

Observed changes in cardiovascular risk factors among high-risk middle-aged men who received lifestyle counselling: a 5-year follow-up

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ABSTRACT

Objective: To examine the long-term impact of health counselling among middle-aged men at high risk of CVD.

Design: An observational study with a 5-year follow-up.

Setting and intervention: All men aged 40 years in Helsinki have been invited to a visit to evaluate CVD risk from 2006 onwards. A modified version of the North Karelia project risk tool (CVD risk score) served to assess the risk. High-risk men received lifestyle counselling based on their individual risk profile in 2006 and were invited to a follow-up visit in 2011.

Subjects: Of the 389 originally high-risk men, 159 participated in the follow-up visits in 2011. Based on their follow-up in relation the further risk communication, we divided the participants into three groups: primary health care, occupational health care and no control visits.

Main outcome measures: Lifestyle and CVD risk score change.

Results: All groups showed improvements in lifestyles. The CVD risk score decreased the most in the group that continued the risk communication visits in their primary health care centre (6.1 to 4.8 [95% CI –1.6 to –0.6]) compared to those who continued risk communication visits in their occupational health care (6.0 to 5.4 [95% CI –1.3 to 0.3]), and to those with no risk communication visits (6.0 to 5.9 [95% CI –0.5 to 0.4]).

Conclusions: These findings indicate that individualized lifestyle counselling improves health behaviour and reduces total CVD risk among middle-aged men at high risk of CVD. Sustained improvement in risk factor status requires ongoing risk communication with health care providers.

KEY POINTS

- Studies of short duration have shown that lifestyle changes reduce the risk of cardiovascular disease among high-risk individuals.
- Sustaining these lifestyle changes and maintaining the lower disease risk attained can prove challenging.
- Cardiovascular disease (CVD) risk assessment and individualized health counselling for high-risk men, when implemented in primary health care, have the potential to initiate lifestyle changes that support risk reduction.
- Attaining a sustainable reduction in CVD risk requires a willingness to engage in risk-related communication from both health care providers and the individual at high risk.

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Introduction

Cardiovascular disease (CVD) remains the dominant non-communicable disease cluster in the twenty-first century. Each year CVD accounts for over four million deaths in Europe, representing 46% of all deaths in Europe.[1] Predisposing risk factors for all manifestation of CVD are unhealthy lifestyles that

include: smoking, non-optimal dietary habits, physical inactivity and overweight. Consequences often include unwanted changes in cardio-metabolic risk factors such as dyslipidemia, hyperglycaemia and elevated blood pressure. However, all of these risk factors are modifiable through lifestyle changes. Evidence from randomized controlled trials shows the positive

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influences of lifestyle counselling on risk factors for CVD among high-risk subjects. In studies of short duration, follow-up in primary health care [2–4] and in occupational health care [5,6] that compared intensive lifestyle support with usual care successfully reduced risk. A non-randomized controlled community-based study that compared intensive lifestyle and usual care groups yielded a similar result, as outcome measurement took place at 18 months after baseline.[7] However, the existing literature did not always support the effectiveness of lifestyle counselling as shown in short-term [8] and long-term randomized trials.[9] On the other hand, long-term prospective cohort studies have shown healthier life styles to associate with lower incidences of myocardial infarction [10] and CVD mortality.[11] We conducted a prospective follow-up study of middle-aged men at high risk of CVD. The study had three different aims: to evaluate the influence of individualized risk assessment and lifestyle counselling on participant's lifestyle, on cardio-metabolic risk factors, and on total CVD risk during a 5-year follow-up, the results of which will be presented here.

Methods

Subjects and study design

Traditionally, primary prevention is one main task in primary health care, but to provide lifestyle intervention during a normal visit is often considered a challenge. To provide systematic preventive measures to high-risk men in the Helsinki area, the City of Helsinki and the Helsinki Heart District (a member of the Finnish Heart Association) launched this project as well as trained the study nurses and developed the tools used for guidance.

