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RESEARCH ARTICLE

Effects of Primary Cardiovascular Prevention on Vascular Risk in Older Adults

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Introduction: Primary cardiovascular prevention through simultaneously targeting multiple risk factors may be even more effective than single risk factor modification in older adults. The effects of multicomponent cardiovascular prevention on cardiovascular risk are explored.

Study design: Post hoc analysis of the cluster randomized Prevention of Dementia by Intensive Vascular care trial.

Setting/participants: Community-dwelling older adults aged 70–78 years, free from cardiovascular disease at baseline (n=2,254, 63.9% of the Prevention of Dementia by Intensive Vascular care trial population).

Intervention: Between 2006 and 2015, the intervention group received nurse-led vascular care every 4 months at the general practitioner practice, the control group received care as usual.

Main outcome measures: Cardiovascular disease events and Systematic COronary Risk Evaluation in Older People (SCORE-OP), an index based on six risk factors for cardiovascular mortality. Effects were adjusted for clustering and assessed using mixed effects Cox proportional-hazard models and linear mixed models respectively.

Results: There was no effect of the intervention on cardiovascular disease events (hazard ratio=0.99, 95% CI=0.71, 1.38). During a median follow-up of 6.1 years, SCORE-OP increased from 14.0% and 13.9% to 23.9% and 25.0% in the intervention and control group, respectively (adjusted mean difference in increment in SCORE-OP between the study groups 0.60%, 95% CI= −0.01, 1.20). Exploratory analyses showed a larger reduction of 2.4 mmHg (95% CI=0.9, 3.9) in systolic blood pressure and 1.9% (95% CI=0.4, 3.4) in current cigarette smoking in the intervention group compared with the control group.

Conclusions: Multicomponent cardiovascular prevention did not improve the overall risk profile in older adults in a primary prevention setting, relative to usual care. However, exploratory analyses showed an effect on blood pressure and smoking cessation. Possibly, contrast between study groups was too small because of the Hawthorne (being part of a study) effect and increasing quality of (preventive) health care for older adults, to yield an effect on the risk profile.

INTRODUCTION

Major improvements in cardiovascular prevention have contributed to a steady decline in cardiovascular disease (CVD) mortality rates since the 1980s, especially in Western European countries.[1] However, for individuals, prevention through lifestyle changes is difficult to accomplish. Although

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cardiovascular risk factor management is mainly promoted in middle-aged individuals, primary prevention seems effective up to old age.[2–5]

To conceptualize intermediate CVD outcomes, indexes that combine risk factors have been developed.[6] They estimate an overall effect of interventions, are easy to interpret, allow for comparison among different behavioral interventions, and avoid the need of individually testing interdependent factors. For older adults, only a few CVD risk scores in Western countries exist.[7] The Systematic COronary Risk Evaluation in Older People (SCORE-OP), developed and internally validated in 40,825 participants from four European cohorts, predicts risk of cardiovascular mortality over 10 years in people aged 65–85 years without a prior myocardial infarction.[8] In SCORE-OP, an individual's risk estimate will increase over time irrespective of any changes in risk factors, because age is included.

Recently, in the Prevention of Dementia by Intensive Vascular care (preDIVA) trial, a multicomponent, nurse-led intensive vascular care was offered to older community-dwelling adults, with and without a history of CVD. No beneficial effects of the intervention were observed for either dementia (primary outcome) or cardiovascular morbidity or mortality (secondary outcome) over 5.0 years on average, relative to usual care.[9]

In this study, an initial check was first done to assess whether, also within the context of primary prevention, multicomponent cardiovascular prevention in the preDIVA trial had no effect on CVD. As the main aim of this study, the authors tested the following hypothesis: The intervention resulted in a smaller increase in SCORE-OP over time compared with standard care in older adults without prior CVD. Furthermore, the study explores which of the components of SCORE-OP are most influenced by the intervention.

