Rethinking management of risk factors in secondary prevention of cardiovascular disease

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Chapter 1

Introduction and general outline
‘The paramedics immediately could see on their screens what was going on: I was having a heart attack! Within almost no time, we arrived at the hospital, I was brought to the catheterization room, and the doctors opened one of the blood vessels in my heart, which was causing the heart attack. After I left the hospital, I have to admit that everything that had happened had given me a real fright. It was clear to me that I had to change my lifestyle to avoid another heart attack. Therefore, I immediately stopped smoking. Unfortunately, I have now gained a few kilos. What is the best thing to do now? Is the weight reduction programme of RESPONSE 2 something for me? Will it work for me? I have never attended a programme like that before in my life. Will I even like it? I do like the fact that it takes place close to home, in my own neighbourhood. I really am prepared to change my lifestyle, that will be necessary, to live healthier, to see my grandchildren grow up. I would like to be more physically active but I don’t have much energy. I am also interested in the cardiac rehabilitation programme and talking with a nurse about everything that is going on. It would be nice if somebody could coach you in the choices which you have to make. It is not a minor thing; my life was turned upside down from one day to the next.’ (Mr P. Sanders, 63 years old)
Cardiovascular disease (CVD) is the leading cause of death worldwide, accounting for more than 17 million deaths every year, and 31% of all global deaths. Of these deaths, an estimated 7.4 million (42%) were due to coronary heart disease (CHD)\(^1\), which refers to a narrowing or occlusion of the coronary arteries that provide oxygen and blood to the heart. Patients who have suffered an event due to CVD are at high risk of recurrent events. Secondary prevention aims to reduce this risk by stopping or slowing the progression of the underlying disease, i.e. atherosclerosis. The main objectives of CVD prevention are to reduce morbidity and mortality, to improve quality of life and add healthy life years.\(^2,3\) CVD prevention guidelines have been formulated by the Joint European Societies on CVD Prevention, with clear targets for secondary prevention\(^2\). Management of risk factors of patients with CVD consists of a combination of medical treatment and lifestyle modification. Guideline-recommended treatment targets are shown in Table 1.

**Table 1.**
Joint European Societies guideline recommendations for secondary prevention of cardiovascular disease\(^2\)

<table>
<thead>
<tr>
<th>Guideline recommendations</th>
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<tbody>
<tr>
<td>Smoking cessation among smokers</td>
</tr>
<tr>
<td>Regular physical activity, ≥30 min. 5x/week</td>
</tr>
<tr>
<td>BMI &lt;25 kg/m(^2)</td>
</tr>
<tr>
<td>Waist circumference:</td>
</tr>
<tr>
<td>&lt;94 cm (men)</td>
</tr>
<tr>
<td>&lt;80 cm (women)</td>
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<tr>
<td>Blood pressure &lt;140/90 mmHg</td>
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<tr>
<td>Total cholesterol &lt;4.5 mmol/L</td>
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<tr>
<td>LDL-cholesterol &lt;1.8 mmol/L</td>
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<tr>
<td>Among patients with type 2 diabetes:</td>
</tr>
<tr>
<td>Fasting glycaemia &lt;7.0 mmol/L</td>
</tr>
<tr>
<td>HbA1c &lt;6.5%</td>
</tr>
</tbody>
</table>

BMI=Body mass index; HbA1c=glycated haemoglobin; LDL=low-density lipoprotein

Secondary prevention is highly effective in reducing the risk of recurrent CVD events. The potential cumulative risk reduction by pharmacological treatment of blood pressure and LDL-cholesterol only has been estimated to be as high as 75%.\(^4\) Adherence to recommendations regarding smoking, diet, and exercise after an acute coronary
syndrome is associated with a substantially lower risk of recurrent events rate.\textsuperscript{5} However, in real life a large majority of patients fail to achieve the therapeutic targets indicated by the guidelines.\textsuperscript{6}

The EUROASPIRE (European Action on Secondary and Primary Prevention by Intervention to reduce Events) surveys on lifestyle and risk factor management and on the use of drug therapies in patients with CHD aim to evaluate guideline implementation in clinical practice. These European surveys show that between 1996-2013, in patients who have suffered an acute coronary event, control of lifestyle risk factors has deteriorated, with increasing prevalences of obesity and central obesity, and unaltered rates of persistent smoking. Medication use has increased, with a concomitant improvement of blood pressure and LDL-cholesterol control.\textsuperscript{6} In spite of this, the majority of patients still do not achieve the guideline recommended targets. Of these risk factors, smoking may be the strongest, and is highly prevalent in patients with CVD.

