
The follow-up after myocardial infarction – is it good enough?

PERSPECTIVES

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The majority of Norwegian coronary patients fail to change their lifestyle behaviour and miss the recommended treatment targets for cholesterol and blood pressure after discharge from hospital.

Coronary heart disease is the single most important cause of death in the world, and annually more than 13 000 patients are diagnosed with acute myocardial infarction in Norway (1). Although mortality after myocardial infarction has been considerably reduced in recent years, data from Sweden show that one in five myocardial infarction patients experience a subsequent cardiovascular event in the course of the first year (2). In Norway, the decline in recurrent myocardial infarctions in the period 1994–2009 was mainly observed in patients over the age of 65, while the incidence in the younger population remained unchanged in the period 2001–08 (3).

Despite the fact that a large number of factors contribute to the development and progression of coronary heart disease, it has been robustly documented that we need to monitor and treat the traditional cardiovascular risk factors

that verifiably improve the patients' prognoses (4). Table 1 shows the key treatment targets described in the most recent European guidelines for the prevention of coronary heart disease (4).

Table 1

Recommended treatment targets for established cardiovascular risk factors and cardiac rehabilitation in the European guidelines for coronary prevention from 2016 (4)

Treatment target	Level of evidence (benefit and effect) ¹
Smoking cessation	IA
At least 150 minutes of moderate physical exercise (30 min 5 x/week) or 75 minutes of vigorous activity per week	IA
Body mass index (BMI) < 25 kg/m ² or 10 % weight loss at BMI > 30 kg/m ²	IA
Low-density lipoprotein cholesterol < 1.8 mmol/l	IA
Blood pressure < 140/90 (80 in diabetics) mm Hg ²	IB (IA in diabetics)
HbA _{1c} < 7 % (8 %) in diabetics	3
Participation in an inter-disciplinary cardiac rehabilitation programme	IA

¹Level of evidence I (A or B) is the strongest recommendation provided in international guidelines.

²A somewhat less stringent target may be considered for the most elderly patients.

³HbA_{1c} < 7 % has a Class 1A recommendation for diabetes patients generally, while a somewhat less stringent target may be considered for patients with established cardiovascular disease.

Despite considerable knowledge and clear guidelines, secondary prevention is suboptimal in clinical practice. European multi-centre studies conducted regularly since the 1990s show that the incidence of obesity and diabetes has increased, while daily smoking and poorly controlled blood pressure remain unchanged. Only the lipid profile has improved, presumably as a result of a rise in statin prescriptions (5). Norway did not take part in these studies, but we have now surveyed the prevalence of risk factor control through the NORwegian CORonary Prevention Study (NOR-COR) (6). After a median of 16 months we comprehensively surveyed a total of 1127 patients between the ages of 31–80, all of whom had been treated for myocardial infarction and/or coronary revascularisation at either Drammen Hospital or Vestfold Hospital. Table 2 shows the prevalence of risk factors in NOR-COR compared to Europe (5). On average, every Norwegian patient had no control of three out of six risk factors, and the patients who had suffered several coronary events had the lowest level of control. It was surprising that the results from Norway were no better than for the rest of Europe, since we have a strong health service and a

population with higher socioeconomic status than the European average (7). It is uncertain whether the differences are genuine or whether they indicate that we have a patient population which is more representative of clinical practice.

Table 2

Proportion of patients who fail to achieve the treatment targets for key cardiovascular risk factors in EUROASPIRE IV (5) and in NOR-COR (6)¹

Risk factor	EUROASPIRE IV (n = 7998) (%)	NOR-COR (n = 1127) (%)
Daily smoking	16	21
Moderate physical exercise < 30 minutes 3x/week	60	60
Body mass index > 25 (30) kg/m ²	82 (38)	81 (34)
Low-density lipoprotein cholesterol ≥ 1.8 mmol/l	81	57
Blood pressure ≥ 140/90 (80 in diabetics) mm Hg	43	46
HbA1c ≥ 7 % (8 %) in diabetics	48 (26)	59 (35)

¹Risk factors in EUROASPIRE IV were measured 1.4 (0.9–1.9) years after a coronary event. In NOR-COR they were measured after 1.7 (0.2–3.0) years.