METHODS

Study Population

This study is reported following CONSORT. This study provides a post hoc analysis on the preDIVA trial, a cluster RCT designed to investigate the effect of nurse-led intensive vascular care on the occurrence of all-cause dementia. Main secondary outcomes were incident CVD and cardiovascular and all-cause mortality. Participants aged 70–78 years and free of dementia and conditions likely to hinder successful long-term follow-up were eligible to take part in the study; there was no racial or gender bias in the selection of participants. The design and baseline characteristics of preDIVA have been described in detail elsewhere.[9] Of 6,762 eligible older adults from 116 general practitioner (GP) practices within 26 healthcare centers (HCCs) in the Netherlands, 3,526 (52.1%) signed written informed consent. Recruitment was from June 2006 through March 2009. Cluster randomization took place with HCCs as blocks, and GP practices as units of randomization.[9] Because the aim here was to assess the effect of the intervention in a primary prevention setting, only participants without a baseline history of myocardial infarction, stroke, or transient ischemic attack were included in the analyses (n=2,254, 63.9%; Figure 1).

Measures

Every 4 months, the intervention group received nurse-led intensive vascular care at the GP practice to optimize blood pressure, cholesterol and glucose levels, and lifestyle in terms of physical activity, diet, and smoking, over a period of 6 years. During assessments, individually tailored lifestyle advice was given, supported by motivational interviewing techniques. If indicated, drug treatment of hypertension, dyslipidaemia, and Type 2 diabetes mellitus (T2DM) was initiated or optimized. The control group received care as usual, according to the prevailing Dutch guidelines for cardiovascular risk management.[10] Details are described elsewhere.[9]

Participants were assessed at baseline and biannually during follow-up by a practice nurse at the GP practice. The final assessment was carried out between January 2014 and March 2015 by independent evaluators who were blinded for treatment allocation. During assessments, demographic characteristics, medication use, smoking habits, and self-reported history of cardiovascular morbidity and T2DM were collected and cross-checked with the electronic medical records (EMRs) of all participants. In the Netherlands, nearly all inhabitants are registered with a GP,[11] and GPs record diagnoses in the EMRs, including those made by specialists after referral. Mean systolic blood pressure (SBP) and diastolic blood pressure were measured using a standardized protocol.[9]

Statistical Analysis

The effect of the intervention was analyzed for fatal and nonfatal CVD (cardiovascular morbidity and mortality); CVD mortality (mortality from myocardial infarction or stroke); CVD morbidity (nonfatal myocardial infarction or stroke); coronary heart disease (CHD) morbidity (nonfatal myocardial infarction); non-CHD morbidity (nonfatal stroke); and all-cause mortality. CVD mortality was not subdivided into CHD and non-CHD, because in 57% (24/42) the CVD type was unclassified.

For all visits, 81% (100/124) of cardiovascular events were verified in the EMR and used in the analyses. In 73% of deaths, the cause could be retrieved from the EMR, and anonymously sent to an independent outcome adjudication committee.[9] A total of 35% (96/276) of all deaths could not be classified to a certain cause. The 15% (42/276) of all deaths that the committee classified as "cardiovascular" were used in the analysis on clinical endpoints.

Mixed effects Cox proportional hazard models from the R-package "coxme" were used,[12] accounting for clustering of participants within practices and practices within HCCs (Appendix Formula 4, available online). In a sensitivity analysis, a worst-case scenario for CVD mortality was first performed, in which all 96 deaths with unknown cause were analyzed as being cardiovascular. Second, a per protocol analysis was performed, and finally, effects were assessed for individuals with and without an evident indication for drug treatment to prevent CVD.

All analyses were on an intention to treat basis, unless otherwise indicated, and were performed in R, version 3.3.1.[13] Analyses were performed between May 2016 and June 2017.

