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5 CARDIOVASCULAR RISK ASSESSMENT AND MORTALITY OUTCOME RELATED TO PARTICIPATION IN A LONG-TERM PRIMARY PREVENTION PROGRAMME IN GENERAL PRACTICE

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Abstract

The effectiveness of primary prevention programmes for cardiovascular diseases remains controversial, though newer evidence, particularly in relation to Statin therapy, suggests more wide-scale treatment and prevention programmes should be considered. The results of the Vorarlberg Health Monitoring & Promotion Programme (VHM&PP) in Western Austria, reflecting real-life routine practice in a very large systematic programme, are strongly suggestive that general practice monitoring is beneficial, by contrast with smaller scale projects reported previously. The prognosis among re-attenders at all levels of risk is significantly better than non-returners with both cardiovascular and all-cause mortality over 10 years being significantly lower among re-attenders than those who never return, even when accounting for baseline risk factor profile. Furthermore, prognosis relates to the recall schedule, suggesting accurate clinical assessment by general practitioners. SCORE-predicted mortal-

ity exceeds observed mortality in the lowest risk groups of re-attending men and women. These findings challenge the assumption that primary prevention programmes in general practice are ineffective.

Keywords
Primary prevention, cardiovascular disease, risk factors, general practice

Introduction

International guidelines on risk factor detection and treatment programmes for cardiovascular disease (CVD) in general practice (

De Backer *et al.,* 2003) are based on both observational and experimental evidence of effective outcome, but also on the feasibility of mounting effective programmes with a high participation rate, particularly for the most vulnerable and disadvantaged groups. The optimum timing of such intervention can be controversial and varies enormously by country (Ebrahim and Davey Smith, 2004; Primatesta and Poulter, 2004). Strategies range from well-accepted secondary care programmes, high-risk detection and treatment, through to a range of activities varying from lifestyle intervention to specific pharmacological intervention for single risk factors. While appropriate randomised controlled trials are considered scientifically ideal, in routine practice such trials are rarely large enough or sustained over a sufficient period to aid the practitioner in making a decision whether specific demographic groups are benefiting from treatment and how frequently patients should be seen. This is increasingly relevant given the benefits demonstrated recently from Statin treatment in those at more moderate risk (Raza, Babb and Movahed, 2004).

The Vorarlberg Health Monitoring & Promotion Programme (Ulmer et al., 2003) in Western Austria is exceptional in several respects. It is a very large general practitioner led programme with a high degree of population participation through a centrally organised recall system, includes both men and women across adult life, and has considerable and well documented prospective follow up. Our objective in this analysis was to review all cause and cardiovascular disease mortality related to initial risk status assessment and to evaluate the impact of the programme, by relating outcome to compliance or not with the clinical recall schedule.

Methods

Since 1985 all adults in the Austrian province of Vorarlberg have been invited for a regular health check-up performed in a standardized manner by trained general practitioners. The full methodology has been described previously (5). Invitation to re-attend subsequently depends on clinical findings at this first assessment. Recall is centrally organised by the Agency for Preventive and Social Medicine. Participants were re-invited within 1.5 years if judged higher risk and within 3 years if at more moderate risk. Informed consent to process the data was obtained from all participants.

For this analysis we included participants with complete recording of risk factors seen first between 1985-1994 linked to mortality by 2001. Participants dying within 1.5 years of follow-up were excluded. Of the remaining 120,173 participants analysed here (53,801 men and 66,372 women), 26.5% never returned (Group A), 15% were seen within 1.5 years (high risk Group B), 30.1% within 3 years (intermediate risk Group C) and 28.4% later (low risk group D). There were 3327 deaths (6.2%) in men and 2991 deaths (4.5%) in women during a mean follow up time of 4602 days for men and 4747 days for women. Using the recently published SCORE function (Conroy *et al.,* 2003)) for cardiovascular risk we calculated the expected deaths from CVD for a period of 10 years. Cox proportional hazard models adjusting for age, body mass index, systolic blood pressure, total cholesterol, triglyceride, glucose, gamma glutamyltransferase (GGT), smoking, origin, marital and job status were used in order to estimate hazard ratios together with their 95% confidence intervals for all-cause and CVD mortality, relative to re-attendance group.

Results

Participants' characteristics and risk factor profiles from the first check-up are summarised in table 1 for men and table 2 for women, with the three groups who returned compared in reference to those who never returned.

