Challenges in coronary heart disease prevention – experiences from a long-term follow-up study in Norway

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Abstract

Objective: To determine longitudinal changes in lifestyle behaviour and lipid management in a chronic coronary heart disease (CHD) population.

Design: A multi-centre cohort study consecutively included 1127 patients at baseline in 2014-15 on average 16 months after a CHD event. Data were collected from hospital records, a questionnaire and clinical examination. 707 of 1021 eligible patients participated in a questionnaire-based follow-up in 2019. Data were analysed with univariate statistics.

Results: After a mean follow-up of 4.7 years (SD 0.4) from baseline, the percentage of current smokers (15% vs. 16%), obesity (23% vs. 25%) and clinically significant symptoms of anxiety (21% vs. 17%) and depression (13% vs. 14%) remained unchanged, whereas the proportion

with low physical activity increased from 53% to 58% (p<0.001). The proportions with reduced physical activity level were similar in patients over and under 70 years of age. Most patients were still taking statins (94% vs. 92%) and more patients used high-intensity statin (49% vs. 54%, p<0.001) and ezetimibe (5% vs. 15%, p<0.001) at follow-up. 73% reported ≥1 primary-care consultation(s) for CHD during the last year while 27% reported no such follow-up. There were more smokers among participants not attending primary-care consultations compared to those attending (19% vs. 14%, p=0.026). No differences were found for other risk factors.

Conclusions: We found persistent suboptimal risk factor control in coronary outpatients during long-term follow-up. Closer follow-up and intensified risk management including lifestyle and psychological health are needed to improved secondary prevention and outcome of CHD.

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Coronary heart disease, lifestyle, secondary prevention, risk factors, psychosocial factors, long-term follow-up

Introduction

Patients with established coronary heart disease (CHD) are at high long-term risk of recurrent cardiovascular (CV) events.[1] Healthy lifestyle changes and optimal medical treatment of CV risk factors are important to reduce this risk.[2, 3] Data from clinical practice have revealed suboptimal risk factor control in a majority of chronic CHD patients.[4, 5] Furthermore, a significant proportion of these patients have co-existing psychological distress such as

symptoms of anxiety and depression that is also associated with subsequent CV events.[6] Most previous studies have a cross-sectional design with assessment of CV risk factors and psychosocial factors at one measurement point only.[4,5] Thus, there are limited knowlegde about longitundial changes of these factors over time in individual patients. A small French study with six years follow-up of 62 patients with previous myocardial infarction (MI) reported decreasing adherence to optimal medical treatment and recommended lifestyle over time, with marginally better results among participants in cardiac rehabilitation (CR).[7]

Participation in multi-component CR programs has favourable effects on long-term CV mortality, also in the era of modern treatment of CHD.[8] Most CR programs, however, last only up to 6 months following a CVD event.[9] The general practitioners (GPs) are the main actors to initiate, coordinate and provide long-term secondary preventive management in chronic CHD outpatients,[2] of which the frequency and quality remains unknown. Insights into the subsequent primary care follow-up of CHD patients may be important to improve clinical outcomes by developing more effective primary care interventions.

This study aimed to determine longitudinal changes in lifestyle behaviour and the use of lipid lowering drugs at the individual level in chronic CHD outpatients from routine clinical practice from 2014-15 to 2019. We also aimed to describe changes in symptoms of anxiety and depression as well as the frequency and content of primary care consultations for CHD and the association with risk factor control.

Materials and methods

Design and study population

This is a longitudinal follow-up of the NORwegian CORonary (NOR-COR) prevention study, described in detail elsewhere.[10] The study flow chart and reasons for exclusions are shown in *Figure 1*. In brief, 1127 patients (Drammen hospital; n=585, Hospital of Vestfold; n=542)

aged 18-80 (median age 64.8 years, interquartile range 57.6-70.3) were consecutively included at baseline in 2014-15 on average 16 months (range two to 36) after a CHD event. All participants answered a comprehensive questionnaire and underwent a clinical examination with blood sample collections. Patients included at baseline were invited to a questionnaire-based follow-up in 2019.

The two participating hospitals, have a catchment area of 380,000 inhabitants corresponding to 7.4% of the Norwegian population. The catchment area has a representative blend of city and rural districts and reflects Norwegian education, economy, age distribution, morbidity, and mortality.[11] Eighteen percent of the patients from Drammen and 75% of the patients from Vestfold had attended the hospital-based CR programs two to eight months following the index event.[12]

Ethics, consent and permission

The NOR-COR studies were approved by the Regional Committee for Medical and Health Research Ethics in the South East Region of Norway (REK Sør-Øst) 12. February 2014 (2013/1885) and 9. October 2018 (2018/2007). All patients signed a written informed consent prior to study participation.

Study assessments

Data on age, sex, the coronary index event and treatment, participation in CR and somatic comorbidity including heart failure, atrial fibrillation, stroke/transitory ischemic attacks (TIA), peripheral artery disease, chronic kidney disease and recurrent CV event (defined as CV death or readmission for MI, new revascularization procedure, heart failure or stroke/TIA) were registered from hospital medical records. Comorbidity was also summarized into the Charlson comorbidity index. [13]

Marital status, lifestyle behaviour (i.e. smoking status, physical activity, weight and height), lipid lowering therapy, psychosocial factors and the number of follow-up consultations for CHD in general practice the last 12 months were collected from self-report questionnaires at both baseline and follow-up. Information about the content and satisfaction with follow-up care in general practice were collected from the questionnaire at follow-up.

