New approaches to the implementation of cardiovascular disease prevention
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CHAPTER 7

PARTICIPATION IN A NURSE COORDINATED PREVENTION PROGRAMME IMPROVES HEALTH RELATED QUALITY OF LIFE AND REDUCES DEPRESSIVE SYMPTOMS IN PATIENTS WITH AN ACUTE CORONARY SYNDROME

RESULTS OF THE RESPONSE TRIAL


Under review BMC cardiovascular disorders

* contributed equally
ABSTRACT

BACKGROUND: Health-related quality of life (HRQOL) is an important goal in preventive cardiology. HRQOL is related to depressive symptoms, a common co-morbidity and risk factor in patients with an acute coronary syndrome (ACS). Comprehensive nurse-coordinated prevention programmes (NCCP) in secondary care reduce cardiovascular risk, however, their effects of on HRQOL and depressive symptoms have not yet been evaluated. We therefore investigated HRQOL and depressive symptoms in a secondary analysis in the RESPONSE trial, a randomised multicentre trial evaluating the effect of a NCPP on cardiovascular risk.

METHODS: RESPONSE was a multicentre (n=11) randomised controlled trial in ACS-patients in secondary and tertiary healthcare settings evaluating a NCPP. The intervention consisted of four outpatient nurse clinic visits in the first 6 months after the index event, focusing on healthy lifestyles, biometric risk factors and medication adherence, in addition to usual care. The control group received usual care only. The outcome was change in HRQOL as measured by the MacNew questionnaire and change in depressive symptoms as measured by Beck’s Depression Inventory (BDI) questionnaire at 12-months follow-up relative to baseline.

RESULTS: Of 754 patients randomised, 615 were analysed for HRQOL; 120 for depressive symptoms. At baseline, HRQOL was 5.2 (SD 1.1)(scale range 1.0 to 7.0) in both groups. At 12 months follow-up, HRQOL increased by 0.6 (SD 0.9) in the intervention group as compared with 0.4 (SD 0.9) in the control group (p=0.03). This increase was observed across all relevant subscales. The BDI decreased by 1.9 in the intervention group as compared with 0.03 in the control group (p=0.03)(scale range 1.0 to 63).

CONCLUSION: Participation in a NCPP is associated with a modest but statistically significant increase in HRQOL, and a decrease of depressive symptoms, both of which are highly relevant to patients. A reduction in depressive symptoms may in addition contribute to a reduction in the overall risk of recurrent events.
INTRODUCTION

Patients with established coronary artery disease are at high risk of recurrent coronary events and mortality. Effective secondary prevention, including optimal medical therapy and lifestyle interventions (i.e. smoking cessation, healthy diet, weight loss/maintenance and regular exercise) can significantly reduce this risk.\textsuperscript{1,2} To optimise cardiovascular risk factors, nurses as disease managers have been demonstrated to be effective in several prevention programmes,\textsuperscript{3-6} and the European Guideline on cardiovascular disease prevention and the World Health Organisation recommend nurse-coordinated prevention programmes (NCPP) to be integrated into healthcare systems, and such programmes are increasingly being implemented in clinical practice.\textsuperscript{2,7} We have previously shown that participation in a NCPP as part of the RESPONSE (Randomised Evaluation of Secondary Prevention by Outpatient Nurse SpEcialist) trial leads to a reduction in cardiovascular risk and a reduction of hospital admissions for non-cardiac diagnoses. This trial included patients with an acute coronary syndrome (ACS); most of whom with multiple risk factors, including a high prevalence of lifestyle related risk factors. In short, the intervention group received nurse-coordinated care on top of usual care, while the control group received usual care only. We found that a NCPP improves risk factor control after one year. However, lifestyle-related risk factors, such as smoking and overweight, remained largely unchanged, with the exception of physical activity, where we documented an improvement (self-reported).\textsuperscript{8}

Health related quality of life (HRQOL), including emotional, physical and social well-being is an important goal in preventive cardiology, in addition to optimal risk factor control.\textsuperscript{9} Patients with an unhealthy lifestyle have been shown to have a lower HRQOL.\textsuperscript{10} Nevertheless, lifestyle interventions have been shown to improve HRQOL.\textsuperscript{11} Furthermore, HRQOL is influenced by a wide range of factors, such as patient characteristics and emotions, but also by factors as the quality of information and communication - factors which are targeted by NCPPs.

