physical activity or both reduced the blood pressure by about 1 mmHg per kilogram (Neter *et al.* 2003). An overall healthy dietary pattern termed the dietary approach to stop hypertension (DASH), a diet that emphasizes fruits, vegetables, and low-fat dairy products can also be effective in lowering blood pressure (Harsha *et al.* 1999; Conlin *et al.* 2000). This diet in combination with sodium reduction may have even better effects (Sacks *et al.* 2001).

*Other aspects*

Lipid lowering therapy will, in the future, be even more intensified to further reduce the risk for recurrent events (Cannon *et al.* 2004). There is also a potential to further improve the overall pharmacological treatment as there has been reported an under use of drugs in secondary prevention (Mukherjee *et al.* 2004).

Taking this into consideration that patients have to be reassured of their physical function, an exercise test after the infarction conducted by the physician may be useful for this confirmation and for prognostic information (Karlsson 2001). In addition, to motivate the patients to participate in the cardiac rehabilitation programme is also important. In the future planning of the patients' care after discharge from hospital for a first myocardial infarction, it is important for the patients to receive at least one follow-up visit to a cardiologist or other physician with time to discuss all questions that the patients may have. This may also apply to patients who have undergone revascularization therapies, as the length of hospital stay for these patients, as well as for patients with acute myocardial infarction, has declined.

## Concluding remarks

To be maximally effective, as suggested by Sebregts, risk management should focus on a selection of patients most likely to benefit from a particular programme, or even better, patients should be referred to the treatment, which is most appropriate for their special needs (Sebregts *et al.* 2000). General guide lines for cardiac rehabilitation and secondary prevention

emphasizes individual sub-goals based on patients' needs (De Backer *et al.* 2003). To be able to do this, it is important that health professionals listen to the patients and identify their needs. It seems as if the present communication is non concordant with the patients' needs. The clinical challenge for health professionals is to improve and develop the present guide lines to be suitable for daily practical work, particularly concerning communication with the patients regarding information, education and counselling.

## POPULÄRVETENSKAPLIG SAMMANFATTNING

### Problem associerade med modifiering av riskfaktorer i sekundärprevention av kranskärlssjukdom

Avhandlingen handlar om att förändra riskfaktorer hos patienter som har vårdats på sjukhus på grund av en kranskärlssjukdom, samt om patienternas upplevelser efter en första hjärtinfarkt.

Patienter vilka sjukhusvårdats under 1993 och 1995-1996 för en konstaterad kranskärlssjukdom identifierades ett år efter hjärthändelsen och förekomsten av riskfaktorer associerade med återinsjuknande utvärderades. Utvärderingen skedde efter införandet av ett sekundärpreventivt program på hjärtkliniken. Patienterna erbjöds besök till sjuksköterska på hjärtmottagningen för utvärdering av sina riskfaktorer och om dessa förbättrades över tid. Vid de uppföljande besöken validerades även patienternas uppgift om rökstopp med kemiska markörer för rökning, kotinin i plasma och kolmonoxid i utandningsluften. Vid den första utvärderingen hade 70 % av alla patienter en eller flera av följande riskfaktorer; total kolesterol >6,5 mmol/l (30 %), triglycerider >3,0 mmol/l (19%), fasteblodsocker >6,7 mmol/l (29 %), systoliskt blodtryck >160 mmHg (9 %), diastoliskt blodtryck >90 mmHg (8 %) eller rökning (36 %), jämfört med 67 % vid uppföljningen 1 till 2 år senare. Således hade det sekundärpreventiva programmet begränsad effekt på det totala riskfaktormönstret, men över tid observerades en markant sänkning av blodfetter parallellt med en trefaldig ökning av användningen av lipidsänkande läkemedel. Även andelen patienter som rökte sänktes märkbart. Vi fann ingen förändring i patienternas kroppsvikt under de båda utvärderingsperioderna.

Rökvanor hos 1320 patienter registrerades vid vårdtillfället under en 4-års period och faktorer som kan förutsäga rökstopp identifierades. Vi fann att 33 % uppgav att de rökte vid vårdtillfället, vid uppföljningen 3 månader senare uppgav hälften av dem att de hade slutat röka. Sex faktorer var associerade till rökstatus vid uppföljningen, nämligen att inte ha deltagit i hjärtrehabiliteringen, behandling med lugnande läkemedel eller läkemedel mot depression vid inläggningen på sjukhuset, om patienterna hade en tidigare känd hjärthändelse, cerebrovasculär sjukdom eller rökrelaterad lungsjukdom. Dessutom hade en hög cigarett förbrukning betydelse för om patienterna forsatte att röka. Vi fann att 17 (6,5 %) patienter som uppgav att de slutat röka hade förhöjda värden av kolmonoxid (n=6) och/eller kotinin

(n=13), utan alternativt intag av nikotinersättningsmedel. Egna uppgifter om rökstopp stämde dock i de flesta fall med den kemiska markören.