Lifestyle factors, lipid lowering therapy and psychosocial factors[10]

- *Smoking:* Smoking status (never, former, current) and motivation for smoking cessation (0 [not motivated] to 10 [very motivated] Likert scale) were reported at both baseline and follow-up. Readiness for smoking cessation,[14] nicotine dependency assessed by Fagerstrøms test [15] (low; 0-3, moderate; 4-6, high; 7-10), and the use of smoking cessation aids (i.e. bupropion, varenicline or e-cigarette) were collected at follow-up.
- *Overweight and obesity:* Body weight (nearest 0.5 kg) and height (nearest 0.5 cm) were obtained from the self-report questionnaire at baseline and follow-up. Overweight was defined as body mass index (BMI) ≥25 kg/m^2 and obesity as BMI ≥30kg/m^2. At baseline, weight and height were also measured as a part of the clinical examination and mean BMI was 0.93 kg/m^2 (SD 1.6) higher when measured compared to self-reported.
- *Physical activity:* Physical activity (PA) was assessed by a validated questionnaire form HUNT1[16] which assesses frequency (never, <once/week, once/week, two to three times/week and almost every day), intensity (light, medium and vigorous), and duration (<15minutes (min), 15-29 min, 30-60 min and >60 min) at baseline and follow-up. PA was categorized as adequate activity (PA ≥ moderate intensity of ≥30 min ≥ two to three times/week), low PA (PA ≥once/ week and < moderate intensity of ≥30 min ≥ two to three times/week) and inactive (PA <once/week). Changes in PA level between baseline and follow-up were defined either as increased PA (from inactive to low PA or adequate PA, and from low PA to adequate PA) or decreased PA (from adequate PA to low PA or inactive,

and from low PA to inactive). The definition of adequate and low PA was based on the European guidelines from 2012[17] which was prevailing at the time of baseline inclusion. To be able to compare data between baseline and follow-up, the same PA questionnaire was completed at follow-up.

- *Anxiety and depressive symptoms:* Symptoms of anxiety and depression were assessed by the Hospital Anxiety and Depression Scale (HADS) (0-14 points) at baseline and follow-up. A level of ≥eight on the Anxiety or Depression sub-scale was defined as significant symptoms. Absolute changes in symptoms and the proportion with HADS-anxiety ≥eight and/ or HADS-depression ≥eight were calculated.
- *Lipid lowering treatment:* Data on statin treatment, statin adherence and ezetimibe were obtained at baseline and follow-up. High-intensity statin therapy was defined i) ≥40 mg atorvastatin/day or ii) ≥ 20 mg rosuvastatin/day. Low statin adherence was defined by taking ≤six/seven days in the last week.

Statistical analyses

Statistical analyses have been performed using SPSS version 25. The descriptive measurements are presented as frequencies and percentages for proportions, and as mean with standard deviation (SD) or interquartile range for continuous variables. Differences between groups were tested by χ^2 tests, independent and paired *t*-tests. We have few (range 0-10%) missing data for the individual variables as shown in *Supplementary file 1*. Stata version 15 have been used to calculate 95% confidence interval for the different proportions which are listed in *Supplementary file 2*.

Results

The participation rate at follow-up was 69% (707 out of 1021 eligible patients). Median age at follow-up was 69.8 (interquartile range 63.2-74.8) years. Differences in patient characteristics

between participants and non-participants (n = 312) at follow-up are shown in *Table 1*. The latter group had lower education, more unfavourable risk factor profile and more recurrent cardiovascular events between baseline and follow-up. No differences in symptoms of anxiety or depression were found. The time elapsed between the index coronary event and baseline ranged two to 36 (mean 16) months. Current smoking, obesity and statin non-adherence were more prevalent among study participants included >16 months after the index event, whereas the participation rate in CR was higher, compared to those ≤16 months after the index event (*Supplementary file 3*).

The distribution of lifestyle factors, lipid treatment and psychological factors at baseline and follow-up are presented in *Figure 2*. The percentage of current smokers remained unchanged. Twenty-two percent of current smokers (n=103) at baseline had quit smoking at follow-up, whereas eight percent of the former smokers (n=404) at baseline had relapsed. Among current smokers at follow-up, 42% reported moderate or high nicotine dependency while 53% had tried nicotine replacement therapy, bupropion, varenicline or e-cigarettes the past year. Persistent smokers at both baseline and follow-up (n=78) reported an average motivation for smoking cessation of 4.8 (0-10 Likert scale) at follow-up compared to 8.6 at baseline ($p<0.001$), and the majority (79%) were in the precontemplation stage (not thinking about or being unsure about smoking cessation). Thirty-five percent of persistent smokers and nine percent of the quitters lived with a smoking partner ($p=0.016$).

The proportion with low or no physical activity was significantly higher at follow-up compared to baseline (*Figure 2)*. Twenty-five percent of those with low or no physical activity had increased their activity level from baseline to follow-up, whereas 24% had reduced their activity level. These results were consistent for participants both over and under 70 years of age and there were no significant differences in mean Charlson comorbidity index score between patients who decreased PA level compared to those with increased PA level.

We found no significant changes in the proportion with overweight or obesity, but 14% had ≥ten percent change (either reduction or increase) in BMI. The proportions with HADS Anxiety or Depression score ≥eight were also similar at baseline and follow-up. Fourteen percent had significant depressive symptoms at both occasions (persistent symptoms) or only at follow-up (increasing symptoms), while seven percent had such symptoms only at baseline (declining symptoms). In all, 16% had significant symptoms of anxiety at both occasions (persistent symptoms) or just at follow-up (increasing symptoms), whereas nine percent had only such symptoms at baseline (declining symptoms).