Furthermore, HRQOL is related to depressive symptoms. Depression is a common comorbidity among ACS-patients, with an incidence in the year after an acute myocardial infarction ranging from 10 to 30\% per year.\textsuperscript{12-14} Major and minor depressions have been shown to be independent risk factors for cardiovascular mortality.\textsuperscript{15,16} Recently, the American Heart Association listed depression as a risk factor for adverse medical outcomes in ACS-patients.\textsuperscript{16} Depression is also associated with a higher prevalence of unhealthy behaviours, such as smoking and a sedentary lifestyle, and depression per se may also contribute to poorer cardiovascular outcomes.\textsuperscript{17-19}

Participation in an NCPP may improve HRQOL or depressive symptoms, resulting from continued care and attention to the patient’s personal situation. However, it may potentially also be associated with a reduced HRQOL and even with depressive symptoms, as a result of changes in lifestyle such as cessation of smoking, arduous efforts to lose weight and limitations in alcohol intake. Therefore it is important to investigate whether a NCPP with as primary goal to optimise risk factors impacts on HRQOL and on depressive symptoms in a group of ACS-patients and a high prevalence of CVD risk factors, including lifestyle related risk factors. We therefore aimed to investigate the change in HRQOL and depressive symptoms in the RESPONSE-population.
METHODS

Study design

The RESPONSE trial was a multicentre, randomised controlled trial conducted in 11 hospitals in the Netherlands from June 2006 to July 2009. The study was designed to evaluate the impact of a practical, hospital-based NCPP on top of usual care in patients hospitalised for an acute coronary syndrome. The RESPONSE trial has been described in detail elsewhere, and is briefly summarised below.

Patient Population

Eligible patients were 18-80 years of age, admitted for ACS (ST-segment myocardial infarction, non-ST-segment elevation myocardial infarction or unstable angina pectoris) within eight weeks prior to entry into the study. Exclusion criteria were: 1) visits to outpatient clinic not feasible 2) not available for follow-up 3) surgery or percutaneous coronary intervention expected within 8 weeks after inclusion 4) limited life expectancy (≤2 years) 5) previously enrolled in a NCPP, 6) congestive heart failure New York Heart Association class III or IV.

Patients were screened during or shortly after hospitalisation by their treating physician or a trained nurse. Patients were randomised using an online block-stratified randomisation protocol. The institutional committees on human research of all recruiting hospitals approved the protocol and informed consent was obtained from all patients.

Intervention group

Patients randomised to the intervention group were invited to attend the NCPP in addition to usual care. This programme included 4 outpatient clinic visits to a cardiovascular nurse during the first 6 months after inclusion. Between 6 months and 1 year there were no visits to the NCPP.

The NCPP was developed based on national and international guidelines, focusing on (1) healthy lifestyles, (2) biometric risk factors, and (3) medication adherence. Each visit was structured by pre-defined topics, including smoking status, dietary status, level of physical activity, and medication use. Smoking was defined as smoking prior to the index event, physically inactive was defined as less than 30 minutes of moderate physical activity per day for at least 5 days per week. The nurse provided advice on lifestyle and gave individual counselling and education as appropriate. During each visit weight, waist circumference, blood pressure, lipid profile (total cholesterol, LDL-cholesterol, HDL-cholesterol, triglyceride), fasting glucose and HbA1c were measured. For each variable, a target value was defined. When this target value was not reached, medication could be changed (in collaboration with the treating physician), or the patient could be referred to another health professional, in addition to counselling and advice.
Study nurses were all registered nurses with a 4-year bachelor’s degree, and competent in cardiac care. As part of the study, nurses were trained during a 3 day course in the principles of motivational interviewing, a method often utilised to achieve lifestyle changes.22

Control group

Patients randomised to the control group received usual care only, including visits to their treating cardiologists and other relevant specialists, and were offered cardiovascular rehabilitation according to national guidelines 21

Data collection

For our analysis, we used data collected at baseline and 12 months follow-up. Demographics (gender, educational status, work status, civil status and ethnicity), and cardiovascular risk factors (cardiovascular history, smoking status prior to index event, dietary status, level of physical activity and medication) were self-reported. Weight, height, waist circumferences, and blood pressure were objectively measured. Fasting blood samples were analysed for lipid profiles, glucose and HbA1c.