Every year since 2006, all men aged 40 years living in Helsinki have been invited to visit their local health care centre for an evaluation of their CVD risk and, if warranted, to receive health counselling. Of the 4274 men invited to such a visit in 2006, 1454 (34%) participated. During the appointment, a trained nurse interviewed the participants about their lifestyle. A modified version of the North Karelia project risk tool (CVD risk score) served to assess CVD risk.[12] Altogether 471 men with a CVD risk score of ≥ 4.5 received lifestyle counselling based upon their own individual risk profile in accordance with national Finnish guidelines for preventing CVD, which are based upon the European guidelines for CVD prevention in clinical practice.[13] Printed health education materials addressing health behaviour, physical activity, smoking cessation and dietary habits supplemented the personal lifestyle counselling. When

appropriate, the men were invited to participate in regular group sessions for weight control or smoking cessation at their local health care centres. Blood pressure, blood lipids or blood sugar levels exceeding the guidelines' cut-off points triggered a referral to a physician for further evaluation. All high-risk men were advised to meet with their health care providers for CVD risk monitoring every 1–2 years. In other words, high-risk men meet with health care professionals for CVD risk monitoring according to their own motivation. Their local health care centres provided long-term follow-up as normal day-to-day practice or they visited their occupational health services or used private health care services. We designed a follow-up study protocol for these men at higher risk. The Ethics Committee at Helsinki University Central Hospital approved the protocol. According to the study protocol, the high-risk men will be invited to a re-evaluation visit after 2 and 5 years. The results from the 2-year follow-up have been published previously.[14] In 2011, we identified and invited a total of 389 originally high-risk men for a re-evaluation visit. Of these, 159 men provided their written informed consent and participated in the lifestyle interview, the same risk assessment, and measurements as during the baseline visit in 2006. In addition, each participant's contacts with health care providers after the baseline visit were recorded, in order to assess potential differences between primary health care, occupational health care, and private health care, in managing their CVD risk.

Measurements

We used the mean of two blood pressure measurements obtained with the subject in the sitting position using an automated sphygmomanometer (Omron HEM-7051-E, Kyoto, Japan). We measured height (without shoes) to the nearest 0.1 cm, and weight was measured with the participants wearing light indoor clothing to the nearest 0.1 kg; we calculated BMI as kg/m^2 . We measured waist circumference midway between the lowest rib and the iliac crest was measured with the participants in a standing position. We made all measurements according to standard techniques. A trained technician drew blood samples after an overnight fast and had them analysed for lipids and glucose in a certified central laboratory.

CVD risk assessment

The CVD risk score, a modified version of the North Karelia project risk tool, is based on BMI, smoking, physical activity, systolic and diastolic blood pressure and total cholesterol concentration (Table 1).

Table 1. CVD risk score according to modified method of North Karelia project risk score.

Score	BMI ^a , kg/m ²	Current smoking	Physical activity ^d	Systolic BP ^b , mmHg	Diastolic BP ^b , mmHg	Total-C ^c , mmol/L
0	≤24.9	0	≥3x/week	≤129	≤79	≤4.9
0.5	25–26.9	Occasionally	1–2x/week	130–139	80–89	5.0–5.4
1.0	27–28.9	1–4/day	App. 1x/week	140–149	90–94	5.5–5.9
1.5	29–30.9	5–9/day	Sometimes	150–159	95–99	6.0–6.4
2.0	≥31	10–14/day	Never	≥160	≥100	6.5–6.9
2.5	–	15–19/day	–	–	–	7.0–7.4
3.0	–	20–24/day	–	–	–	7.5–7.9
3.5	–	25–29/day	–	–	–	8.0–8.4
4.0	–	≥30/day	–	–	–	≥8.5

^aBMI: body mass index;^bBP: blood pressure;^cTotal-C: total cholesterol.^dContinuous physical activity (duration at least 30 min) causing sweating or some shortness of breath.

According to used criteria, high-risk persons have the risk score of ≥4.5.

Depending on risk factor status, a subject's risk score can range from 0 to 16. A subject with a score of at least 4.5 points is categorised as high risk. We also assessed subjects' 10-year risk of fatal CVD risk extrapolated to age 60 with the Score European Low Risk Chart. The Score Chart is based on gender, age, systolic blood pressure, total cholesterol and smoking status.[13]

Statistics

Clinical characteristics and risk scores: We used one-way analysis of variance (ANOVA) to analyse between-group differences in *clinical characteristics and risk scores* at baseline and follow-up, and paired samples *t*-test for within-group analysis. To compare of changes between the groups, we applied the Univariate General Linear model. PASW/SPSS software served in the above analysis. **Lifestyle characteristics:** The Freeman-Halton extension of Fisher's exact test (www.vassarstats.net/fisher2x3.html) served to analyse proportions between groups. Changes between groups were analysed with PASW/SPSS software's Binary Logistic Regression model. We performed within-group analysis with Wilson's method for paired samples proportions and their differences using Confidence Intervals Analysis (CIA) software for Windows. We used PASW statistics for Windows, version 20.0 (SPSS Inc., Chicago, IL).