The percentage using statin therapy was similar, but significantly more participants used high-intensity statin therapy and ezetimibe at follow-up compared to baseline (*Figure 2)*. The number of participants reporting reduced (≤six/seven days) statin adherence remained unchanged. More patients used high intensity statin treatment at follow up among those with a recurrent CV event than those without, while there were no differences in smoking, obesity or low physical activity.

Symptoms of anxiety were more prevalent among women than men both at baseline (32% vs. 18%, $p<0.001$) and follow-up (28% vs 13%, $p<0.001$), while there were no significant gender differences in depressive symptoms. Women had more frequently low PA (62% vs. 51%, $p=0.019$) and LDL-C ≥1.8 mmol/l (65% vs. 55%. $p=0.032$) than men at baseline, while no other significant gender differences were observed in the risk factors at either baseline or follow-up.

Seventy-three percent of the participants at follow-up reported they had attended at least one consultation for CHD in primary care the past 12 months whereas 27% reported no follow-up consultations. At follow-up, there were more current smokers (19% vs. 14%, $p=0.026$), fewer females (21% vs 12%, $p=0.005$) and fewer patients with anxiety (19% vs. 12%, $p=0.050$) among participants who did not attend compared to those who attended a primary care consultation. No differences in the other risk factors or patient characteristics were found at

baseline or follow-up. In all, 84% of the participants who had attended a CHD consultation the past 12 months prior to the follow-up were satisfied with the preventive care provided, whereas 16% were not satisfied. Blood pressure and cholesterol were frequently reported measured, while two out of five current smokers had not discussed smoking with their GP and half the obese patients had not discussed weight reduction *(Figure 3)*. Participants who had discussed PA with their GP had more often an adequate PA level than those who had not (47% vs 37%, p=0.011). Mental health issues were more frequently discussed in patients with significant levels of anxiety and depression at follow-up than in those without (32% vs. 13%, p<0.001), even so, the majority with such symptoms had not discussed this with their GP.

Discussion

This longitudinal study of chronic CHD outpatients revealed that the proportions with current smoking, obesity and symptoms of anxiety and depression remained unchanged from 2014-15 to 2019, while more patients had an insufficient level of physical activity. The use of statins remained high with significantly more patients taking high-intensity statins and ezetimibe. A quarter of the patients had not attended any preventive consultations for their CHD in primary care the past 12 months, while 73% had attended at least one such consultation. There were more current smokers among patients who did not attend a preventive follow-up consultation, while no differences in the other risk factors were found. Most patients had had their blood pressure and cholesterol measured, whereas lifestyle and psychological factors were less frequently addressed.

The response rate at follow-up was 69% among baseline participants who still fulfilled the entry criteria. In comparison, the EuroAspire V study conducted in the same patient group had a participation rate of 56%.[4] Declining participation rates in epidemiological studies have been observed over the last decades.[18, 19] Several reasons for declining participation rates have

been suggested, including the patients` motivation and perceived relevance of the study as well as patients being tired of responding to repeated heath surveys.[18] In line with others we find that non-response is associated with lower education and poorer lifestyle at baseline. In addition, the non-responders at follow-up had more frequently recurrent cardiovascular events between baseline and follow-up, which may indicate poorer risk factor control and more comorbidity in this group.

Smoking is a major risk factor to target in order to prevent recurrent cardiovascular events in CHD patients.[20] Previous studies have shown that less than half of coronary patients manage to quit after a coronary event,[4] and about one third remained smoke-free over ten years.[21] We found that the proportion of current smokers remained unchanged and that more patients actually relapsed smoking than those who quitted, from baseline to the follow-up. Smoking was more common among those who did not respond to the follow-up invitation (30%), still the 16% current smoking rate at follow-up is higher than the national average of nine percent daily smokers in Norway.[22] The motivation for smoking cessation also dropped significantly during the five years follow-up period, and 80% of the current smokers at follow-up did not even consider to quit. In contrast, only 25% of the current smokers in the EuroApire III study did not consider to quit average 15 months after a coronary event.[14] It has previously been shown that patients who quit immediately after a CHD event have a higher chance of long-term successful quitting.[23] It is therefore not unexpected, but still concerning, that the motivation for cessation is declining with increasing time after the coronary index event. High nicotine dependency is an important reason for unsuccessful smoking cessation,[20] but more than half of the current smokers in our study had low nicotine dependency, so this do not explain the whole picture. Two thirds of the current smokers had discussed smoking with their GP, and half had tried some pharmacological smoking cessation aid the last year. A recent report from the US found that 40% of current smokers were not advised to quite by health care professionals in

the past year and two thirds of current smokers had not tried any smoking cessation aids.[24] Previous studies have also found that health personals attention to smoking have been lower than to many other risk factors.[25, 26] Our findings emphasize the need for increased and persistent focus on smoking in CHD patients including the prescription of pharmacological cessation aids.