Health-related Quality of Life (HRQOL)

We used the MacNew Heart Disease Heart-related Quality of Life questionnaire (MacNew) to measure quality of life. MacNew is a self-administered instrument consisting 27 items related to three domains of HRQOL: emotional, physical and social quality of life. Each item is rated on a 7-point Likert scale, where ‘1’ indicates poor HRQOL and ‘7’ indicates good HRQOL. A total score is calculated by taking the average of the score on each item. Missing items do not contribute to the total score, and if more than 4 items were missing a total score is not calculated. An emotional subscale score is calculated by 14 items (questions 1,2,3,4,5,6,7,8,10,15 and 18), a physical subscale score by 13 items (questions 2,6,9,11,14,16,17,19,20 and 21), and a social subscale score by 13 items (questions 11,12,13,15,22,23 and 27). The MacNew has been shown to be a valid, reliable and responsive questionnaire for patients diagnosed with myocardial infarction and angina pectoris.23

Depression screening

Data collection on depressive symptoms was added in a subset of patients (included in 6 hospitals) after initiation of the main study from September 2008 till July 2009 (protocol addendum). For depression screening, we used the Beck Depression Inventory (BDI). The BDI is a 21 item self-report questionnaire, developed to assess the presence and severity of depressive symptoms. Each item is rated on a 0-3 scale. A total score is presented as the sum of all items. The BDI is a reliable and validated measure of depressive symptomatology.24 A BDI score ≥ 10 indicates at least mild to moderate symptoms of depression and has been associated with poor prognosis in MI patients.15 For our analysis, patients with a BDI score higher or equal to 10 were classified as depressed, and patients with a BDI score lower than 10 were classified as non-depressed.
Study Outcomes

The impact of the NCPP on HRQOL was measured as the change in mean score of the MacNew questionnaire between baseline and 12 months, comparing the intervention group with the control group. The impact of the NCPP on depressive symptoms was similarly measured in the subgroup using the BDI. Both outcomes were secondary outcomes of the RESPONSE trial.

Statistical Methods

Continuous variables with a normal distribution are presented as mean and standard deviation (SD); categorical variables are presented as a number and percentage. Comparisons between groups for continuous data were analysed by independent samples t-tests or Mann Whitney U-tests, categorical data by χ² tests or Fisher’s exact tests, as appropriate. SPSS statistics version 22.0 was used for all statistical analyses.

RESULTS

A total of 1711 patients were screened for eligibility, and 754 patients were included and randomised in the RESPONSE study; of those 710 (94%) patients attended 12 months follow up. For the present analyses, we included 615 (87%) patients with complete MacNew questionnaires at baseline and 12 months (308 in the intervention group and 307 in the control group). (Figure 1) Patients who did not have complete questionnaires were younger, less educated, unmarried or single, and had less peripheral artery disease. Of these 615 patients, 120 (20%) patients had complete BDI-data at baseline and 12 months.

Figure 1. Trial profile
Patient characteristics are presented in Table 1. The mean age was 58 years, and 20% of the patients were female. The majority (73%) of the study population had no known previous cardiovascular disease before admission for an ACS. In total, 44% of the patients were current smokers, more than 70% had a BMI > 25 kg/m², and 49% were physically inactive. Characteristics of the patients screened for depressive symptoms were comparable with the total group. At baseline the BDI score was 8.1 (SD 7.2) in the intervention group and 6.1 (SD 5.1) in the control group. Fifteen (28%) patients were depressed in the intervention group and 14 (21%) patients were depressed in the control group (BDI >10).

