The Extensive Lifestyle Management Intervention (ELMI) following cardiac rehabilitation trial

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Aim Previous studies have reported lifestyle and risk factor deterioration following completion of a cardiac rehabilitation program (CRP). We report the results of a one-year Extensive Lifestyle Management Intervention (ELMI) aimed at preventing these adverse changes.

Methods and results A total of 302 men and women with ischaemic heart disease were recruited following completion of a CRP and randomized to either the ELMI (consisting of exercise sessions, telephone follow-ups and risk factor and lifestyle counselling) or usual care. The primary outcome was global cardiovascular risk using the Framingham and Procam risk scores. Secondary outcomes included risk factors and lifestyle behaviours. Baseline characteristics were similar between the two groups. Adherence to the ELMI was high. There was a non-significant trend in favour of the ELMI between for both the Framingham (6.6±3.1 to 6.2±2.9 vs 6.6±3.2 to 6.7±3.2, P=0.138) and Procam (20.0±20.0 to 20.6±19.5 vs 19.1±18.7 to 21.8±19.1, P=0.089) scores. There were no differences in secondary outcomes.

Conclusions A one-year multi-factorial post-CRP intervention results in modest, non-significant benefits to global risk compared to usual care. The absence of deterioration in the usual care group may be due to improved practices in usual care.

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KEYWORDS
Ischaemic heart disease; Cardiac rehabilitation; Lifestyle management; Risk factors

Introduction
Cardiac rehabilitation programs (CRP) are a proven treatment for individuals with ischaemic heart disease (IHD), resulting in reduced mortality compared to usual care.1,2 Since then, CRP has improved, from an exercise-based program to a global cardiovascular risk reduction format. More recent, long-term comprehensive studies have demonstrated effective risk factor management, delayed disease progression and reduced morbidity.3,4 However, the common CRP is typically three to four months long and results of multi-year risk reduction studies may not be applicable. Current CRP rely on short-term exposure to lifestyle behaviours (exercise, diet, smoking cessation, stress reduction) and risk factor modification to result in long-term improvements to quality of life and reduced
morbidity and mortality. As many CRP do not incorporate long-term follow-up contacts into their protocol, it is hoped that participants will maintain lifestyle changes and continue to undergo risk factor modification.

Unfortunately, several studies indicate that after completion of a CRP, exercise adherence greatly decreases, body weight increases and serum lipid values deteriorate.5,6 Studied interventions to prevent this occurrence are few in number and have had mixed results.7–9 This is due to small sample sizes and the limited scope of the interventions—some targeting exercise patterns only and others focusing on lipid lowering only. Effective interventions must take global risk into account and modify all risk factors as noted by national guidelines.10,11 No study has investigated a multi-factorial intervention aimed at the prevention of behavioural recidivism and risk factor deterioration that occurs following a CRP. It is important that any such intervention be relevant to current clinical practices.

To address this issue we conducted the Extensive Lifestyle Management Intervention (ELMI) trial to investigate a randomized, one-year multi-factorial risk factor and lifestyle intervention in men and women with IHD following a CRP with the primary outcome of global cardiovascular risk. This is an effectiveness study utilizing a resource-sparing intervention based on current national guidelines.

**Methods**

Full study design of the ELMI trial has been described in detail elsewhere.12 Men and women with IHD (at least one of: myocardial infarction (MI), revascularization procedure, positive coronary angiogram or episodes of angina) were recruited from graduates of two hospital-based CRPs. These two hospitals provide tertiary care for local and remote populations. In the period relevant to study recruitment, a total of 12,048 selective coronary angiograms, 4,890 percutaneous coronary interventions and 2,945 open heart surgeries were performed in addition to approximately 15,900 admissions for acute coronary syndrome (ICD-9 codes 410, 411 or 413) at the two hospitals. Patients on the cardiac wards of these hospitals who were not transferred from outlying areas (approximately 70%), were automatically referred to the CRP, a minority of patients were referred from the surrounding community. We estimate that approximately 30% of all possible candidates at these hospitals are referred and attend the CRPs—a similar tertiary care hospital reported a 28% referral of possible patients.13 The initial CRP consisted of twice-weekly supervised exercise sessions over 16 weeks, and comprehensive lifestyle and risk factor management. Patients who had difficulty with the English language, plans to leave the treatment area or a medical condition non-cardiovascular in nature which would make participation or survival for the study’s duration unlikely were excluded. The study criteria were designed to apply to the majority of the CRP graduates. Eligible participants were asked to provide informed consent (approved by the St. Paul’s Hospital Ethics Committees). Consenting participants underwent a baseline lifestyle and risk factor assessment (exercise stress test, activity assessment, diet, quality of life, smoking status, blood pressure (BP), lipids, blood sugar, body mass index (BMI), waist circumference, and medication assessment).