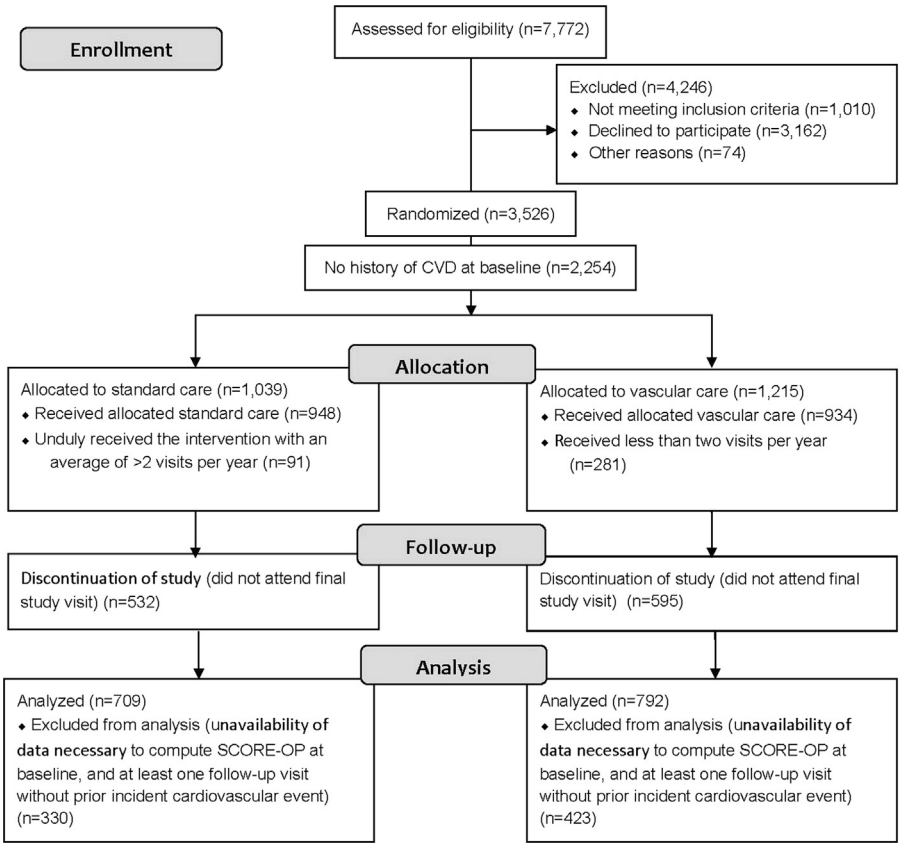

Figure 1. CONSORT flow diagram.
Note: More details are given in Moll van Charante et al.[9]
CVD, cardiovascular disease; SCORE-OP, Systematic COronary Risk Evaluation–Older People.

SCORE-OP is a composite of CVD risk factors (total cholesterol, SBP, age, smoking status, high-density lipoprotein [HDL] cholesterol, T2DM), predicting 10-year mortality risk for CVD, CHD, and non-CHD. SCORE-OP was calculated using estimated baseline survival rates and β-coefficients for low-risk countries as previously reported (Appendix Formula 1, available online).[8] To test if nurse-led intensive vascular care results in a smaller increase in SCORE-OP compared with standard care, the adjusted mean difference in SCORE-OP between treatment groups was estimated, using the means of all measurements obtained during the study after baseline, adjusted for SCORE-OP at baseline and time to measurement. This way data from all participants could be used, not only from those who underwent a final assessment. Linear mixed models from the R-package "lme4" were used to calculate the adjusted mean differences. Random effects at the participant level, nested within the practice level at an HCC level, were included to account for the potential dependencies between the observations[14] (Appendix Formula 2, available online). Because there was no statistical evidence for differences in treatments over time by adding a time by treatment term, it was omitted from the final model. Participants were considered as dropouts from the time a cardiovascular event occurred, because SCORE-OP was no longer applicable for patients with incident CVD.

Several sensitivity analyses for the effects on SCORE-OP estimations were performed. First, a per protocol analysis was done, excluding 91/1,039 participants in the control group who unduly received the intervention with an average of more than two visits per year, and 281/1,206 participants in the intervention group who received fewer than two visits per year. Second, as SCORE-OP is bounded between 0 and 100%, it was investigated whether the results on the logit scale of the outcome were consistent with the findings on the original scale. Because the results were similar, models with outcome variables on the original scale are presented. Third, because the linear mixed model assumes data to be missing at random, and that drop out during study is likely to have generated a nonrandom pattern of missing data, the effect of nonrandom dropout was evaluated, by performing joint model analyses.[15] Differences between the estimates for the coefficients of the joint model analysis and the longitudinal process alone might indicate bias introduced by the dropout process. Further details on the joint model analysis are given in Appendix Text 1 (available online).