Table 1. Population characteristics

<table>
<thead>
<tr>
<th>Patient Characteristics</th>
<th>Included in HRQOL analysis</th>
<th>Included in depression analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Intervention</td>
<td>Control</td>
</tr>
<tr>
<td></td>
<td>n=308</td>
<td>n=307</td>
</tr>
<tr>
<td>Demographics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age (years)</td>
<td>57.7 (9.5)</td>
<td>58.2 (9.7)</td>
</tr>
<tr>
<td>Female</td>
<td>63 (21%)</td>
<td>63 (21%)</td>
</tr>
<tr>
<td>Caucasian</td>
<td>282 (92%)</td>
<td>281 (92%)</td>
</tr>
<tr>
<td>Higher education (&gt;8 years)</td>
<td>69 (22%)</td>
<td>65 (21%)</td>
</tr>
<tr>
<td>Employed (fulltime or part-time)</td>
<td>162 (53%)</td>
<td>171 (56%)</td>
</tr>
<tr>
<td>Married / cohabiting</td>
<td>250 (81%)</td>
<td>257 (84%)</td>
</tr>
<tr>
<td>Previous vascular disease</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Myocardial infarction</td>
<td>51 (17%)</td>
<td>54 (18%)</td>
</tr>
<tr>
<td>Percutaneous coronary intervention</td>
<td>41 (13%)</td>
<td>46 (15%)</td>
</tr>
<tr>
<td>Coronary artery bypass surgery</td>
<td>14 (5%)</td>
<td>17 (6%)</td>
</tr>
<tr>
<td>Stroke</td>
<td>12 (4%)</td>
<td>7 (2%)</td>
</tr>
<tr>
<td>Peripheral artery disease</td>
<td>18 (6%)</td>
<td>22 (7%)</td>
</tr>
<tr>
<td>No known previous CVD</td>
<td>224 (73%)</td>
<td>222 (73%)</td>
</tr>
<tr>
<td>Cardiovascular risk factors</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Family history of CVD</td>
<td>179 (58%)</td>
<td>187 (61%)</td>
</tr>
<tr>
<td>Diagnosed diabetes mellitus</td>
<td>42 (14%)</td>
<td>42 (14%)</td>
</tr>
<tr>
<td>Dyslipidaemia before hospital admission</td>
<td>214 (70%)</td>
<td>218 (71%)</td>
</tr>
<tr>
<td>Hypertension before hospital admission</td>
<td>120 (39%)</td>
<td>107 (35%)</td>
</tr>
<tr>
<td>Current smoking</td>
<td>142 (46%)</td>
<td>126 (41%)</td>
</tr>
<tr>
<td>Overweight (BMI&gt;25)</td>
<td>241 (78%)</td>
<td>219 (71%)</td>
</tr>
<tr>
<td>Physically inactive</td>
<td>155 (50%)</td>
<td>149 (49%)</td>
</tr>
<tr>
<td>Depression parameters</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BDI score</td>
<td>8.1 (7.2)</td>
<td>6.1 (5.1)</td>
</tr>
<tr>
<td>BDI ≥ 10</td>
<td>15 (28%)</td>
<td>14 (21%)</td>
</tr>
</tbody>
</table>

Data are presented as number (percentage), mean ± standard deviation, or median (interquartile range).

Table 2 presents the scores and the changes in MacNew between baseline and 12 months follow-up. HRQOL improved in both groups. There was a slight but statistically significant improvement in MacNew scores at 12 months in favour of the intervention group [Intervention +0.6 (SD 0.9) vs. control +0.4 (SD 0.9) p=0.03]. This improvement was consistent across all three dimensions of the questionnaire (emotional, physical and social). The absolute difference in mean change between the intervention and control group was 0.15 (95% CI 0.02-0.29 p=0.03).
Table 2. Non-fatal 10-year CVD according to type