Participants were balanced based on age (<63 or ≥63), gender and adjustment in lipid-lowering medications (part of the initial CRP protocol) prior to being randomized to either the

**Usual Care**

- Month 1
  - Four cardiac rehabilitation sessions

- Month 2 & 3
  - Cardiac rehabilitation session each

- Month 4 & 5
  - Telephone follow-up call each

- Month 6
  - Lifestyle and risk factor assessment

- Month 7 & 8
  - Telephone follow-up call each

- Month 9
  - Lifestyle and risk factor assessment

- Month 10 & 11
  - Telephone follow-up call each

- Month 12
  - Outcome assessment

**Extensive Lifestyle Management Intervention**

- Completion of cardiac rehabilitation program

- Recruitment and randomization

- Month 1
  - Four cardiac rehabilitation sessions

- Month 2 & 3
  - Cardiac rehabilitation session each

- Month 4 & 5
  - Telephone follow-up call each

- Month 6
  - Lifestyle and risk factor assessment

- Month 7 & 8
  - Telephone follow-up call each

- Month 9
  - Lifestyle and risk factor assessment

- Month 10 & 11
  - Telephone follow-up call each

- Month 12
  - Outcome assessment

Fig. 1 Study outline.

ELMI or Usual Care (UC) groups (Fig. 1). Randomization was conducted by computer-generated block randomization using variable block sizes of 2, 4 and 8 so that the research personnel were unaware of the pattern of group assignment. Due to the nature of the study, participants could not be blinded to their group assignment.

**Usual care group**

Participants in the UC group were informed that the research coordinator would contact them in one year for their outcome assessment. There was no attempt to control for the type of treatment the UC participants received at any time during the study.

**Extensive Lifestyle Management Intervention Group**

The ELMI was designed so that each participant was contacted at least once per month (Fig. 1) using a case management model based on principles of behavioural change.14 Cardiac rehabilitation sessions consisted of a warm up, aerobic exercise, and a
cool down (approximately 75 min in total) monitored by a case manager and exercise leader. During these sessions participants were counselled to establish a home-based exercise program. Each participant received a logbook for exercise, diet and medications at the study’s onset to aid in lifestyle adherence. Telephone follow-up calls were conducted by the case manager to identify any new or change in symptoms, follow-up on goal progress, and assess and counsel on lifestyle behaviours and risk factors.

ELMI lifestyle and risk factor counselling sessions were held at months 6 and 9 in which participants were assessed for activity, diet, fasting lipids, blood glucose (HbA1c if diabetic), BP, weight, WC, symptoms, medications and medication compliance. The 6-month assessment also included an exercise stress test and counselling sessions with an exercise specialist and a diettian. Treatment Algorithms derived from clinical guidelines at the time and expert consensuses for physical activity, dietary, weight, diabetes, lipid, blood pressure and smoking cessation management were implemented to ensure consistent management for the ELMI group while allowing for individually-tailored treatment.15–19 For adverse results of weight, diabetes and smoking, a letter with treatment recommendations (in consultation with the program cardiologist) was sent to the participant’s family physician. Participants were asked to visit their family physician to implement these recommendations.

Upon entry to the ELMI and during the lifestyle and risk factor counselling sessions, participants received an ELMI Lifestyle and Risk Factor Report. The Report outlined the participant’s current lifestyle and risk factor profile, their previous profile, current goals, and ideal risk factor and lifestyle targets. A copy of the Report was forwarded to each participant’s family physician, and cardiologist where applicable.