Chapter 2 serves as an introduction to the current clinical situation in the Netherlands. We provide an overview of the prevalence of cardiovascular risk factors in the Dutch study population of EUROASPIRE IV. In this introductory chapter, we report that the current level of risk factor management is far from optimal. Our results show that there is room for improvement of the current risk management in secondary prevention of cardiovascular disease.

Currently, the greatest challenge in preventive cardiology is not to develop more powerful drug interventions, but to implement highly effective treatments and strategies that are already available. Rethinking current concepts and strategies in risk factor management is warranted, and in this thesis, we address this issue. We present studies evaluating the coordinating role of nurses in secondary prevention (part 1), and studies on smoking cessation (interventions) in coronary patients (part 2).

PART 1 NURSE-COORDINATED CARE

Multidisciplinary approaches, including nurse-coordinated care, are recommended in the European prevention guidelines to improve secondary prevention of CVD.\textsuperscript{2} This recommendation is based on a limited, yet increasing number of studies investigating the effects of various forms of nurse-coordinated care. Nurse-coordinated care in secondary prevention in general consists of cardiovascular risk assessment and supporting the patient to achieve the goals and target levels for risk factors. Nurses work as part of a multidisciplinary team, and are trained to support patients and their families in making lifestyle changes and adhering to (drug)therapy.\textsuperscript{7} Next to these skills, care coordination is
part of a nurse’s repertoire of skills and experiences and is increasingly being recognised as a pivotal part of secondary prevention. According to Krumholz et al., coordinated care encompasses the development and implementation of a therapeutic plan designed to integrate the efforts of multiple health professionals. Ideally, secondary prevention consists of a team-based patient-centred approach, benefitting from the expertise of multiple health professionals. Nurses have been shown to be effective coordinators of such preventive care.

Studies investigating nurse-coordinated prevention programmes have shown promising results. However, these initial landmark studies were conducted before clear definitions were developed of what nurse-coordinated care entails, and how to distinguish this care from other approaches, such as traditional disease and/or case management. Furthermore, these trials were carried out in widely varying healthcare settings, with a plethora of interventions, strategies, and outcomes. The effective components of nurse-coordinated care lack clear definitions, hampering the further investigation and implementation of these components. We therefore performed a comprehensive systematic review of the available evidence of nurse-coordinated care in secondary prevention of CHD aiming to clearly define intervention components and the effects thereof.

**Lifestyle modification**

A healthy lifestyle is the cornerstone of secondary prevention. Guidelines on secondary prevention of cardiovascular disease emphasise the importance of lifestyle interventions. Lifestyle is based on long-standing behavioural patterns that are maintained in daily life. Many patients adopt healthier lifestyles directly after an event, or during the subsequent cardiac rehabilitation programme, but relapse into old habits when returning to everyday life. Lasting improvement of lifestyle in patients with CVD has been shown to be challenging. A number of studies have demonstrated that health care professionals are often unable to help patients achieve a healthier lifestyle. This may reflect a lack of skills, or a lack of time, with a limited number of brief clinic visits.

The Randomised Evaluation of Secondary Prevention by Outpatient Nurse Specialists (RESPONSE-1) trial was designed to evaluate the effects of a nurse-coordinated prevention programme in patients after an acute coronary syndrome, focusing on both medication optimisation and lifestyle modification. At 12 months, patients in the nurse-coordinated care group had better control of risk factors and a predicted relative risk of mortality (calculated using the SCORE algorithm) that was 17% lower than the usual care group. However, lifestyle-related risk factors were common and remained largely unchanged at follow-up in most patients.