The positive effects of PA on secondary prevention of CHD are well documented.[2, 3, 27] Several studies have shown that persistent high activity or increased activity level after a coronary event are associated with lower mortality compared to those who were persistently inactive.[3, 27] It is therefore concerning that the proportion with low PA increased from baseline to follow-up. The PA level declined gradually after 70 years of age in a Norwegian population-based study,[28] whereas we found no difference in the proportions that decrease or increased the PA level between those over and under 70 years of age at the time of follow-up. Whether this observation is partly explained by the properties of the questionnaire to capture minor changes in PA level in this cohort of elderly CHD patients, remains unknown. On the other hand, a Norwegian survey found that people at age 65-75 years spent more time on physical activity than those in age groups between 25-64 years.[29] We found no significant differences in somatic comorbidity between participants who decreased versus increased their activity level in our study. Patient with adequate PA level had more often discussed PA with their GP in the previous year compared to those who with low PA, and advice from GPs is previously shown to promote PA in CHD patients.[2, 30]

We found no significant changes in the proportion of patients with obesity between the baseline and the follow-up, but 15% of the patients had a significant increase or decrease in BMI of more than ten percent. Large fluctuations in body weight is previously shown to be more important for clinical outcomes than BMI per se.[31] Regular measurements of BMI to identify these

patients with significant changes in diets or occult comorbid somatic disease should probably be the main focus at follow-up consultations.

The proportion with clinically significant symptoms of anxiety and depression remained unchanged from baseline to follow-up. Several studies have assessed depressive symptoms after a CHD event, but mainly during the baseline year and with conflicting results. Some have found a tendency of persistent depressive symptoms [32, 33], while others have found that most patients experience improvement in symptoms.[34] A German study with six years follow-up found that a quarter of the patients had persistent or increasing depressive symptoms.[35] In line with this, 15% of our patients had either significant symptoms of depression at both timepoints or increasing symptoms from baseline to follow-up. Depressive symptoms are associated with unhealthy lifestyle and poor treatment adherence.[2] Only one third of those with significant symptoms of anxiety and/or depression had discussed this with their GP in the past year, even though regular assessment of psychological factors is recommended in CHD patients.[2]

Fifty-seven percent did not reach the previous treatment target for LDL-C <1.8 mmol/L at baseline, which is somewhat better than reported in the large EuroAspire V survey (32%).[4] Contrary to previous studies, [7, 36] most patients reported to use a statin at long-term follow-up with high rates of reported adherence, and the proportion using recommended [2] high intensity statin therapy and ezetimibe increased significantly. Medication for chronic diseases, such as statins, are subsidized in Norway, practically eliminating costs as a reason for discontinuation. Moreover, four out of five patients reported to have measured their cholesterol level the past year. These findings together with the high focus on lipid-lowering treatment the past years may have contributed to the positive trend observed.

To our knowledge this is one of the first studies assessing the frequency and content of primary care consultations in a CHD population. Most patients reported at least one consultation with their GP in the past year, and 84% of those who attended were satisfied with the provided care. While most patients had their blood pressure and cholesterol measured, fewer had discussed lifestyle and mental health issues. In the INTERHEART study[37] more than 90% of the risk of MI could be attributed to modifiable risk factors including hyperlipidaemia (population attributable risk (PAR) up to 49%) hypertension (PAR 18%), unfavourable lifestyle (PAR from 12% (PA) to 36% (smoking)) and psychosocial factor (PAR 33%). Altogether, the risk that could be attributed to psychosocial and lifestyle factors was in line with that of the biological risk factors.[37] It is therefore worrying that 40% of current smokers, 68% of patients with significant symptoms of anxiety and/or depression and 51% of obese patients have not discussed these issues with their GP the last year prior to study participation.

In a previous study we have shown that insufficient knowledge of guidelines, lack of strategies to reach the treatment targets, strategies to handle drug related side-effects, and lack of time to provide information and support for lifestyle changes, were the main barriers for secondary prevention among GPs in the catchment area of Drammen and Vestfold.[38] In line with this, several surveys have revealed that GPs do not use the preventive guidelines in their daily practice.[2] Furthermore, many GPs are uncertain of their skills in behavioral counselling, and therefore reluctant to address lifestyle issues with their patients.[26] The GPs in our area requested closer cooperation with the specialist health care,[38] which may contribute to improved long-term secondary prevention. As recommended,[4] increased access to high-quality local maintenance programs in the communities may also contribute to improved long-term secondary prevention among CHD patients.[2]

There are limitations to the study. The coronary risk factors and study factors were measured at one point in time at baseline and follow-up, and are thus prone to measurement and recall

bias. Information about important risk factors such as cholesterol, blood pressure and blood glucose as well as anticoagulants and anti-hypertensive drugs were not available at follow-up. The questionnaire used to assess PA level have been validated in healthy men, but not in women or CHD patients which is a potential source to bias. As there are relative few patients with changes in lifestyle and in significant symptoms of anxiety and depression between baseline and follow-up, our sample size is too small to perform multivariate regression analyses and explore predictors for changes in risk factors. There were more patients with unfavourable lifestyle at baseline among those who did not participate at follow-up. Potentially, larger changes (both favourable and unfavourable) in risk factor control over time may have been observed, if these patients had attended the follow-up.

High participation rates at both baseline (83%) and follow-up (69%), the routine clinical setting, and few missing data are important strengths of the study. In addition, a reproducibility study of the questionnaire used in the baseline and partly in the follow-up study, demonstrated highly acceptable test-retest values for all key items and instruments.[39]

Conclusions

The present study among coronary outpatients from routine clinical practice has demonstrated persistent suboptimal control of lifestyle factors and high levels of anxiety and depressive symptoms during 4.7 years follow up, whereas a favorable trend in lipid management was observed. One out of four had not attended a preventive CHD consultation in primary care the past year, and these patients were more frequently smoking. Closer follow-up care and intensified risk-management of lifestyle factors and psychological health may improve secondary prevention.

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Disclosure statement.