Results

The number of dropouts during the 5-year follow-up was 230. At baseline, we found no differences between the dropouts and those who continued in any of the risk factors assessed (all $p > .11$). However, the two groups showed differences in lifestyle factors at baseline: rate of smoking 64.5% vs. 55.3% ($p = .070$), physical activity 38.8% vs. 28.9% ($p = .046$), and use of soft fats 28.4% vs. 18.9% ($p = .023$); dropouts presented first.

The CVD risk score was higher in the dropouts than in those who continued (6.4 vs. 6.1, $p = .046$). The mean follow-up time was 5.1 years (SD = 0.4). Among all participants ($n = 159$), the mean CVD risk score decreased from 6.1 at baseline to 5.4 at the final visit ($p < .001$); the Score risk chart extrapolated to age 60 decreased from 4.9 to 4.5 ($p = .060$). We grouped the participants into three groups according of their choice on where to continue their risk communication. Of the participants; 34.6% (Group 1) had visited no health care providers for CVD risk monitoring between baseline and follow-up, 37.1% had made such visits at their primary health care centres (Group 2), and 28.3% had visited at their occupational health care centres (Group 3). Only two men were followed up in private health care centres, for further analyses, we included these men in Group 3. Of the 12 participants who participated in weight-controlling sessions, 7 belonged to Group 2 and 5 to Group 3; only one participants (Group 3) took part in smoking cessation sessions organised regularly at their local health care centres during the follow-up period. A positive family history for CVD was reported by 18.5% of the men in Group 1, 45.5% of the men in Group 2, and 40.3% of the men in Group 3. At baseline none of the participants received antihypertensive, lipid-lowering or diabetes medication. During follow-up, however, men in Groups 2 and 3 began receiving medications as follows: antihypertensive medication for 40.7% and 26.7% ($p = .136$), respectively, lipid lowering medication for 23.7% and 8.9% ($p = .048$), respectively, and diabetes medication for 10.2% and 2.2% ($p = .110$), respectively. The clinical characteristics of the study population appear in Table 2. At baseline, the groups showed no significant differences in clinical characteristics other than diastolic blood pressure. At follow-up, the groups showed no significant differences in any of the assessed clinical characteristics. However, we did identify statistically significant changes within groups (Table 2). BMI increased in Group 3, systolic and diastolic blood

Table 2. Clinical characteristic at baseline and 5-year follow-up grouped according to CVD risk control visits.