Other studies evaluating health-care provider driven lifestyle programmes for patients with CHD have shown limited to no beneficial effects on lifestyle risk factors. To achieve long-term improvements in lifestyle, a ‘medical’ approach may not be suitable. Rethinking the current approaches to secondary prevention programmes is therefore
warranted. This entails re-evaluating the role of medical professionals (doctors, nurses, other affiliated professionals), the components included in prevention programmes, and the setting. Potentially, secondary prevention programmes aimed at maximum reduction of cardiovascular risk factors, that are comprehensive and accessible (community-based), adapted to the medical and personal setting of patients, and involving patients’ partners, can lead to improved risk factor control. We therefore designed a nurse-coordinated prevention programme for coronary patients which included medical management but also coordinated referral of patients and their partners to a comprehensive set of lifestyle programmes, using up to three community-based interventions: the RESPONSE-2 trial.

**RESPONSE-2**
RESPONSE-2 was a multi-centre, randomised trial in 15 hospitals in the Netherlands. We hypothesized that a comprehensive intervention, involving patients’ partners, would have a greater impact compared to a single risk factor approach. We designed a strategy of nurse-coordinated referral based on patient preferences to a set of ≥ 1 community-based, existing interventions to achieve weight loss, improvement of physical activity, and smoking cessation, on top of usual care and including the patient’s partner. These up to three community-based lifestyle programmes were offered uniformly, in their existing commercial formats.

**The three existing community-based lifestyle programmes**

**Smoking cessation programme**
Luchtsignaal® is an existing national smoking cessation programme in the Netherlands, offering up to seven telephone counselling sessions during a period of three months. The programme is based on the stages of change from the transtheoretical model and used strategies from motivational interviewing, action and coping planning, self-control training, and relapse prevention. Depending on patients’ preferences, pharmacological therapy for smoking cessation could be prescribed.

**Weight reduction programme**
Weight Watchers® aims to reduce weight by emphasizing a healthy diet, change in behaviour, physical activity and group motivation and offers weekly group meetings for a weigh-in and group discussion, coordinated by a coach. Furthermore, dietary intake is based on a points system that addresses the total caloric energy in each product.

**Physical activity programme**
Philips DirectLife® is an internet-based coaching activity health programme that includes an accelerometer, comparable to a small USB memory device. The programme monitors daily physical activities, provides feedback via the accelerometer and offers personalized, internet-based coaching.
Nurses were trained in a systematic referral approach, consisting of risk status assessment, discussing the current risk status with patients, and assessing the level of motivation to change or sustain the current cardiovascular risk status. Depending on the level of motivation, participation in relevant lifestyle programme(s) was advised, followed by an official referral to the lifestyle programme after patient consent. This was the first trial to study referral of patients and their partners to existing community-based lifestyle programmes in secondary prevention, coordinated by hospital-based nurses.

To evaluate the effects of the comprehensive lifestyle modification programmes within the context of nurse-coordinated care, we defined a unique outcome parameter. To qualify for a successful outcome, a patient was only deemed successful if reaching the target (improvement) for at least one of the three lifestyle risk factors, without deterioration in any of the other two at 12 months follow-up. Success was defined as either 1) significant weight loss (≥5% weight reduction), 2) total smoking cessation (urine cotinine <200 ng/ml), or 3) at least 10% improvement on 6-minute walking distance test. Deterioration was defined as: 1) any weight gain in combination with a BMI >25 kg/m²; 2) any decrease in 6-minute walking distance compared with baseline; and 3) a positive cotinine test in non-smokers at baseline. Two exceptions were made: in patients who stopped smoking and/or improved their 6-minute walking distance, a BMI increase of ≤2.5% was classified as no deterioration.

PART 2 SMOKING CESSATION

The association between smoking and cardiovascular disease is one of the best-established relationships in modern medicine. Consequently, smoking cessation after a coronary event is potentially the most effective of all preventive measures. A systematic review and meta-analysis showed a relative risk in myocardial infarction (MI) of 0.57 (95% 0.36-0.89) and in the composite endpoints of death/MI 0.74 (95% 0.53-1.02), compared with continued smoking in the short term of 6 months. Since smoking is the most important risk factor for CVD, we investigated smoking cessation rates in Europe and the Netherlands, the success of different smoking cessation interventions, and the dynamics of smoking cessation after an acute coronary event or revascularisation.