Table 1. Baseline participant characteristics and risk factor profiles by return groups for men

Men[a]	group A: never returned n=15,406	group B: within 1.5 years n=7,145	group C: within 1.5 and 3 years n=15,765	group D: returned later n=15,485
	means (standard deviations)			
age (years)	41.3 (15.5)	45.7 (15.4)	43.7 (14.3)	40.7 (13.1)
body mass index (kg/sqm)	25.1 (3.7)	25.4 (3.4)	25.3 (3.4)	25.2 (3.4)
systolic blood pressure (mmHg)	132.8 (19.4)	133.5 (19.3)	132.3 (18.4)	131.5 (17.9)
diastolic blood pressure (mmHg)	82.0 (11.1)	81.8 (11.0)	81.8 (10.7)	81.9 (10.7)
cholesterol (mg/dl)	218.6 (48.5)	227.1 (47.4)	222.6 (46.3)	219.3 (46.8)
triglyceride (mg/dl)	155.3 (109.8)	164.9 (112.3)	155.12 (106.6)	152.8 (104.9)
glucose (mg/dl)	85.9 (23.8)	87.4 (26.3)	85.9 (22.8)	85.0 (20.0)
gamma gt (mg/dl)	26.3 (40.0)	25.8 (32.0)	24.4 (31.2)	24.2 (33.1)
	n (%)			
smoker	4,424 (28.7%)	2,060 (28.8%)	4,675 (29.7%)	4,727 (30.5%)
married	9,850 (67.3%)	5,532 (79.4%)	12,619 (80.9%)	12,268 (79.8%)
blue collar	6,135 (41.7%)	2,515 (35.8%)	5,018 (32.3%)	4,850 (31.9%)
national origin	13,888 (90.1%)	6,531 (91.4%)	14,612 (92.7%)	14,451 (93.3%)
deaths from all causes	1,310 (8.5%)	658 (9.2%)	905 (5.7%)	454 (2.9%)
hazard ratios (95%CI)[d]	referent	0.70 (0.63-0.77)	0.57 (0.52-0.62)	0.39 (0.35-0.44)
deaths from CVD[b]	489 (3.2%)	307 (4.3%)	446 (2.8%)	186 (1.2%)
deaths from CHD[c]	295 (1.9%)	174 (2.4%)	259 (1.6%)	123 (0.8%)
hazard ratios for CVD (95%CI)[d]	referent	0.85 (0.73-0.98)	0.78 (0.68-0.89)	0.49 (0.41-0.58)
deaths from CVD within 10-years	395 (2.6%)	214 (3%)	298 (1.9%)	106 (0.7%)
Expected deaths from CVD (10-year)[e]	367 (2.4%)	211 (3%)	352 (2.2%)	238 (1.5%)

[a]including all participants examined 1985-1994 with a valid SCORE risk function, follow-up 1985-2001, 1.5% - 3% missing values (% do not add to 100%)
[b]Cardiovascular disease (ICD-9 401-414, 426-443 with the exception of 426.7, 429.0, 430.0, 432.1, 437.3, 437.4 and 437.5, including 798.1 and 798.2)
[c]Coronary heart disease (ICD-9 410-414)
[d]adjusted for age, blood pressure, body mass index, triglycerides, glucose, GGT, smoking, marital and job status. Group A = referent category.
[e]calculated using the SCORE risk function for low risk regions

Table 2. Baseline participant characteristics and risk factor profiles by return groups for women