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Data availability statement

According to Norwegian legislation, the Norwegian Data Protection Authority and the Committee of Ethics, we are not allowed to share original study data publicly. However, except for anthropometric data, the other essential data by which the conclusions in the article are based will be provided upon reasonable request to the corresponding author.

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Table 1. Baseline characteristics and differences between those who participated and not at follow-up. (Data are presented as n (%) or median (interquartile range))

	Participants (n=707)	Non-participants (n=359)	p-value
From the index coronary event			
Age years, median (interquartile range)	62.8 (53.4-69.9)	63.7 (56.9-68.7)	0.171
Females, n (%)	137 (19.4)	100 (23.8)	0.078
Low education[a], n (%)	467 (66.5)	264 (75.9)	0.002
Living alone, n (%)	118 (17.8)	66 (20.6)	0.253
≥ 1 coronary event prior to index event, n (%)	208 (29.4)	99 (27.6)	0.530
Myocardial infarction as index event, n (%)	548 (77.5)	299 (83.3)	0.027
Stable or unstable angina as index event, n (%)	159 (22.5)	60 (16.7)	
Heart failure, n (%)	88 (12.4)	42 (11.7)	0.724
Atrial fibrillation, n (%)	63 (8.9)	30 (8.4)	0.777
Peripheral artery disease, n (%)	49 (6.9)	31 (8.6)	0.318
Stroke or transient ischemic attack, n (%)	37 (5.2)	31 (8.6)	0.032
Chronic kidney failure (eGFR<60 mL/min/1.73m^2), n (%)	69 (10.7)	43 (12.8)	0.330
Participation in cardiac rehabilitation, n (%)	352 (49.8)	147 (43.7)	0.061
From baseline			
Current smoking, n (%)	103 (15.2)	111 (32.2)	<0.001
Low density lipoprotein cholesterol ≥1.8 mmol/L, n (%)	393 (56.5)	204 (59.6)	0.342
Low physical activity[b], n (%)	277 (39.8)	144 (42.4)	<0.001
Physical inactivity[c] n (%)	90 (12.9)	88 (25.9)	<0.001
Diabetes mellitus, n (%)	104 (14.7)	66 (18.4)	0.121
Blood pressure ≥ 140/90 (80) mmHg, n (%)	246 (44.5)	134 (46.2)	0.629
Body mass index ≥30 kg/m2, n (%)	155 (22.8)	88 (25.9)	0.275
At least 1 antiplatelet agent, n (%)	696 (98.4)	342 (95.3)	0.002
Statin treatment, n (%)	661 (93.5)	323 (90.0)	0.041
Taking statins <7/7 day a week, n (%)	49 (7.1)	37 (10.6)	0.223
HADS[d], Anxiety sub-score ≥8, n (%)	142 (20.5)	75 (22.9)	0.399
HADS[d], Depression sub-score ≥8, n (%)	91 (13.0)	55 (16.6)	0.129
Recurrent cardiovascular event between baseline and follow-up, n (%)[e]	125 (17.6)	115 (27.4)	<0.001

[a] Low education was defined by completion of primary- and secondary school only

[b] Low physical activity defined as ≥1 per week and < moderate intensity of minimum 30 min ≥ 2-3 per week

[c] Physical inactive defined as physical activity <1 per week.

[d]Hospital anxiety and depression scale

[e]Recurrent cardiovascular events was defined as cardiovascular death or readmission for myocardial infarction, new revascularization procedure, heart failure or stroke/transitory ischemic attack.

Figure 1: Study flow chart.