Assessment methods

Physical activity was determined by the 4-week modified Minnesota Leisure Time Physical Activity (LTPA) questionnaire,20 and physical fitness by a symptom limited treadmill exercise stress test reported as the maximal metabolic equivalents (METS). Dietary adherence was determined from a 3-Day Food Record and analyzed by a registered diettian using Nutritionist IV Diet Analysis software (First Data Bank). The values of average percent daily kilocalories (kcal) were reported for protein, carbohydrates, total fat, saturated fat and unsaturated fat. Quality of life was assessed by the Perceived Stress Scale21 and the Illness Intrusive Rating.22 Both of these questionnaires use Likert scoring with the reported result being the cumulative score of all the questions. Self-efficacy was reported as both a general score and an exercise specific self-efficacy score based on Likert scoring. Body mass index was calculated from weight in kilograms divided by height in metres squared. Waist circumference was measured using standard techniques and the average of two successive measures was recorded.23 Blood pressure was recorded as the average of two measures taken 2 min apart after 5 min of rest using a manual sphygmomanometer. Smoking status was determined by self-report. Serum TC, HDL-C, TG and glucose were assessed using standard methods from fasting samples.24 LDL-C was calculated using the Friedewald equation.25 The presence of angina was determined through patient interview based on standard criteria.26

Statistical power considerations

At the time of the study’s design, the variability (standard deviation) of the risk scores over the follow-up period was unknown as there were no available data. We anticipated that 10% of the participants would be lost to follow-up,27 so 90% of participants would be available for assessment of the primary outcome. With a sample size of 135 people in each group we are able to detect 0.342 of a standard deviation of the change between the two groups at a power of 80% (α=0.05, two sided, 0.363 of a standard deviation at a power of 90%). Based on data published from the Stanford Coronary Risk Intervention Project (SCRIP) study we are able to detect differences in the mean change of three main contributors to the primary outcome risk scores and individual secondary outcomes as follows: TC of 0.28 mmol/l, HDL-C of 0.08 mmol/l, and systolic BP of 3.8 mmHg. Therefore, after increasing the number randomized to account for the 10% lost at follow-up, a sample size of 300 participants was determined a priori resulting in 150 participants randomly assigned to each study group.

Statistical analyses

The primary outcome was the absolute change in IHD global risk, as assessed independently by the Framingham (FRA) and the Procam score of the closest category, ex-smokers <12 months were treated as non-smokers and those without previously diagnosed diabetes but with glucose >7.8 mmol/l (value used to define individuals with diabetes in original Framingham cohort) were scored as diabetic. For the Procam score age was held constant, family history was recorded at baseline and carried through to follow-up unchanged and participants without previously diagnosed diabetes but with glucose >6.7 mmol/l (value used to define individuals with diabetes in original Procam cohort) were scored as diabetic.

Baseline characteristics of the ELMI and UC groups were compared using the Pearson Chi-square test for categorical factors and the independent samples t-test for continuous factors. The primary outcome, absolute change in the risk scores between the ELMI and UC groups, was compared by independent samples t-test. Secondary outcomes between the ELMI and UC group that were continuous variables were assessed by independent samples t-test. Changes within each group in continuous variables were assessed by paired samples t-test. Changes within each group in binary factors were assessed by the McNemar Chi-square test. Analyses of secondary outcomes were not adjusted for the multiplicity of testing. Data on participants without any one-year follow-up information (lost to follow-up) were compared to those with complete or partial information in order to elucidate any relevant characteristics that may differ from the remainder of the study group. The groups were compared using the Pearson Chi-square test for categorical factors and the independent samples t-test for continuous factors.

Continuous factors are reported as means ± standard deviations and categorical and binary factors as counts and percentages. All statistical analyses were performed using the SPSS 10.0.07 statistical package for Microsoft Windows. Significance level for all tests was set at 0.05 and all t-tests were two-tailed. All comparisons were made using an intent to treat analysis with no cross-overs. Every effort was made to obtain as much data as possible from each participant. Lack of compliance with the intervention was not considered a reason for withdrawal from the study. Due to the vast array of outcome variables, full outcome data were not available for some participants. This was
mainly due to participant refusal (i.e., unwillingness to complete stress test, the questionnaires, or attend face to face session).