Resultat från en intervjustudie visade att medicineringen och uppföljningen efter förstagångsinfarkt kunde upplevas förvirrande och motsägelsefull. Patienterna tolkade symptom som en konsekvens av att vara medicinerad och relaterade inga kroppsliga obehag till hjärtinfarkten. Medicineringen ledde till en känsla av intrång i det dagliga livet men upplevdes också som säkerhet och skydd mot en ny infarkt. Kommunikation med olika läkare och övrig vårdpersonal gav en oklar bild av sjukdomen och dess behandling. Tiden efter sjukhusvistelsen kändes osäker och vansklig. Patienterna verkade ha ett stort behov av att bli bekräftad i sin fysiska funktion av läkaren.

Sammanfattningsvis kan vi konstatera att det finns svårigheter att förändra riskprofilen vid sekundärprevention efter konstaterad kranskärlssjukdom. Fastän en avsevärd förbättring i behandlingen av blodfetter har skett främst genom en ökad användning av blodfettssänkande läkemedel, kvarstår problem med förändring av andra riskfaktorer som övervikt och rökning. Med de ännu lägre behandlingsmålen för blodtryck och blodfetter som är aktuella idag finns det potential för förbättring även av dessa riskfaktorer. Vidare framkom att patienterna, vilka i många fall tidigare inte behövt regelbunden medicinering, upplevde medicinerna som ett intrång i livet. Alla kroppsliga obehag relaterades till medicinerna som trots allt accepterades eftersom de också gav ett visst skydd mot nytt insjuknande och för tidig död. Vårdpersonalens information och uppföljning var uppskattad men upplevdes som motsägelsefull och otydlig. Utgångspunkten i det sekundärpreventiva arbetet bör vara patienternas upplevelse av sitt tillstånd och den behandling som de får.

**ACKNOWLEDGEMENTS**

This thesis has been accomplished by the support of many people. I wish to express my sincere gratitude to everybody who contributed in any way to this work. In particular, I would like to thank the following:

All patients for their interest and especially the participants in the interview study for sharing their experiences.

Johan Herlitz, Professor in Cardiology and my main supervisor, for guiding me in the research of secondary prevention and coronary heart disease. He was the first to encourage me to undertake research studies, and made it possible for me to deepen my knowledge in this way. He has always supported me, and I admire him for his intellectual insight, continuous interest, never ending enthusiasm, constructive critique and invaluable advice throughout the study period.

Marianne Hartford, Assoc. Professor, supervisor, for her wisdom, genuine support, enthusiasm and for her constructive critique on my papers.

Agneta Hjalmarson, supervisor, for being my special guide concerning smoking and coronary heart disease and for conveying to me her incomparable knowledge about smoking cessation in such an excellent way.

Inger Ekman, supervisor and friend, for guiding me so skilfully in the field of qualitative research. She has been a great source of inspiration and always so enthusiastic and supportive.

Tomas Karlsson and Jonny Lindqvist, statisticians, who significantly supported me with the statistics and for sharing their knowledge about statistical matters.

Ann-Britt Thorén, Annika Odell, Angela Bång, Solveig Aune, Åsa Cider, Marianne Berglin-Jarlöv and Åsa Axelsson, my dear colleagues, for their fruitful and educational discussions in the "Doctoral group" about scientific matters and for constructive critique on my papers. A special thank to Ann-Britt Thorén, for always being there to listen to me and for her skilful help with the "Endnote" programme and her invaluable involvement and time when reading my manuscript and giving me constructive comments. What would I have done without you !

Göran Holm, for excellent advise on diabetes issues.

Birgitta Franzén and Marguerite Åkerström, for their positive and encouraging support and assistance in a variety of issues.

Maureen Jehler, for her skilful help with the English language when turning my "svenglish" into British English.

All my friends and workmates at Hjärtmottagningen, Sahlgrenska University Hospital.

My beloved children Maria, Tomas, Lina and Alexander, for being there to cheer me up!

The Swedish Heart and Lung Foundation, Vårdalsstiftelsen, Swedish Medical Research Council, Merck Sharp and Dohme, and the Local Research and Development Department for Göteborg and Southern Bohuslän for supporting this project with grants.

And last but not least, my dear husband Olle, for always standing by me to help with difficult matters, in particular with computer problems in moments of desperation, and with invaluable support when I was studying statistics.

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