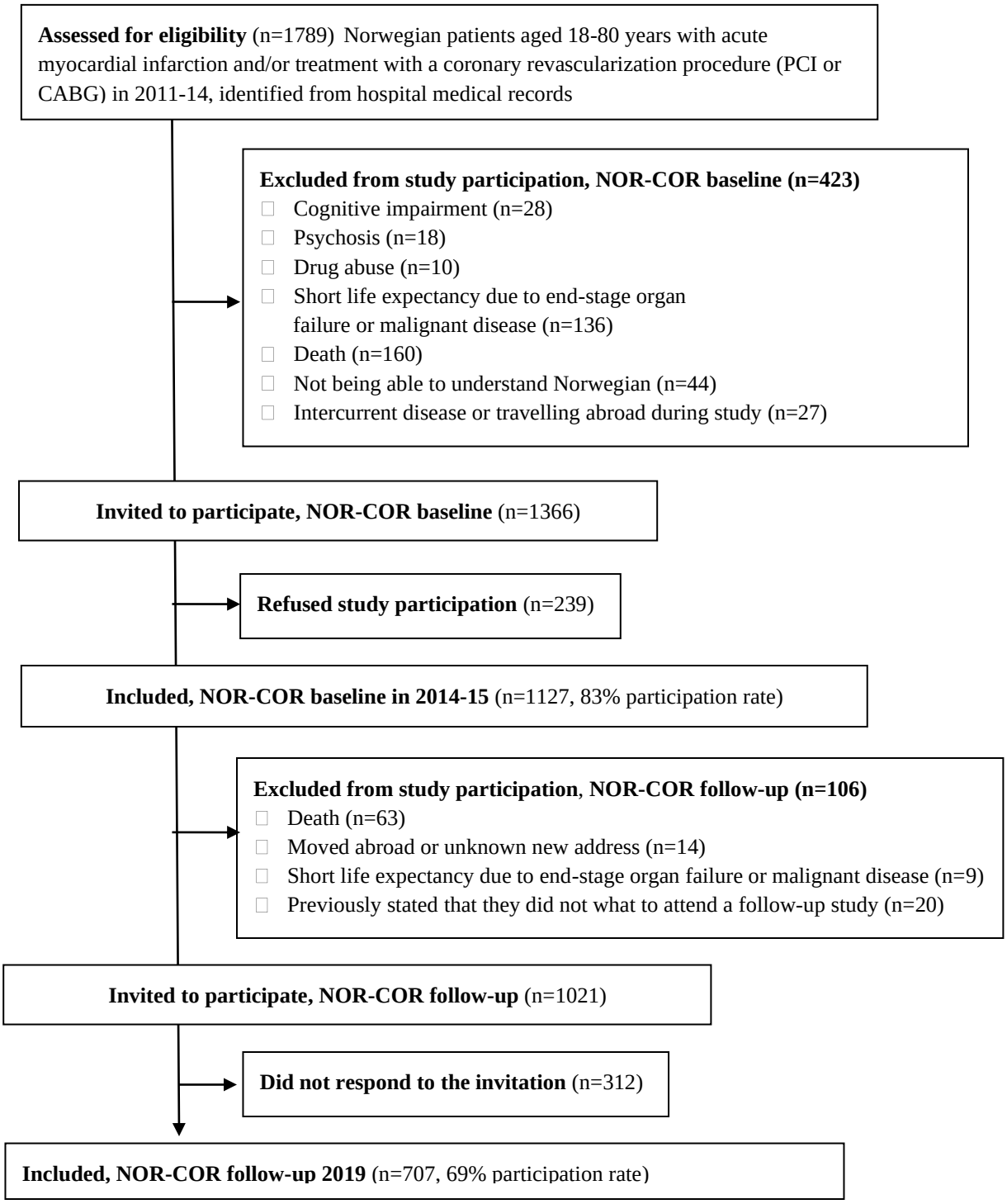
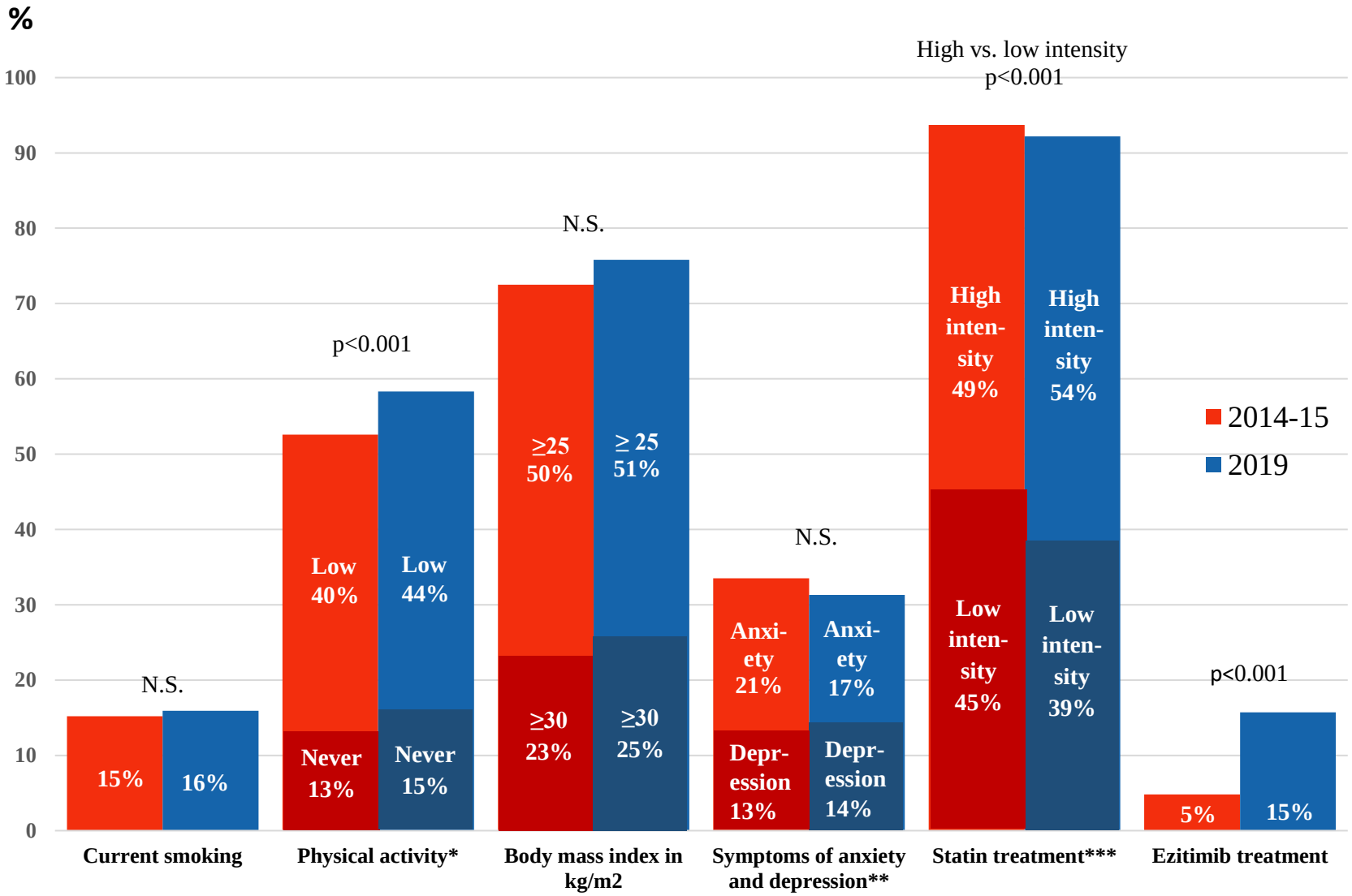