Results

Over a 28 month period, 1649 men and women attended the initial CRP, of which 1052 (64%) completed and were screened for the study. A total of 628 were eligible and 302 were recruited and randomized (151 in each group), representing 48% of eligible participants, 29% of individuals screened and 18% of those attending the CRP. Reasons for refusal to participate included: not interested, conflict in schedule with proposed intervention (i.e. currently employed), moving plans/uncertain of future plans, time in the CRP significantly extended and loss of contact. Participation in the initial CRP resulted in significant improvements to risk factors with no differences in the extent of changes between the two randomized groups (data not shown). Table 1 outlines the baseline demographics, risk factors and lifestyle factors. The two groups were similar except for a greater proportion of participants presenting with prior coronary artery bypass graft (CABG) procedure and fewer with percutaneous coronary angioplasty (PTCA) in the UC group. Usual care participants also had lower BMI and waist circumference than the ELMI participants. Medication use between the two groups was similar at baseline with the majority of those attending the CRP. Participants taking lipid-lowering therapy (primarily HMG CoA reductase inhibitors), B-blockers and ASA.

Table 1 Participant demographics and baseline comparison of IHD risk factors and lifestyle variables (totals with percentages)

<table>
<thead>
<tr>
<th></th>
<th>ELMI (n=151)</th>
<th>UC (n=151)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men</td>
<td>125 (83%)</td>
<td>124 (82%)</td>
</tr>
<tr>
<td>Age (years)</td>
<td>64.8±8.8</td>
<td>63.4±10.2</td>
</tr>
<tr>
<td>St. Paul’s Hospital CRP</td>
<td>108 (72%)</td>
<td>103 (68%)</td>
</tr>
<tr>
<td>Family History</td>
<td>43 (28%)</td>
<td>58 (38%)a</td>
</tr>
<tr>
<td>IHD presentation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MI</td>
<td>83 (55%)</td>
<td>77 (51%)</td>
</tr>
<tr>
<td>CAGB</td>
<td>46 (30%)</td>
<td>62 (41%)a</td>
</tr>
<tr>
<td>PTCA</td>
<td>66 (44%)</td>
<td>47 (31%)</td>
</tr>
<tr>
<td>Other IHD indicators</td>
<td>24 (16%)</td>
<td>28 (19%)</td>
</tr>
<tr>
<td>Angina</td>
<td>43 (28%)</td>
<td>35 (23%)</td>
</tr>
<tr>
<td>Diabetes</td>
<td>26 (17%)</td>
<td>34 (23%)</td>
</tr>
<tr>
<td>Post-menopausal</td>
<td>14 (54%)</td>
<td>17 (63%)</td>
</tr>
<tr>
<td>FRA Risk Score</td>
<td>6.6±3.1</td>
<td>6.5±3.2</td>
</tr>
<tr>
<td>PROCAM Risk Score</td>
<td>20.0±19.7</td>
<td>17.8±18.5</td>
</tr>
<tr>
<td>Total cholesterol (mmol/l)</td>
<td>4.46±0.87</td>
<td>4.59±0.93</td>
</tr>
<tr>
<td>LDL-C (mmol/l)</td>
<td>2.53±0.74</td>
<td>2.69±0.74</td>
</tr>
<tr>
<td>HDL-C (mmol/l)</td>
<td>1.13±0.31</td>
<td>1.15±0.28</td>
</tr>
<tr>
<td>Triglycerides (mmol/l)</td>
<td>1.75±0.94</td>
<td>1.65±0.83</td>
</tr>
<tr>
<td>TC/HDL-C</td>
<td>4.15±1.08</td>
<td>4.16±1.17</td>
</tr>
<tr>
<td>Glucose (mmol/l)</td>
<td>5.8±1.4</td>
<td>5.8±1.7</td>
</tr>
<tr>
<td>Blood Pressure (mmHg)</td>
<td>128/72±21/11</td>
<td>127/72±20/10</td>
</tr>
<tr>
<td>Smokers (%)</td>
<td>5 (3%)</td>
<td>7 (5%)</td>
</tr>
<tr>
<td>Exercise Capacity (METs)</td>
<td>9.8±2.7</td>
<td>10.0±2.5</td>
</tr>
<tr>
<td>LTPA (kcal/week)</td>
<td>3137±2531</td>
<td>2965±2183</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>28.1±4.2</td>
<td>27.0±3.7</td>
</tr>
<tr>
<td>Waist circumference (cm)</td>
<td>95.5±12.8</td>
<td>92.7±11.0</td>
</tr>
<tr>
<td>Diet (% daily kcal)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protein</td>
<td>19±4</td>
<td>19±4</td>
</tr>
<tr>
<td>Carbohydrate</td>
<td>56±9</td>
<td>57±8</td>
</tr>
<tr>
<td>Fat</td>
<td>22±7</td>
<td>22±7</td>
</tr>
<tr>
<td>Saturated</td>
<td>6±3</td>
<td>6±3</td>
</tr>
<tr>
<td>Ununsaturated</td>
<td>13±4</td>
<td>13±5</td>
</tr>
<tr>
<td>Quality of life</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived stress</td>
<td>33±7</td>
<td>32±8</td>
</tr>
<tr>
<td>Illness intrusive</td>
<td>31±14</td>
<td>31±15</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>42±4</td>
<td>42±5</td>
</tr>
<tr>
<td>Exercise self-efficacy</td>
<td>66±11</td>
<td>65±13</td>
</tr>
</tbody>
</table>