	CVD risk control visits during follow-up			<i>p</i> Value ^a	All <i>n</i> = 159	<i>p</i> Value ^b
	No control <i>n</i> = 55	Primary care <i>n</i> = 59	Occupational care <i>n</i> = 45			
BMI (kg/m²)						
Baseline	29.1 (4.5)	30.2 (6.6)	29.0 (4.3)	0.434	29.5 (5.3)	–
Follow-up	29.7 (4.5)	30.6 (7.2)	29.9 (4.6)	0.650	30.1 (5.7)	–
Change	0.6 (2.3)	0.4 (2.4)	0.9 (2.1)	0.692	0.6 (2.3)	.001
95% CI	–0.4 to 1.2	–0.2 to 1.1	0.3 to 1.5	–	0.3 to 1.0	–
WC (cm)						
Baseline	101.7 (12.0)	105.9 (15.3)	103.1 (10.8)	0.244	103.7 (13.1)	–
Follow-up	103.0 (12.1)	105.7 (17.3)	104.8 (12.4)	0.402	104.5 (14.2)	–
Change	1.3 (6.8)	–0.2 (6.4)	1.7 (6.7)	0.391	0.8 (6.7)	.128
95% CI	–0.6 to 3.2	–2.0 to 1.5	–0.4 to 3.8	–	–0.2 to 1.9	–
SBP (mmHg)						
Baseline	136.6 (15.1)	141.5 (18.7)	140.0 (15.9)	0.278	139.4 (16.7)	–
Follow-up	144.2 (18.6)	137.7 (14.9)	142.4 (14.7)	0.092	141.3 (16.4)	–
Change	7.6 (14.9)	–3.8 (16.2)	2.4 (17.2)	0.004	1.9 (16.7)	.156
95% CI	3.6 to 11.7	–8.0 to 0.4	–2.8 to 7.5	–	–0.7 to 4.5	–
DBP (mmHg)						
Baseline	88.6 (9.5)	93.9 (12.8)	92.6 (9.9)	0.026	91.7 (11.1)	–
Follow-up	92.9 (10.6)	89.0 (8.9)	91.8 (9.8)	0.103	91.2 (9.9)	–
Change	4.3 (9.6)	–4.9 (11.7)	–0.8 (12.1)	0.003	–0.5 (11.7)	.570
95% CI	1.7 to 6.9	–8.0 to –1.8	–4.5 to 2.8	–	–2.4 to 1.3	–
Total-C						
Baseline	5.6 (1.0)	5.6 (1.3)	5.5 (1.0)	0.963	5.5 (1.1)	–
Follow-up	5.8 (0.9)	5.3 (1.0)	5.4 (1.1)	0.830	5.5 (1.1)	–
Change	0.2 (1.03)	–0.3 (1.3)	–0.1 (1.0)	0.029	–0.0 (1.1)	.666
95% CI	0.0 to 0.4	–0.6 to 0.1	–0.3 to 0.2	–	–0.2 to 0.1	–
LDL-C						
Baseline	3.26 (0.83)	3.20 (0.99)	3.27 (0.88)	0.841	3.24 (0.90)	–
Follow-up	3.31 (0.78)	2.94 (0.85)	3.23 (0.94)	0.117	3.15 (0.86)	–
Change	0.05 (0.60)	–0.26 (0.88)	–0.04 (0.84)	0.031	–0.09 (0.79)	.153
95% CI	–0.12 to 0.22	–0.50 to –0.03	–0.31 to 0.22	–	–0.22 to 0.03	–
HDL-C						
Baseline	1.57 (0.46)	1.52 (0.36)	1.41 (0.34)	0.149	1.51 (0.39)	–
Follow-up	1.42 (0.34)	1.36 (0.40)	1.29 (0.34)	0.262	1.36 (0.39)	–
Change	–0.15 (0.24)	–0.16 (0.33)	–0.12 (0.19)	0.966	–0.15 (0.26)	<.001
95% CI	–0.22 to –0.09	–0.24 to –0.07	–0.19 to –0.07	–	–0.19 to –0.11	–
TG						
Baseline	1.72 (1.11)	2.14 (2.51)	2.03 (1.82)	0.498	1.96 (1.92)	–
Follow-up	1.75 (1.04)	1.72 (0.96)	1.88 (2.86)	0.882	1.77 (1.72)	–
Change	0.03 (1.04)	–0.42 (2.45)	–0.15 (1.49)	0.612	–0.19 (1.80)	.190
95% CI	–0.26 to 0.31	–1.07 to 0.22	–0.60 to 0.31	–	–0.47 to 0.09	–
Glucose						
Baseline	5.5 (0.6)	5.7 (0.6)	5.6 (0.5)	0.123	5.6 (0.6)	–
Follow-up	5.9 (0.8)	5.8 (0.8)	5.9 (0.7)	0.863	5.9 (0.8)	–
Change	0.4 (0.6)	0.1 (0.7)	0.3 (0.5)	0.116	0.3 (0.6)	<.001
95% CI	0.2 to 0.5	–0.1 to 0.3	0.1 to 0.4	–	0.1 to 0.3	–

Data are means (SD).

^a*p* Values are for testing equality between groups.

^b*p* Values are for testing paired difference.

BMI: body mass index; WC: waist circumference; SBP: systolic blood pressure; DBP: diastolic blood pressure; Total-C: total cholesterol in mmol/L; LDL-C: low-density cholesterol in mmol/L; HDL-C: high-density cholesterol in mmol/L; TG: triglycerides in mmol/L, glucose in mmol/L.

pressures increased in Group 1, diastolic blood pressure decreased in Group 2, total cholesterol concentration increased in Group 1, LDL cholesterol concentrations decreased in Group 2, HDL cholesterol decreased in all three groups, and glucose concentration increased in Groups 1 and 3. The changes in systolic ($p = .004$) and diastolic blood pressure ($p = .003$), as well as in total ($p = .029$) and LDL cholesterol ($p = .031$) differed significantly between the groups. The lifestyle factors assessed either at baseline or at follow-up visit showed no difference between groups (Table 3). During the

follow-up smoking decreased significantly in Groups 1 and 2, and physical activity increased statistically significantly in all groups, as did percentage of users of soft fats. Risk scores at baseline and changes during the follow-up appear in Table 4. At baseline, means in either the CVD risk score ($p = .898$) or Score Chart ($p = .594$) showed no significant differences, whereas at follow-up, they did CVD risk score ($p = .027$) and Score Chart ($p = .010$). The CVD risk score decreased most in Group 2 during follow-up, only in Group 2 was the change statistically significant. The Score Chart decreased in

Table 3. Lifestyle characteristics at baseline and at 5-year follow-up grouped according to CVD risk control visits.