Last, for three categories, we evaluated if the treatment effect was different among the subgroups by alternately including an interaction term for the category into the linear mixed model (Appendix Formula 3, available online). The categories were gender, T2DM at baseline, and baseline indication for drug treatment. Between men and women, physiologic differences exist regarding CVD, and adherence to drugs and a healthy lifestyle differ.[16] An indication for drug treatment was defined according to the prevailing Dutch GP guideline on CVD prevention at the time of the study: SBP $\geq$180 mmHg, or a 10-year cardiovascular

mortality risk >10% in combination with an SBP ≥140 mmHg or total cholesterol/HDL ratio ≥5 mmol/L.[10] Because standard care for people with T2DM consists of regular checkups, including attention for blood pressure and lifestyle, it was hypothesized that the contrast between intervention and standard care for individuals without T2DM is larger, and a greater effect of the intervention could be observed in this group.

To explore which of the modifiable components were influenced by the intervention, the adjusted mean differences during study for the individual risk factors of SCORE-OP were calculated using linear mixed models with the same random structure as in Appendix Formula 2 (available online). Given the fact that care providers are expected to treat risk factors to a target value, further reductions are not likely to occur. Therefore, per participant the percentage of targets reached was calculated for each visit. Only variables of SCORE-OP that are modifiable were used, plus the variable low-density lipoprotein cholesterol because this is an important factor in cardiovascular risk management in current guidelines.[2] Targets were as defined in the study protocol: not currently smoking, SBP ≤140 mmHg, total cholesterol/ HDL cholesterol ratio of ≤5 mmol/L, and low-density lipoprotein cholesterol ≤2.5 mmol/L.

RESULTS

A total of 1,215 participants in the intervention group and 1,039 in the control group did not have a history of CVD and were included in this study. Of these 2,254 participants, there were 1,501 (67%) who were included in the analyses for SCORE-OP because they had all the necessary data to compute SCORE-OP at baseline, and at least one follow-up visit without prior incident cardiovascular event (Figure 1, Table 1). Median follow-up was 5.4 years in the primary prevention population (n=2,254) and 6.1 years in the 1,501 subjects included in the analyses for SCORE-OP. The baseline data of participants included and not included in this analysis for SCORE-OP are given in Appendix Table 1 (available online).

There was no effect of the intervention on fatal and nonfatal CVD (hazard ratio=0.99, 95% CI=0.71, 1.38); specific CVD outcomes; or all-cause mortality (Table 2). Results were similar within the subgroups of participants who had an indication for drug treatment and those who had no indication (Appendix Table 2, available online). Also, a per protocol analysis did not significantly change these findings (Appendix Table 3B, available online). Similar results are observed for the total preDIVA population, which included people with and without a history of CVD.[9]

At baseline, the 10-year risk of CVD mortality according to SCORE-OP was 14.0% in the intervention and 13.9% in the control group. During a median follow-up of 2,225 days (6.1 years), the mean risk increased to 25.0% in the control group and to 23.9% in the intervention group (adjusted mean difference= –0.60%, 95% CI= –1.20, 0.01; Table 2). The adjusted mean difference was similar for the predicted 10-year risk of CHD mortality and non-CHD mortality (Table 2). A per protocol analysis for the effect of the intervention on SCORE-OP did not change the results (Appendix Table 3A, available online). Also, those who dropped out because of discontinuation, a CVD event, or unavailability of one of the components of SCORE-OP, did not substantially alter the results: the adjusted mean difference for CVD mortality risk was –0.40 (95% CI= –0.91, 0.10) in the model without correction for selective dropout, and –0.42 (95% CI= –0.92, 0.08) in the joint model.

The difference between intervention and control group was similar for men and women (–0.70 vs –0.59, difference in treatment differences 0.11 [95% CI= –1.05, 1.27]), and for the group with and without an indication for drug treatment (–0.72 vs –0.43, difference in treatment differences 0.30 [95% CI= –0.87, 1.47]; Appendix Table 4, available online). Participants without T2DM had significantly more effect from the intervention than the small group of individuals with T2DM at baseline (–1.10 vs 1.54, difference in treatment differences 2.64 [95% CI=1.07, 4.21]; Appendix Table 4, available online).

Compared with the control group, the intervention resulted in a significant reduction in SBP of 2.39 mmHg (95% CI=0.87, 3.90); a 1.85% (95% CI=0.35, 3.36) reduction in current cigarette smoking; and no significant effect on the other risk factors (Table 3, Appendix Figure 1, available online).