Women[a]	group A: never returned n=16,471	group B: within 1.5 years n=10,850	group C: within 1.5 and 3 years n=20,370	group D: returned later n=18,681
	means (standard deviations)			
age (years)	42.8 (17.7)	45.8 (16.1)	43.8 (15.1)	41.0 (14.1)
body mass index (kg/sqm)	24.3 (4.8)	24.5 (4.4)	24.3 (4.4)	24.1 (4.4)
systolic blood pressure (mmHg)	129.6 (23.1)	130.8 (22.0)	129.3 (21.6)	127.3 (20.7)
diastolic blood pressure (mmHg)	79.9 (11.3)	80.3 (11.3)	79.9 (11.0)	79.3 (11.1)
cholesterol (mg/dl)	215.4 (47.1)	224.4 (48.4)	218.9 (46.9)	213.8 (45.6)
triglyceride (mg/dl)	117.8 (70.9)	121.7 (75.3)	114.4 (68.3)	110.6 (65.4)
glucose (mg/dl)	85.2 (21.9)	84.1 (22.0)	84.2 (19.0)	84.0 (18.5)
gamma gt (mg/dl)	14.9 (23.2)	14.7 (19.4)	13.6 (15.7)	13.4 (18.3)
	n (%)			
smoker	2,914 (17.7%)	2,139 (19.7%)	4,176 (20.5%)	4,008 (21.5%)
married	9,993 (61.6%)	6,681 (61.8%)	13,498 (66.5%)	13,004 (69.9%)
blue collar	6,189 (38.9%)	4,336 (41.0%)	7,511 (37.8%)	6,494 (35.8%)
national origin	15,172 (92.1%)	10,159 (93.6%)	19,244 (94.5%)	17,572 (94.1%)
deaths from all causes	1132 (6.9%)	678 (6.2%)	805 (4%)	376 (2%)
hazard ratios (95%CI)[d]	referent	0.76 (0.69-0.85)	0.65 (0.59-0.72)	0.47 (0.42-0.52)
deaths from CVD[b]	538 (3.3%)	316 (2.9%)	365 (1.8%)	134 (0.7%)
deaths from CHD[c]	253 (1.5%)	156 (1.4%)	184 (0.9%)	65 (0.3%)
hazard ratios for CVD (95%CI)[d]	referent	0.84 (0.72-0.98)	0.79 (0.68-0.92)	0.5 (0.4-0.6)
deaths from CVD within 10-years	404 (2.5%)	187 (1.7%)	210 (1%)	63 (0.3%)
Expected deaths from CVD (10-year)[e]	343 (2.1%)	198 (1.8%)	270 (1.3%)	164 (0.9%)

[a]including all participants examined 1985-1994 with a valid SCORE risk function, follow-up 1985-2001, 1.5% - 3% missing values (% do not add to 100%)
[b]Cardiovascular disease (ICD-9 401-414, 426-443 with the exception of 426.7, 429.0, 430.0, 432.1, 437.3, 437.4 and 437.5, including 798.1 and 798.2)
[c]Coronary heart disease (ICD-9 410-414)
[d]adjusted for age, blood pressure, body mass index, triglycerides, glucose, GGT, smoking, marital and job status. Group A = referent category.
[e]calculated using the SCORE risk function for low risk regions

Participants who were seen within 1.5 years had a more adverse cardiovascular risk factor profile at baseline than the other three groups. These respondents were older than others, had a higher total cholesterol and triglyceride profile. The never returned group had highest levels of GGT and the men were more likely to be unmarried and in blue-collar occupations. The highest rates of smoking were in the group who returned more than three years from first visit and these were also younger on average. Having adjusted for the risk factor profile at baseline, hazard ratios for both CVD and all-cause mortality showed those re-attenders were notably less likely to die than non-returners, with a clearly graduated effect according to initial risk assessment. Actual observed deaths from CVD within 10-years were higher than deaths expected by the SCORE function only in the case of non-returners. Conversely mortality rates were lower than expected in the other groups of both men and women, particularly the lowest risk group.

Discussion

These data demonstrate that those who never returned have the most adverse mortality outcome. This is arguably an effect of self-selection and has been observed of course in other studies. However the notable finding here is the prognosis among re-attenders, according to initial assessment by general practitioners, which appears to be categorising patients accurately, suggesting the benefit of a systematically organised programme. The data are strongly suggestive that general practice monitoring is beneficial. Whilst the highest risk group had the expected CVD mortality predicted by the SCORE, they did significantly better than non attenders and the lowest risk groups in fact had considerably better than anticipated mortality based on the SCORE. A comparison bias must be considered since participants who returned later to the programme had to survive to do so, but we did exclude those who died within 18 months of screening to account for this in part. As we do not have linked treatment information we cannot indicate whether this accounts for the improved outcome. However this cannot be attributable only to cardiovascular risk modification given the effect persists with adjustment for those risk factors and suggests that compliers are more likely to make general lifestyle changes over and above the treatment programme. The differences in outcome between re-attenders and non-returners generally may relate to social support factors in men, who were less likely to be married, but not so in women. Alcohol is likely to be a contributory factor too, given higher GGT measures in both sexes. In conclusion this is a an example of a real-life long-term general practice follow up indicating systematic benefit from regular re-attendance.

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