	CVD risk control visits during follow-up			<i>p</i> Value ^a	All <i>n</i> = 159	<i>p</i> Value ^b
	No control <i>n</i> = 55	Health centre <i>n</i> = 59	Occupational care <i>n</i> = 45			
Smoking, %						
Baseline	63.6	50.8	51.1	0.318	55.3	–
Follow-up	50.9	37.3	40.0	0.309	42.8	–
Change	–12.7	–13.5	–11.1	0.738	–12.5	<.001
95% CI	–23.9 to –0.8	–23.4 to –3.1	–24.8 to 3.5	–	–19.2 to –5.7	–
PA ≥90 min/wk, %						
Baseline	36.4	22.0	28.9	0.241	28.9	–
Follow-up	60.0	55.9	53.3	0.792	56.6	–
Change	23.6	33.9	24.4	0.859	27.7	<.001
95% CI	9.5 to 36.2	18.9 to 46.6	4.7 to 41.6	–	18.6 to 36.0	–
Users of soft fat, %						
Baseline	21.8	22.0	11.1	0.277	18.9	–
Follow-up	72.7	84.7	73.3	0.246	77.4	–
Change	50.9	62.7	62.2	0.270	58.5	<.001
95% CI	35.5 to 62.3	46.6 to 73.6	45.5 to 73.9	–	49.7 to 65.5	–

PA: physical activity.

^a*p* Values are for testing equality between groups.^b*p* Values are for testing paired difference.**Table 4.** Risk scores at baseline and at 5-year-follow-up grouped according to CVD risk control visits.

	CVD risk control visits during follow-up			<i>p</i> Value ^a	All <i>n</i> = 159	<i>p</i> Value ^b
	No control <i>n</i> = 55	Primary care <i>n</i> = 59	Occupational care <i>n</i> = 45			
CVD risk score						
Baseline	6.0 (1.7)	6.1 (1.7)	6.0 (1.4)	0.898	6.1 (1.6)	–
Follow-up	5.9 (2.2)	4.8 (2.3)	5.4 (2.2)	0.027	5.4 (2.3)	–
Change	–0.1 (1.7)	–1.3 (2.1)	–0.6 (2.6)	0.011	–0.7 (2.2)	<.001
95% CI	–0.5 to 0.4	–1.9 to –0.8	–1.4 to 0.1	–	–1.1 to –0.4	–
Score Chart						
Baseline	4.7 (1.7)	5.1 (2.2)	4.8 (2.2)	0.594	4.9 (2.1)	–
Follow-up	5.2 (2.3)	4.0 (1.9)	4.3 (2.1)	0.010	4.5 (2.2)	–
Change	0.5 (2.1)	–1.1 (1.9)	–0.5 (2.7)	0.001	–0.4 (2.3)	.060
95% CI	–0.1 to 1.1	–1.6 to –0.6	–1.3 to 0.3	–	–0.7 to 0.02	–

Data are means (SD).

^a*p* Values are for testing equality between groups.^b*p* Values are for testing paired difference.

CVD risk score: a modified version of the North Karelia project risk tool; Score Chart: CVD risk extrapolated to age 60 by Score European Low Risk Chart.

Groups 2 and 3 during follow-up but in contrast increased in the Group 1. Only in Group 2 was the change statistically significant. Risk scores reduction remained significant even when analyses were limited to participants receiving no cardio-metabolic medication. The differences in changes in the CVD risk score ($p = .011$) and in the Score risk chart ($p = .001$) between the groups were statistically significant.