The importance of cardiac rehabilitation

Cardiac rehabilitation may be defined as the sum of all clinical activities that contribute to patients being able to implement lifestyle changes, use medication as prescribed and re-establish or improve their physical, mental and social status (4). General practitioners, who conduct more than 90 % of all preventive consultations, play a key but under-studied role in the cardiac rehabilitation chain (8). The Norstent study, involving more than 9000 patients treated with percutaneous coronary intervention (PCI), showed that only 28 % were taking part in a structured cardiac rehabilitation programme in Norway (9).

In NOR-COR, 75 % of patients at the Hospital of Vestfold had participated in an inter-disciplinary cardiac rehabilitation programme, while only 18 % of patients at Drammen Hospital participated in the less comprehensive programme offered there (10). At the Hospital of Vestfold the probability that programme participants would stop smoking, improve their lipid profile and adhere to prescribed medication was three times higher than for those who did not take part. In this hospital all coronary patients were assessed for referral to cardiac rehabilitation prior to discharge, while there is no data available to indicate the

referral rate at Drammen Hospital. Nationally there are presumably considerable differences in referral rates and in the content and duration of cardiac rehabilitation programmes. This should be investigated.

Barriers that influence secondary prevention

Knowledge about underlying barriers that influence lifestyle behaviour and biological risk factors is a prerequisite for being able to improve secondary prevention (11). The barriers are many and can be categorised as *patient-related*, *treatment-related*, *healthcare personnel* and *system-related* (11).

The NOR-COR programme studied how clinical, psychosocial, patient-related and treatment-related barriers influence smoking, low-density lipoprotein cholesterol, blood pressure, obesity, physical exercise and diabetes (12). Out of a total of 390 patients who smoked at the time of the index event, 56 % continued smoking (13). Low socioeconomic status, a long history of smoking and non-ST elevation infarction were factors associated with continued smoking in adjusted analyses. The smokers were aware of their risk, and expressed a high level of motivation to quit, but only 42 % reported that they had been offered nicotine replacement therapy or smoking cessation assistance by healthcare personnel. Only 43 % achieved the treatment target for low-density lipoprotein cholesterol of 1.8 mmol/l (14). Ten per cent of patients with unfavourable low-density lipoprotein cholesterol did not use statins at all, while only half were prescribed high-intensity treatment with atorvastatin ≥ 40 mg or rosuvastatin ≥ 20 mg. In patients on low-intensity statin therapy, low self-reported drug adherence and statin-related side effects were associated with 1.6–3.3 times higher probability of missing the low-density lipoprotein cholesterol target in adjusted analyses, while socioeconomic and psychological factors had no impact. Although side effects and low adherence to statins represent a major challenge in clinical practice, a Norwegian study showed that systematic statin treatment run by a cardiologist resulted in 90 % of coronary patients achieving the target for low-density lipoprotein cholesterol (15). The selected patient sample may have influenced the good result, but the findings nevertheless suggest that it is possible to succeed with optimal statin doses in the great majority of coronary patients. The CANTOS study documented for the first time that specific anti-inflammatory treatment of post-infarction patients with high sensitive CRP ≥ 2 mg/l reduces the incidence of cardiovascular events (16). Our study's finding that 46 % of patients with unfavourable low-density lipoprotein cholesterol control had CRP ≥ 2 mg/l was therefore important. Since statins also reduce CRP, this highlights the need to optimise statin treatment before we consider introducing new and often more expensive drugs.

Almost half the NOR-COR patients had poor control of their blood pressure (17). Combination treatments with several classes of antihypertensives are more effective and have fewer side effects than high dosages of single drugs (4). Patients with poor blood pressure control were taking an average of 1.9 blood pressure drugs at the time of their discharge from hospital, while the proportion who took beta blockers or angiotensin inhibitors was significantly lower at the time of the follow-up. Diabetes, increasing age and body mass

index were factors associated with poorly controlled blood pressure, while low socioeconomic status, mental stress and self-reported adherence had no impact.

Information transfer and follow-up plans

Clear treatment programmes and follow-up plans at the time of discharge after a coronary event are strongly recommended (4). We have reviewed a random sample (n = 200) of discharge summaries and information handouts given to our NOR-COR patients and their general practitioners on discharge from hospital after the index event. In line with European findings, we established that these documents provided little information about risk factors, treatment targets and follow-up (5). The patient's smoking status was described in approximately half of the cases, whereas less than one third of the smokers had received specific advice and/or plans for smoking cessation. Information and plans for lifestyle change, and treatment targets for low-density lipoprotein cholesterol, were provided in less than a quarter of cases. A little more than half the sample received a recommendation or referral to a cardiac rehabilitation programme, or was recommended a follow-up appointment with their general practitioner. Specific information about check-up times and the nature of the general practitioner's follow-up was even rarer.