For four risk factors (SBP, low-density lipoprotein cholesterol, smoking status, and total cholesterol/HDL ratio), the mean percentage of targets reached per participant at baseline and during follow-up was evaluated (Appendix Figure 2, available online). The mean percentage gradually increased during study; the adjusted mean difference between study arms was 2.90% (95% CI=1.25, 4.56).

DISCUSSION

Over 6 years, nurse-led intensive vascular care in community-dwelling older adults without a history of CVD resulted in higher reduction in SBP and lower smoking rates compared with standard care, but the care did not affect the overall CVD risk profile as defined by SCORE-OP, nor did it reduce CVD morbidity or mortality rates. Additional sensitivity analyses did not change these results.

There are several possible explanations for the lack of an effect on the cardiovascular risk profile, and clinical endpoints. First, a substantial Hawthorne effect could have occurred; this is the phenomenon that people have a tendency to change behavior when target of special

Table 1. Baseline Characteristics

Characteristics	Intervention (*n*=792)	Control (*n*=709)
Demographics		
Age in years, M (SD)	74.1 (2.4)	74.1 (2.5)
Male, *n* (%)	297 (38)	275 (39)
Educational level, *n* (%)		
<7 years	165 (21)	161 (23)
7–12 years	519 (66)	461 (65)
>12 years	108 (14)	87 (12)
Caucasian, *n* (%)	755 (95)	688 (97)
Cardiovascular risk factors		
SBP in mmHg, M (SD)	156.0 (21.0)	154.9 (20.1)
DBP in mmHg, M (SD)	81.7 (10.8)	82.3 (10.5)
Total cholesterol in mmol/L, M (SD)	5.44 (0.97)	5.58 (1.09)
HDL cholesterol in mmol/L, M (SD)	1.56 (0.41)	1.56 (0.42)
LDL cholesterol in mmol/L, M (SD)	3.28 (0.90)	3.42 (0.98)
BMI, M (SD)	27.5 (4.3)	27.2 (4.2)
Type 2 diabetes, *n* (%)	145 (18)	98 (14)
Current smoking, *n* (%)	82 (12)	83 (10)
Physically active (WHO), *n* (%)	698 (88)	627 (88)
Medication use		
Antihypertensive(s), *n* (%)	339 (43)	304 (43)
Cholesterol lowering drug(s), *n* (%)	156 (20)	139 (20)
Antiplatelet/anticoagulant drug(s), *n* (%)	61 (7.7)	59 (8.3)
Clusters		
Number of practices/number of healthcare centers	63/26	53/24

Note: Normal range: total cholesterol <5.0 mmol/L; HDL cholesterol 0.9–2.0 mmol/L; LDL cholesterol <3.1 mmol/L; BMI 18.5–25.
DBP, diastolic blood pressure; HDL, high-density lipoprotein; LDL, low-density lipoprotein; SBP, systolic blood pressure.

Table 2. Hazard Ratios for Relative Risk of CVD Incidence and All-Cause Mortality[a]

Outcome	Intervention group, *n* (%) (*n*=1,039)	Control group, *n* (%) (*n*=1,215)	Hazard ratio (95% CI)
Fatal and non-fatal CVD[b]	75/790 (9.5)	65/715 (9.1)	0.99 (0.71, 1.38)
CVD mortality[c]	21/1,074 (2.0)	21/941 (2.2)	0.87 (0.46, 1.65)
CVD mortality – including mortality with unknown cause[d]	81/1,134 (7.1)	57/977 (5.8)	1.19 (0.80, 1.75)
CVD morbidity[e]	55/821 (6.7)	45/724 (6.2)	1.01 (0.68, 1.50)
CHD morbidity[f]	42/975 (4.3)	32/870 (3.7)	1.08 (0.68, 1.71)
Non-CHD morbidity[g]	15/818 (1.8)	14/721 (1.9)	0.93 (0.45, 1.93)
All-cause mortality	158/1,211 (13.0)	118/1,038 (11.4)	1.15 (0.88, 1.49)