Discussion

A considerable proportion of those screened failed to continue. In terms of the risk factors, the dropouts did not differ from those participating in the study at baseline. However, lifestyle factors between these two groups did differ at baseline. Obviously, due to higher

rates of smoking, the dropouts had higher CVD risk score, but this should not adversely influence the overall findings; indeed, it could even potentially strengthen them. All study participants comprised a uniformly high CVD risk group, attitudes towards elevated CVD risk varied widely. Awareness of the risk was insufficient to motivate all subjects to participate in risk factor control visits. More than one third of the participants had participated in no risk factor control visit between baseline and follow-up visits whereas, almost two-thirds spontaneously sought risk factors monitoring during follow-up at either local health care centres or at occupational health care. One feature that distinguished the participants from one another was a positive family history of CVD. A positive family history was more than two times as common among

the participants who searched for risk factor monitoring during follow-up. According to the Health Belief Model, perceived susceptibility encourages health-protective behaviours.[15] The literature has assessed association between a positive family history of CVD and health behaviour on large scale.[16–18] Surveys comparing adults without CVD across two categories, with and without a family history of CVD, have found that those with such a family history were more likely to contact with clinicians [19] and to follow clinicians' recommendations to change their lifestyles.[20] From data on 186,000 users of the Heart Age calculator (www.heartage.me), investigators found that awareness of cholesterol and blood pressure levels was greater in those with a family history of CVD, but their healthy lifestyle behaviours were no different.[21] We found that control visits with health care providers led to favourable changes in lifestyle factors and lower CVD risk scores. In addition, several cardio-metabolic risk factors showed improvement. The decrease in diastolic blood pressure and in low-density cholesterol level was statistically significant among those who continued visits in their primary health care centre. Also, the changes in lifestyle factors and reduction in CVD risk scores were greater in the group visiting their primary health care centre. However, evaluations of the CVD risk score must take into account the fact that this group also benefit from more active treatment, as they received more cardio-protective medications than did those who received treatment at the occupational health care. However, the lifestyle changes alone significantly decreased the CVD risk score and the Score Chart among men who were followed up within the primary health care and received no cardio-protective medication. The initial baseline risk assessment and health counselling sessions took place in primary health care centres, so nurses and physicians in these centres were likely better prepared to discuss with these participants. This may partly explain the more favourable results achieved in the primary health care centres than in occupational care. Despite self-reported improvements in all lifestyle factors assessed, the men who were not followed up showed no improvement in any cardio-metabolic risk factors assessed or in CVD risk scores and even showed an increase in their Score Risk Chart during follow-up. The results of annual surveys, of health behaviour among Finnish adult show that the consumption of unsaturated fat among Finnish men was 64% in 2006 and 60% in 2011, smoking prevalence was 24% in 2006 and 22% in 2011, and the proportional level of physical activity was 63% in 2006 and 67% in 2011.[22,23] Among the study participants,

despite some minor consumption of unsaturated fat at baseline, their use exceeded that of the general male population at follow-up, and starting from a much lower level of physical activity at baseline, the study participants almost reached the level of the general male population at follow-up. Smoking prevalence was higher among the study population than among the general male population, but the decrease was distinct. The main objective of occupational health care in Finland is to prevent work-related illnesses. To this end, employers can offer primary care and other health care services to their employees, but additional costs limit this possibility in practice. The fact that the public primary care provides primary care for all may at least partly explain why a large number of the participants were followed up in primary health care, a fact that limits the comparability of the results in our study between the primary health care and occupational health care. The main weakness of the present study was the relatively small number of men who took part in the final study visit. Also, the observational method of the study may be a weakness, but randomisation of these high-risk men would have posed ethical issues. In the absence of a control group, we compared data from the present study to data from surveys of the National Institute for Health and Welfare.[22,23] The strength of study includes the natural course of the follow-up. All participants underwent the same risk assessment and received the same health counselling during baseline visits; thereafter, during the follow-up, their health behaviour including risk factor monitoring visits was based on their own choices. Those who with interest and willingness manage their risk factors benefit most.

Conclusions

Men at high risk of CVD and who, after receiving health counselling, continued to discuss their risk with health care providers, based on their own determination of their need for visits, experienced a sustained reduction in CVD risk. Furthermore, our findings show that a positive family history of CVD can contribute to healthier behaviour in this high-risk middle-aged male population. Our findings support to continue CVD risk evaluation and health counselling of high-risk middle-aged men. One future challenge is to encourage as many as possible of those who were satisfied with self-care to participate in risk monitoring visits. Health care systems also face the challenge of providing long-term care for all at high risk.

Ethics approval

The City of Helsinki and the Coordinating Ethics Committee at the Helsinki University Hospital approved the study protocol on 5 July 2007 (ref: 185/E5/07). All participants provided their written informed consent.

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Disclosure statement

The authors declared no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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