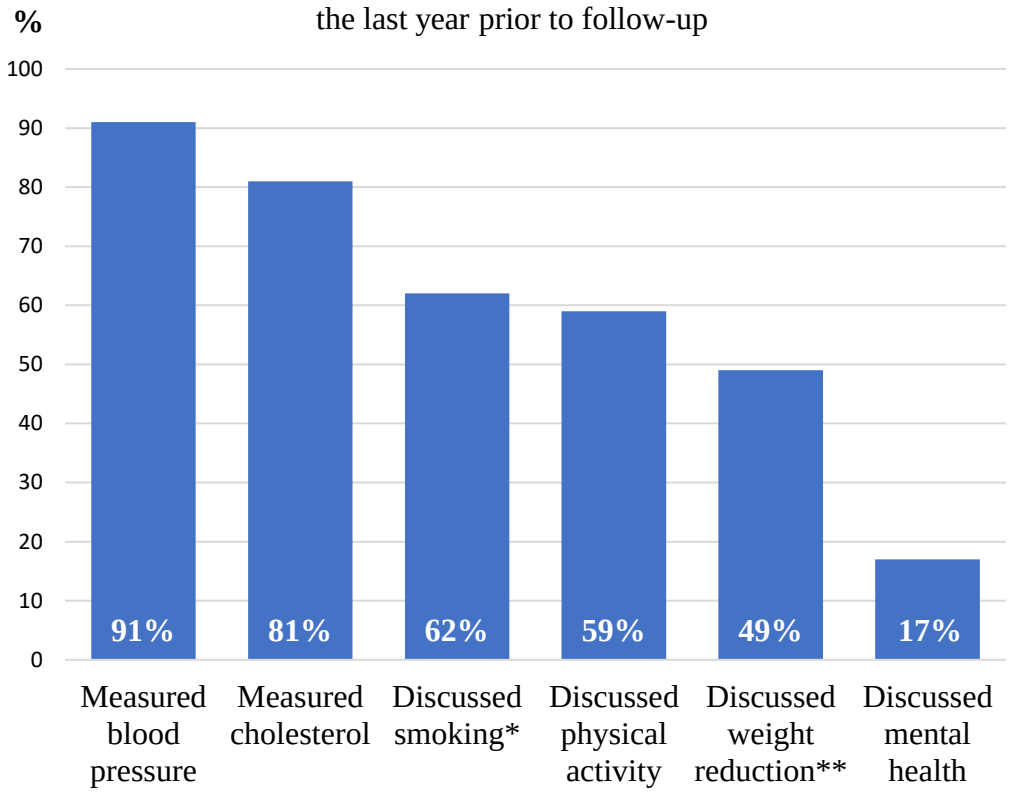
Figure 2. Longitudinal changes in lifestyle habits, psychological factors and lipid lowering treatments over 4.7 years in patients with chronic coronary artery disease



The results in this figure are based on data from the 707 who participated both at baseline (red bars) and at follow-up (blue bars).

*Low physical activity (PA) was defined as PA ≥1 per week and < moderate intensity of minimum 30 min ≥ 2-3 per week and never as PA <1 per week
**Assessed by Hospital Anxiety and Depression Scale (HADS), anxiety defined as HADS Anxiety sub-score ≥8 and depression as HADS Depression sub-score ≥8
*** High intensity statin was defined ≥40 mg atorvastatin/day or ≥ 20 mg rosuvastatin/day

Figure 3. Process of care at consultations in general practice the last year prior to follow-up



*Among persistent smokers

**Among patients with Body Mass Index ≥30 kg/m^2

Supplementary file 1. Missing data for main variables at baseline and at follow-up in n (%)

Variables	Baseline, n (%)	Follow-up, n (%)
Education	21 (1.9)	*
Living alone	90 (8.0)	*
Charlson comorbidity index	109 (9.6)	*
Heart failure	4 (0.4)	*
Atrial fibrillation	7 (0.6)	*
Chronic kidney failure (eGFR<60 mL/min/1.73m^2)	96 (8.1)	*
Peripheral artery disease	4 (0.4)	*
Stroke or transient ischemic attack	4 (0.4)	*
Participation in hospital based cardiac rehabilitation	6 (0.5)	*
Smoking status	48 (4.2)	4 (0.6)
Motivation for smoking cessation – current smokers	3 (2.9)	5 (6.8)
Fagerstrøms test – current smokers	*	5 (6.8)
Stages of change – current smokers	*	8 (7.1)
Living with a smoking partner	*	7 (1.0)
Physical activity	21 (2.1)	9 (1.3)
Blood pressure in mmHg	119 (10.5)	*
Diabetes	4 (0.4)	*
Body Mass Index	51 (4.5)	16 (2.3)
Low Density Lipoprotein Cholesterol	36 (3.2)	*
Hospital Anxiety and Depression Scale	66 (5.8)	37 (5.2)
Statin therapy	4 (0.4)	15 (2.1)
Statin adherence the last week	21 (1.9)	25 (3.5)
Follow-up by their GP[a] the last year	*	10 (1.4)
Satisfied with the follow-up at the GP[a]	*	35 (4.9)
Measured blood pressure at the GP[a] last year	*	4 (0.6)
Measured cholesterol at the GP[a] last year	*	13 (1.8)
Discussed smoking with GP[a] last year, current smokers	*	4 (3.6)
Discussed physical activity with GP[a] last year	*	29 (4.1)
Discussed weight with GP[a] last year	*	66 (9.3)
Discussed mental health issues with GP[a] last year	*	52 (7.3)
Recurrent cardiovascular event between baseline and follow-up	14 (1.2)	

Baseline values are listed for all 1127 participants at baseline, and at follow-up for the 707 participants at both timepoint

*Variable not measured at the given timepoint

For the variable age, sex, diagnosis at index coronary event, and >1previous coronary events we have no missing values.