<table>
<thead>
<tr>
<th>Type</th>
<th>Baseline Intervention (n=308)</th>
<th>Baseline Control (n=307)</th>
<th>12 months Intervention (n=308)</th>
<th>12 months Control (n=307)</th>
<th>Change from baseline to 12 months</th>
<th>Mean Difference of the Mean</th>
<th>St. Error</th>
<th>95% C.I. Lower</th>
<th>95% C.I. Upper</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>MacNew Total</td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td>Mean Difference of the Mean</td>
<td>St. Error</td>
<td>Mean Difference of the Mean</td>
<td>St. Error</td>
<td>Mean Difference of the Mean</td>
</tr>
<tr>
<td>Emotional subscale</td>
<td>5.2 (1.1)</td>
<td>5.2 (1.0)</td>
<td>5.7 (0.9)</td>
<td>5.6 (1.1)</td>
<td>0.57</td>
<td>0.42</td>
<td>0.15</td>
<td>0.07</td>
<td>0.29</td>
<td>0.03</td>
</tr>
<tr>
<td>Physical subscale</td>
<td>5.0 (1.2)</td>
<td>5.0 (1.2)</td>
<td>5.6 (1.1)</td>
<td>5.4 (1.1)</td>
<td>0.51</td>
<td>0.37</td>
<td>0.15</td>
<td>0.08</td>
<td>-0.12</td>
<td>0.07</td>
</tr>
<tr>
<td>Social subscale</td>
<td>5.5 (1.2)</td>
<td>5.5 (1.1)</td>
<td>6.2 (0.9)</td>
<td>6.0 (1.1)</td>
<td>0.64</td>
<td>0.46</td>
<td>0.18</td>
<td>0.08</td>
<td>0.02</td>
<td>0.03</td>
</tr>
</tbody>
</table>

CVD = cardiovascular disease
Non-fatal 10-year CVD includes CVD diseases or events requiring hospitalization. Fatal CVD is not included in the table.
Data are presented as number (percentage). Percentages may not add up to 100 because of rounding.
In patients with depression screening, the intervention group showed a decrease of 1.9 points as compared with 0.03 points in the control group (p=0.03). The mean difference between the intervention and the control group was -1.84 points [(95% C.I. -3.45 to -0.20) p=0.03]. At 12 months, 12 patients in the intervention group were depressed as compared to 11 in the control group (p=ns).

**DISCUSSION**

The main finding of our study is that participation in an NCPP leads to an increase in HRQOL on top of improved risk factor control in patients who have been hospitalised for an ACS. This increase in HRQOL was seen across all the emotional, physical and social subscales. Furthermore, an NCPP contributes to a reduction in depressive symptoms in ACS patients. However, there was no difference in the number of depressed patients between the intervention and control group based on a binary definition.

In addition to morbidity and mortality outcomes, HRQOL is an indicator of disease-related symptoms and improvement of overall function, and plays an important role in treatment strategies. A consensus statement from the Society for Cardiovascular Angiography and Interventions advocates that HRQOL outcomes should be measured in clinical trials and guidelines. In line with this, our study reports the HRQOL outcomes from a large, randomised controlled trial investigating the effect of such a programme on cardiovascular risk factors.

Several studies have shown that HRQOL improves after treatment in patients with coronary artery disease undergoing a percutaneous coronary intervention, coronary artery bypass grafting or treated with optimal medical therapy. In our study, revascularisation rates in both groups were comparable. Patients randomised to the intervention group received greater emphasis on improvement of risk profiles through adherence to medication and changing unhealthy lifestyles. Usual care, as provided in both groups, included visits to cardiologists, general practitioners and other relevant health personnel, and there were no restrictions in either group as to participation in cardiac rehabilitation programmes. Accordingly, the observed improvement in HRQOL was achieved against a background of a high level of usual care, and with excellent adherence to medication in both groups.

Clinically meaningful changes in the total score of the MacNew have been reported to be in the magnitude of 0.5, similar to our results. Although both groups showed improvement in quality of life, the intervention group improved more than the control group. Potential explanations for this improvement include more individual attention from the nurses, and their ability to respond to individual patient’s needs, as well as providing better information.