Notes: The effect of the intervention was analyzed for fatal and non-fatal CVD (cardiovascular morbidity and mortality); CVD mortality (mortality from myocardial infarction or stroke); CVD morbidity (non-fatal myocardial infarction or stroke); CHD morbidity (non-fatal myocardial infarction); non-CHD morbidity (non-fatal stroke); and all-cause mortality.
[a]In the intervention compared to the control group, adjusted for clustering.
[b]CVD mortality + CVD morbidity.
[c]Mortality from myocardial infarction or stroke, CVD mortality was not subdivided into CHD and non-CHD, because in 57% (24/42) the CVD type was unclassified.
[d]Worst-case scenario; CVD mortality defined as CV mortality and unknown causes of death.
[e]Non-fatal events of myocardial infarction or stroke.
[f]Non-fatal events of myocardial infarction.
[g]Non-fatal events of stroke.
CHD, coronary heart disease; CVD, cardiovascular disease.

Table 3. Adjusted Mean Difference Between Intervention and Control Group During Follow-up for SCORE-OP and Individual Risk Factors

Outcome	Mean at baseline		Mean during study		
	Intervention group, M (SD)	Control group, M (SD)	Intervention group, M (SD)	Control group, M (SD)	Adjusted mean difference, (95% CI)
SCORE-OP					
10-year CVD mortality risk, %	14.0 (7.7)	13.9 (7.9)	23.9 (13.7)	25.0 (14.1)	−0.60 (−1.20, 0.01)
10-year CHD mortality risk, %	5.8 (3.6)	5.8 (3.7)	9.5 (6.0)	9.9 (6.2)	−0.20 (−0.52, 0.11)
10-year non-CHD mortality risk	8.2 (4.2)	8.0 (4.4)	14.8 (8.4)	15.3 (8.5)	−0.31 (−0.66, 0.04)
Individual risk factors of SCORE-OP					
SBP, mmHg	156.0 (20.9)	154.9 (20.1)	149.2 (18.7)	151.3 (20.5)	−2.39 (−3.90, −0.87)
Total cholesterol, mmol/L	5.4 (1.0)	5.6 (1.1)	5.2 (1.1)	5.3 (1.1)	−0.03 (−0.12, 0.02)
HDL cholesterol, mmol/L	1.6 (0.4)	1.6 (0.4)	1.5 (0.4)	1.5 (0.4)	−0.00 (−0.02, 0.02)
Smoking status, % smoking	10.4 (30.5)	11.7 (32.2)	7.1 (25.6)	9.6 (29.4)	−1.85 (−3.36, −0.35)
Type 2 diabetes mellitus, % with T2DM	18.3 (38.7)	13.8 (34.5)	20.0 (40.0)	16.3 (36.9)	−0.73 (−2.19, 0.74)

Note: Normal range: total cholesterol (<5.0 mmol/L) and HDL cholesterol (0.9–2.0 mmol/L). Means and SDs at baseline and of repeated measurements after baseline with adjusted mean difference between study groups (intervention minus control). For smoking status and type 2 diabetes mellitus, figures reflect the percentage within the population; the adjusted mean difference reflects the absolute difference in this percentage between study groups.
CHD, coronary heart disease; CVD, cardiovascular disease; SBP, systolic blood pressure; SCORE-OP, Systematic COronary Risk Evaluation–Older Persons.

attention because of study participation. The screenings, performed every 2 years, prompted interventions in high-risk cases in both the intervention and control groups, which is reflected by the cardiovascular risk factor improvement rates in both groups over the years (Appendix Figure 2, available online). Furthermore, the pragmatic, public health approach may have been insufficiently intensive to yield an effect on clinical endpoints.[17] Indeed, in primary care settings already providing high standards of cardiovascular risk management, it may be difficult to improve the overall efficacy. Additionally, this study may have been underpowered to detect a potential small effect, considering the CI of the adjusted mean differences just overlapped the neutral value (zero). Finally, perhaps the observed effects on SBP and smoking are too late in life and too modest to exert any effect on CVD. In some studies, the effect of (much more substantial) blood pressure lowering in older people resulted in reductions in CVD and all-cause mortality.[3–5] Yet, several other studies suggest that in old age the association between traditional cardiovascular risk factors and incident CVD events diminishes or even reverses.[18,19] This reversed association seems to be most pronounced in the elderly who are frail.[19] Insufficient data were available to define frailty subgroups for the population studied here.