[a] General practitioner

Supplementary file 2. 95% Confidence interval for reported variables

Variables	Baseline, % (95%CI[a])	Follow-up, % (95%CI[a])
Current smokers	15 (12, 17)	16 (13, 18)
Quitters from baseline to follow-up		22 (15, 32)
Relapsers from baseline to follow-up		8 (6, 12)
Current smokers with moderate/high nicotine dependency		43 (33, 52)
Use of pharmacological smoking cessation aids, past year, current smokers		53 (43, 62)
Persistent smoker in precontemplation stage		79 (67, 87)
Living with smoking partner in persistent smokers		35 (24, 45)
Living with smoking partner in quitters		9 (3, 20)
Low physical activity	53 (49, 56)	58 (54, 61)
Increased physical activity level, from baseline to follow-up		25 (21, 30)
Decreased physical activity level, from baseline to follow-up		24 (20, 27)
Body Mass Index ≥30 kg/m2	22 (19, 25)	25 (22, 28)
>10% change in Body Mass Index, from baseline to follow-up		14 (12, 17)
HADS[b] Anxiety sub-score >8	20 (17, 23)	17 (14, 19)
HADS[b] Depression sub-score >8	13 (10, 15)	14 (11, 16)
HADS[b] Anxiety sub-score >8 baseline and/or follow-up		16 (14, 19)
HADS[b] Anxiety sub-score >8, only baseline	9 (7, 12)	
HADS[b] Depression sub-score >8 baseline and/or follow-up		14 (11, 17)
HADS[b] Depression sub-score >8, only baseline	7 (5, 9)	
Statin therapy	94 (92, 96)	92 (90, 94)
High intensity statin therapy	52 (49, 56)	61 (57, 65)
Ezetimib	5 (3, 6)	15 (13, 18)
Statin adherence ≤6 of 7 days last week	7 (5, 9)	7 (5, 9)
Follow-up ≥1 by their GP[c] the last year		73 (69, 76)
No follow-up by their GP[c] the last year		26 (23, 30)
Satisfied with the follow-up by the GP[c,] in those attending ≥1 consultation		84 (80, 87)
Not satisfied with the follow-up by the GP[c] in those attending ≥1 consultation		16 (13, 19)
Discussed smoking with GP[c] last year, % current smokers		59 (50, 69)
Discussed physical activity with GP[c] last year		55 (50, 60)
Discussed weight with GP[c] last year, % patients with obesity		59 (55, 63)
Discussed psychosocial factors with GP[c] last year		17 (15, 20)
Discussed physical activity with the GP[c] and adequate physical activity level		47 (42, 52)
Not discussed physical activity with the GP[c] and adequate physical activity level		37 (32, 43)
Discussed mental health issues with GP[c] and HADS[b] Anxiety and Depression sub-score <8		13 (10, 16)
Discussed mental health issues with GP[c] and HADS[b] Anxiety and/or Depression sub-score ≥8,		32 (25, 41)

[a] Confidence interval
[b] Hospital Anxiety and Depression Scale
[c] General practitioner

Supplementary file 3. Characteristics of participants at baseline, stratified by duration from the index event to the baseline interview in n (%) and median (interquartile range)

	≤16 months from index event to baseline (n=591)	**> 16 months from index event to baseline (n=536)**	**p-value**
Age years at baseline, median (interquartile range)	63.9 (56.5-69.5)	62.6 (56.0-68.4)	0.057
Females, n (%)	132 (22.3)	105 (19.6)	0.259
Low education[a], n (%)	419 (72.1)	361 (68.2)	0.158
Living alone, n (%)	113 (20.5)	88 (18.0)	0.313
Participation in cardiac rehabilitation, n (%)	249 (42.1)	277 (51.7)	0.001
Current smoking, n (%)	100 (17.5)	130 (24.3)	0.002
Low density lipoprotein cholesterol ≥1.8 mmol/L, n (%)	324 (56.1)	305 (58.8)	0.359
Low physical activity[b], n (%)	341 (58.5)	324 (61.5)	0.310
Diabetes mellitus, n (%)	88 (14.8)	101 (18.8)	0.076
Blood pressure ≥ 140/90 (80) mmHg, n (%)	251 (46.1)	207 (44.0)	0.507
Body mass index ≥30 kg/m_2, n (%)	118 (20.7)	139 (27.3)	0.010
At least 1 antiplatelet agent, n (%)	579 (98.0)	517 (96.5)	0.121
Statin treatment, n (%)	559 (94.6)	484 (90.3)	0.006
Taking statins <7/7 day a week, n (%)	49 (7.1)	37 (10.6)	0.004
HADS[c] Anxiety score ≥8, n (%)	125 (22.4)	102 (19.8)	0.298
HADS[c] Depression score ≥8, n (%)	88 (15.5)	71 (13.9)	0.384

[a] Low education was defined by completion of primary- and secondary school only

[b] Low physical activity defined as ≥1 per week and < moderate intensity of minimum 30 min ≥ 2-3 per week

[c] Hospital anxiety and depression scale