aP<0.05 by Pearson Chi-square test.

The mean follow-up period was similar between the two groups, 13.0±1.2 vs 13.0±1.3 months for the UC and ELMI groups, respectively. With respect to the primary outcome, only those participants who had baseline and one-year outcome data for all variables required for the global risk scores were included in the analyses. There were no statistically significant differences between the participants for months 6 and 9, respectively, had letters of recommendation mailed to their family physicians from the ELMI supervising cardiologist regarding their patient’s weight blood sugar, lipid or BP management. Of these, the ELMI participant’s family physician implemented the recommendations 55% of the time. At the end of one year, the average participant in the ELMI underwent 9 h and 11 min of intervention.

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change in the FRA and Procam scores of the two groups: -0.34±2.46 vs 0.09±2.08 for the FRA score ($P=0.138$) and 0.54±9.52 vs 2.74±10.60 for the Procam score ($P=0.089$), for the ELMI and UC groups respectively. Table 2 outlines the changes in the risk scores from baseline to one year within each group. Among the secondary outcomes there were no significant differences with respect to change in these factors between the two groups.

**Discussion**

Difficulties with IHD risk factor management and lifestyle adherence have been well described. Studies to date investigating these factors following a CRP report a deterioration of risk factors and lifestyle behaviours. The ELMI trial is the first study to
investigate a comprehensive, individually-tailored risk factor and lifestyle management intervention aimed at preventing the deterioration of risk factors and lifestyle behaviours following a CRP.

After one year of risk factor and lifestyle intervention we found no significant differences between the ELMI and UC groups with respect to changes in IHD global risk. There was a non-significant trend in favour of the ELMI group for both the FRA and Procam risk scores. Compared to baseline, the Procam risk score significantly increased in the UC group. With respect to the secondary outcomes of risk factors and lifestyle behaviours, there were no significant differences between the two groups. Many of the within group changes that were significant were common to both study groups and in the same directions (HDL-C, glucose, physical activity and illness intrusiveness). Of note was a significant increase in systolic BP and waist circumference in the UC group that was not observed in the ELMI group.

This trial was designed to test the effectiveness of case management practices utilizing current clinical guidelines in a manner that can be readily adopted into clinical practices. The gap between current guidelines and treatment is well-described.32,33 Given the high attendance and completion of the ELMI, we feel we were successful in conducting a clinical intervention that is resource sparing and closes the treatment gap through communication with family physicians. While the limited benefit of the intervention may be initially surprising, these results are consistent with the only other studies that have investigated interventions following a CRP.

One reported lower TC and LDL-C levels in 20 people at the end of a one-year intervention of monthly counselling sessions compared to a usual care group, but did not report any significant changes from baseline values.8 The other reported no significant differences in weight, serum lipids or exercise capacity between 31 people randomized to a home-based maintenance program of an initial visit to the participants’ home followed by telephone calls every two weeks and usual care.7 It is possible that these studies were limited by the small sample sizes, however, our much larger sample confirms these modest findings, highlighting the challenge of long-term secondary prevention in clinical practice.

A similar intervention to the ELMI trial was used in the Multi-Fit study, utilizing a case managed intervention incorporating counselling, telephone follow-up and mailed reports.34 After one year, the average patient received nine hours of intervention contact which resulted in significantly greater reductions in TC, LDL-C and smoking cessation rates, however, no significant changes were reported in other risk factors. Despite a similar intervention with the ELMI trial, some key differences exist: the Multi-Fit study was conducted when lipid-lowering therapy was not a common practice, the LDL-C target for the intervention group was 2.46 mmol/l compared to 3.36 mmol/l (the national guideline at the time), resulting in a more aggressive approach to LDL-C reduction and the study began upon hospital admission for MI, a time which provides an excellent window of opportunity for lifestyle and risk factor management. In contrast, 87% and 80% of the ELMI and UC participants in the current trial were using lipid-lowering therapy at baseline, the ELMI trial utilized the same risk factor targets as those used in primary practice and the intervention began after a CRP in which participants had already undergone significant lifestyle and risk factor management. It is possible these differences may in part account for the discrepancy in results between the two studies.