Smoking cessation intervention

According to the European guidelines on cardiovascular disease prevention, smoking cessation must be encouraged in all smoking patients. It is recommended to identify (pre-event) smokers and to provide repeated advice on stopping, with offers to assist. Guidelines recommend that health care professionals and patients agree on a smoking cessation strategy which includes established cognitive-behavioural strategies (e.g.
motivational interviewing) and pharmacological support.\textsuperscript{2,21,22} Professional support provided by a dedicated research nurse or trained smoking cessation counsellor can increase the odds of stopping [RR 1.66 (95\% CI 1.42, 1.94)].\textsuperscript{23} Both individual and group behavioural interventions are effective in helping smokers to quit.\textsuperscript{24} The community-based smoking cessation intervention of our RESPONSE-2 trial was a protocol-driven intervention that included professional smoking cessation counsellors, behavioural therapy including motivational interviewing, intensive individual (telephone) follow-up support after discharge, and pharmacological treatment offered as adjunct to behavioural counselling.\textsuperscript{23,25}

Hospitalisation for an acute coronary event provides an important opportunity to address smoking cessation. Several characteristics have been described that are associated with a lower likelihood of successful smoking cessation, such as exposure to environmental tobacco use, lower educational level, and higher scores on the Hospital Anxiety and Depression Scale (HADS).\textsuperscript{26,27} However, considering the temporal trends and changing smoking legislation in Europe, a continuous re-evaluation of cessation rates and the characteristics of successful quitters is warranted. Better understanding of such characteristics may guide the development of more effective smoking cessation interventions. We investigated smoking cessation rates and quitter characteristics across different national and international settings, within two randomised clinical trials (RESPONSE 1 and 2) and three large European surveys (EUROASPIRE 2-4).

**Aims of this thesis**
To rethink the current management of risk factors in secondary prevention by:


2. Studying smoking behaviour in coronary heart disease patients and identifying characteristics of successful quitters after an acute coronary event or revascularisation.

**Outline of the dissertation**
**Chapter 2 serves as an introduction**, describing the prevalence of cardiovascular risk factors and their treatment in Dutch patients with coronary heart disease (the EUROASPIRE- project), and comparing these data with those from 6, 13, and 17 years previously.

**Part 1 Nurse-coordinated care (chapters 3-6)**
Chapter 1

The first part of the thesis concerns nurse-coordinated care in the secondary prevention of coronary heart disease patients. In chapter 3 we systematically review the available evidence on the efficacy of nurse-coordinated care. In chapter 4 we present the objectives, design and expected results of our randomised controlled trial investigating a community-based comprehensive lifestyle programme on top of usual care, in patients who were recently hospitalised for coronary heart disease in the Netherlands (RESPONSE-2). In chapter 5 we present the main findings of our RESPONSE-2 trial. In chapter 6 we performed a subanalysis of the RESPONSE-1 trial presenting the effect of a nurse-coordinated prevention programme on the achievement of LDL-cholesterol targets in patients hospitalised for an acute coronary syndrome.

Part 2 Smoking cessation (chapters 7-9)
In the second part of this thesis we evaluate smoking behaviour in (European) coronary heart disease patients and to identify characteristics of successful quitters after an acute coronary event or revascularisation procedure. In chapter 7 we present characteristics of successful quitters after an acute coronary syndrome in the population of the RESPONSE-1 trial. In chapter 8 we investigate the characteristics of successful quitters, the use of cardiac rehabilitation programmes, including the smoking cessation programme, and the level of general risk factor management in persistent smokers versus in those who successfully quit smoking in Europe (EUROASPIRE IV). Finally, in chapter 9 we investigate characteristics of successful quitters and their use of the smoking cessation programme and the other lifestyle interventions (RESPONSE-2), to improve lifestyle-related risk factors.
References