In the subgroup of participants without T2DM, the intervention was beneficial in terms of improved SCORE-OP compared with the control group. This may be attributable to a greater contrast between study arms in individuals without T2DM, because of existing diabetes management programs in primary care. However, because the effects for participants with T2DM appeared contra-effective, this finding may also reflect a Type I error, or can be caused by baseline imbalance.

Limitations

The pragmatic approach of this study has high external validity and applicability to current care in daily practice, because the intervention was based on prevailing guidelines on cardiovascular risk management and carried out in a community setting with few exclusion criteria. In addition, in terms of risk factor occurrence, the population is comparable with a population from national cohort data.[20] No high-risk population was selected, thereby potentially limiting the window of opportunity, and hence the effect of the intervention.[17,21] This RCT is unique in investigating the effect of a multifactorial intervention for primary

cardiovascular prevention in community-dwelling older adults, and it has a relatively large sample size and long follow-up duration.[21,22] Other trials investigate single risk factor interventions, or multifactorial interventions in younger people.[21,23] A limitation of this study is the relatively high drop-out rate (587/1,501 or 39%), and number of participants with missing values for the main analyses (753/2,254 or 33%). Dropout, especially because of mortality and CVD, might be selective, because the intervention was developed to lower the risk of these events. However, a joint model analysis did not change the results, indicating that dropout did not influence the findings. Participants with missing values were of the same age, though unhealthier and more often men compared with those who continued participation (Appendix Table 1, available online). Differences between the groups included and not included in this analysis for SCORE-OP are mainly due to the fact that participants not included in the analyses had a history of CVD. A study on dropout and non-adherence to the intervention in preDIVA (n=3,526) showed that older age, poorer cognition, more symptoms of depression, and disability, and not cardiovascular risk factors, were the main determinants of dropping out.[24] In this post hoc analysis, no adjustment for multiplicity was performed. Because results are neutral, this would not have changed conclusions. In line with the pragmatic nature of the study, adherence to the intervention was not measured, precluding the possibility to repeat analyses in those with the highest adherence.

The predicted 10-year CVD mortality risk at baseline in this population is similar to that in the population in which SCORE-OP was developed (14.0% versus 14.3%).[8] Observed events increase with higher predicted risks, though baseline SCORE-OP predicts higher risks than actually observed in the population studied here, because of the follow-up duration that is half of the 10-year period over which SCORE-OP predicts risk (Appendix Table 5, available online).

Primary cardiovascular preventive interventions may yield greater effect in older people at high risk, although in frail individuals effectiveness is assumed to reverse.[18,19,21] Future research may elucidate which patient groups will benefit most from preventive interventions, by comparing trials and performing subgroup analyses. Furthermore, multicomponent interventions to prevent CVD may have a greater effect if executed in countries that have relatively low standards of vascular care in combination with sharp projected increases in incident CVD. Alternatively, interventions could be initiated at a younger age or perhaps should continue for more years.

CONCLUSIONS

In this study, nurse-led intensive vascular care during an average 6.1 years in a primary prevention setting resulted in a reduction in SBP and smoking, but did not significantly improve the cardiovascular risk factor profile as measured by SCORE-OP, nor lower CVD morbidity and mortality rates in adults aged 70–78 years. For a proof of concept of multicomponent cardiovascular care for older people, future trials should identify subgroups that will benefit most from preventive interventions, and focus on populations in settings with relatively poor standards of vascular care to achieve larger improvements on overall cardiovascular risk and clinical outcomes.

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EFvB, MPHB, ER, RJGP, WAvG, and EPMvC contributed to the conception or design of the work. EFvB, MPHB, WBB, ER, RJGP, WAvG, and EPMvC contributed to the acquisition, analysis, or interpretation of data for the work. EFvB and MPHB drafted the manuscript. All authors critically revised the manuscript and gave final approval and agree to be accountable for all aspects of work ensuring integrity and accuracy.

Trial registry for the preDIVA trial: ISRCTN; trial number: ISRCTN-29711771. www.controlled-trials.com/ISRCTN29711771.

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SUPPLEMENTAL MATERIAL

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