More elaborate interventions have resulted in more profound improvements as demonstrated by the SCRIP and Lifestyle Heart Trial.3,35 The interventions used in both of these studies were conducted over a much longer duration than the current trial and more aggressive in their risk factor targets compared to usual care. As a result, a bias in favour of the intervention cannot be ruled out. Despite the remarkable findings of these studies, they have only had a minimal effect on the clinical practice of CRP.

Our hypothesis was developed based on reports which indicated that lifestyle and risk factors begin to deteriorate following completion of a CRP: only 50% of patients reported using heart rate monitoring as an indicator of exercise intensity.31 less than one third reported exercising at the recommend frequency.9 TC, LDL-C and TG increased significantly two and a half years following a CRP6 and BP, BMI, TC LDL-C and TG significantly increased one year following a four week CRP.6 In the ELMI trial, there was no clinically significant deterioration of risk factors and lifestyle behaviours in the UC group- in fact some factors had improved after one year. As many of the previous studies were completed several years earlier, it is possible that usual care practices have changed since these reports. Indeed, the use of ASA, beta-blockers, anti-hypertensive and lipid-lowering therapies has increased over recent years.32,36,37 This is also reflected by the relatively low values of risk factors in the study cohort at baseline, particularly cholesterol and blood pressure. Even though all participants had IHD, the mean risk factor profile is indicative of low to moderate risk patients and therefore a one-year follow-up may be limited with respect to benefits as a result of secondary prevention. A recent report published after the initiation of the ELMI trial reported no significant worsening of risk factors one year following a 12-week CRP which may reflect improved usual care.38

The possibility of a self-selection bias cannot be ruled out given the willingness to participate in a CRP and then volunteer for a long-term adherence study. Those patients who were highly motivated and more conscious of their health may have more readily participated in the study irrespective of their group assignment. This may account for the high attendance of the participants. However, our ability to recruit nearly 1/3 of the screened and nearly 1/2 of the eligible population is comparable to the SCRIP study3 and superior to major pharmaceutical trials.39 This cohort presents with similar characteristics to that reported in a survey of American CRP with respect to age, proportion of previous MI and CABG, and percentage of those with diabetes.40 Although those who were lost-to-follow-up had a significantly lower exercise
capacity and lower self-efficacy (borderline), we did not adjust for these factors in the analysis of the primary outcome as the proportion of those lost-to-follow-up was similar between groups and the influence of these factors on the primary outcome global risk scores is not established.

The possible limitation of using global risk scores developed from primary prevention cohorts as the primary outcome must also be considered. These scores were chosen due to the lack of any secondary prevention global risk scores and the fact that global risk is superior to any single risk factor. Given the multi-factorial nature of IHD and the intervention used, these scores have the ability to reflect the additive effect of small changes in individual risk factors. The lack of previous available data for the global risk scores may have limited the ability to properly power the study. Based on the variability of these risk scores and the current sample size, a difference between the two groups of 0.76 and 3.33 for the FRA and Procam scores, respectively, could be detected at 80% power.

After one year of a multi-factorial risk factor and lifestyle intervention following a CRP we observed a non-significant trend in favour of the intervention with respect to global risk reduction compared to the UC group. It is possible that these differences may become more pronounced in the following years as benefits to low-and moderate risk patients as a result of secondary prevention occur over a longer time period. Therefore it may be premature for any recommendation regarding extended follow-up in a similar population of CRP participants. However, these results cannot be generalized to high-risk patients or in areas where rehabilitation services are limited, in which a similar program may be beneficial even after one year. Surprisingly, we did not observe any remarkable deterioration in the UC group. Given previous reports that indicate a worsening of risk factors and lifestyle adherence following cardiac rehabilitation, it is unclear if this finding is site-specific or factors on the primary outcome global risk scores is not established.

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