In the EuroAspire III survey (2006-2007), conducted in 8745 patients with coronary artery disease in 22 European countries, HRQOL was shown to be higher in patients adopting healthier lifestyles. However, the EuroAspire III survey was designed as a cross-sectional study, and the direction of the association between HRQOL and lifestyle is uncertain. Adding to their observations, our study shows that attending an NCPP (on top of usual care) that improves both medication adherence and lifestyle components, leads to a greater improvement in HRQOL than usual alone.

Murchie et al. (2004) investigated the effect of a NCPP on quality of life (QOL) as measured by
Short-Form 36 (SF-36). At 12-months follow-up, they showed a significant improvement in 5 of 8 domains of SF-36, comparable with our findings. However, our NCPP took place in a hospital setting and, by comparison, we included younger patients (58 years vs 66 years) with a more recent coronary event. Furthermore, our measure of interest was HRQOL as opposed to generic QOL. In a cluster-randomised trial in primary practices, Khunti et al. (2007) found a slight increase in QOL (SF36) in patients with coronary heart disease attending specialist nurse managers as compared with usual care. This increase reached statistical significance in the domains of physical functioning, general health, vitality, social functioning and mental health. This study population consisted mainly of chronic patients, and the intervention was delivered in the primary practice.

Consistent with our findings, a meta-analysis by Ekers et al. showed that nurse-delivered collaborative care is an effective treatment for depression in several chronic health problems, including in coronary heart disease. However, studies were included with nurse interventions specifically targeting depression, where nurses received brief periods of training for this purpose. In our study, nurses received training in motivational interviewing and secondary prevention, but not specifically for depression treatment, as depression treatment was not a pre-specified target for our nurse delivered intervention. Possibly, the nurse and the extra attention and care received by patients visiting the NCPP have, on their own, a modestly positive effect on depressive symptoms. Furthermore, while the mean decrease in BDI was higher in the intervention group as compared with the control group, it was not sufficient to change the prevalence of the number of depressed patients at 12 months, with 12 (22%) patients in the intervention group and 11 (17%) patients in the control group having a BDI>10 after one year.

Strengths and limitations

There are several strengths to our study. First, we assessed HRQOL in a large, contemporary randomised multicentre trial with a well-defined trial population. Second, the NCPP investigated in the trial was a practical intervention with clearly defined intervention components, facilitating future implementation of comparable programmes. Finally, complete questionnaires on HRQOL were available in the majority of patients, making selection bias unlikely.

Some limitations should be considered when interpreting our results. First, we did not collect data on systolic left ventricular (dys) function. However, no patients in our trial had severe, symptomatic heart failure, as we excluded all patients with heart failure NYHA class III or IV. Only 6 patients (in the control group) were hospitalised for congestive heart failure during follow-up, making congestive heart failure unlikely as a cause for the slight difference in HRQOL observed between the groups. Second, we excluded patients >80 years of age. While the different components of secondary prevention should always be considered in the context of life expectancy, improvements in HRQOL would be of value in patients >80 years. While it is conceivable that an increase in HRQOL may be observed in patients older than included in our trial, we cannot infer this from our data. Third, our trial included a slightly lower proportion of women as compared with other national and international surveys. In the European Action on Secondary and Primary Prevention by Intervention to Reduce Events (EUROASPIRE) III survey, performed in 22 countries in Europe (including the Netherlands), 27% of participants were women. Fourth, we collected data about depression in a small sample, as this component of the study was added to the protocol after initiation of the main trial. Although only a modest number of patients were screened for depressive
symptoms, we observed a small but significant difference between the groups.

Conclusion

Our study suggests that participation in a nurse-coordinated prevention programme with four outpatient clinic visits in addition to usual care leads to a small but significant improvement in HRQOL in patients with coronary artery disease. This improvement was seen across the emotional, physical and social dimensions of HRQOL. In addition to the effect on HRQOL, the NCPP was found to reduce depressive symptoms in these patients. In conclusion, our study shows that an NCCP has a favourable effect on HRQOL and depressive symptoms in patients who have been hospitalised for an ACS.

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