There is a clear need for more detailed information about treatment recommendations and follow-up initiatives than what is current practice. This is particularly important because European studies have shown that doctors in the primary health service have insufficient knowledge of secondary preventive treatment targets (18). In a Norwegian study, patients who had received percutaneous coronary intervention treatment called for more patient information, specific follow-up appointments with general practitioners, access to cardiac rehabilitation programmes and coherent follow-up plans across treatment levels (19).

The general practitioners' challenges and needs

We conducted a series of semi-qualitative explorative in-depth interviews to facilitate a SWOT analysis (Strengths, Weaknesses, Opportunities and Threats) of the general practitioners' challenges and needs. Eight GP surgeries (n = 35 general practitioners, 1–7 doctors in each group) in the counties of Buskerud and Vestfold discussed each of the topics at staff meetings held in April 2016, in the presence of an interviewer and a minute secretary. The general practitioners had no prior knowledge of the findings from the NOR-COR project when they gave their answers.

As shown in Table 3, the participants request more information from the hospital concerning expected follow-up practices, individualised treatment targets and algorithms for medication escalation regimes. Many want closer cooperation and more guidance from the hospital wards, including

opportunities for courses/placements. They also want cardiac rehabilitation programmes to become compulsory and would like to see that follow-up appointments with the primary health service are arranged before patients are discharged from hospital. It is interesting to note that there is a reasonably good match between the needs reported by the general practitioners and the barriers identified by the NOR-COR project when surveying patients and their hospital records.

Table 3

Strengths, weaknesses, opportunities and threats in relation to improving secondary preventive treatment and follow-up initiatives as reported by eight GP surgeries in the counties of Buskerud and Vestfold (n = 35 doctors). The Roman numerals in brackets indicate the number of surgeries that made this particular point.

	Strengths	Weaknesses
Internal	Knowledge of patients and their case histories over time (VIII)	Insufficient knowledge about guidelines (VI)
	Regular consultations to allow adjustment and evaluation of treatment initiatives (V)	Too many guidelines (VI)
	Background knowledge about what lifestyle changes and initiatives are within reach of the individual (IV)	Inadequate strategies for treatment and medication escalation, especially for statins (III)
	Accessibility (III)	Challenging to achieve treatment targets (III)
	Time to explain (II)	Insufficient knowledge to be able to deal with side effects (II)
	The patients trust them (II)	The patients want to talk about other things (II)
	Opportunities	Threats

	Strengths	Weaknesses
External	More specific information from hospitals at the time of discharge (individualised treatment targets, algorithms for medication escalation regimes and other expected follow-up initiatives) (VIII)	It is difficult to get in touch with patients who have no interest in follow-ups. No system for catching them (V)
	Closer cooperation with specialists/hospitals through telephone advice or meetings (IV)	Patients may lack the required motivation to change their lifestyle (V)
	Courses and training, including placements on hospital wards (IV)	Not enough time to provide sufficient information and support in relation to lifestyle changes (II)
	Arrange the first appointment with the general practitioner before discharge from hospital (III)	Insufficient trust and authority (II)
	Participation in cardiac rehabilitation programmes must be made 'compulsory' (III)	

How to improve secondary prevention

Despite considerable scientific documentation and a large number of guidelines (4), our success rate for secondary prevention in clinical practice is too low (6). This weakens the prognosis of individual patients and has major health economic and social consequences. Changing lifestyle habits and behaviours is a challenge (4). However, it is possible to improve the risk profile of many coronary patients by introducing some relatively simple measures. Medicinal treatments of blood pressure and low-density lipoprotein cholesterol can be optimised, nicotine replacement treatment can be prescribed more frequently, patients can be systematically referred to cardiac rehabilitation programmes and hospitals can issue more detailed and specific information to patients and general practitioners. National data are now required; we need more research into the content and quality of the secondary prevention work that is carried out *after* discharge from hospital, so that we can provide cost effective treatment and follow-up for a large and growing group of patients.

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