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Translating guidelines to practice: findings from a multidisciplinary preventive cardiology programme in the west of Ireland

Irene Gibson[1], Gerard Flaherty[1,2], Sarah Cormican[2], Jennifer Jones[1,3], Claire Kerins[1], Anne Marie Walsh[1], Caroline Costello[1], Jane Windle[1], Susan Connolly[3,4] and James Crowley[1,5]

Abstract

Aims: The aim of this observational, descriptive study is to evaluate the impact of an intensive, evidence-based preventive cardiology programme on medical and lifestyle risk factors in patients at high risk of developing cardiovascular disease (CVD).

Methods: Increased CVD risk patients and their family members/partners were invited to attend a 16-week programme consisting of a professional multidisciplinary lifestyle intervention, with appropriate risk factor and therapeutic management in a community setting. Smoking, dietary habits, physical activity levels, waist circumference and body mass index, and medical risk factors were measured at initial assessment, at end of programme, and at 1-year follow up.

Results: Adherence to the programme was high, with 375 (87.2%) participants and 181 (84.6%) partners having completed the programme, with 1-year data being obtained from 235 (93.6%) patients and 107 (90.7%) partners. There were statistically significant improvements in both lifestyle (body mass index, waist circumference, physical activity, Mediterranean diet score, fish, fruit, and vegetable consumption, smoking cessation rates), psychosocial (anxiety and depression scales and quality of life indices), and medical risk factors (blood pressure, lipid and glycaemic targets) between baseline and end of programme, with these improvements being sustained at 1-year follow up.

Conclusions: These findings demonstrate how a holistic model of CVD prevention can improve cardiovascular risk factors by achieving healthier lifestyles and optimal medical management.

Keywords

Cardiovascular disease prevention, guidelines, lifestyle modification, medical risk factor management, multidisciplinary team

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Introduction

Cardiovascular disease (CVD) is the leading cause of mortality globally.[1] In Europe, CVD accounts for 42% of premature deaths,[2] while in Ireland disease of the circulatory system is the leading cause of death[3] with high CVD mortality compared to European averages. The mortality rate caused by CVD is 25/100,000 per year in Ireland compared to 18/100,000 per year across the EU15 countries.[4] Not only does CVD impact greatly on life years and quality of life, it also exerts a large economic burden, costing the EU

[1]West of Ireland Cardiac Foundation, Galway, Ireland
[2]National University of Ireland, Galway, Ireland
[3]Imperial College, London, UK
[4]Imperial College Healthcare NHS Trust, London, UK
[5]University Hospital Galway, Galway, Ireland

Corresponding author:
Irene Gibson, Croí, West of Ireland Cardiac Foundation, Heart and Stroke Centre, Moyola Lane, Newcastle, Galway, Ireland.
Email: irene@croi.ie

economy €192 billion per year.[2] Investment in reducing the burden of CVD will lead to long-term savings in the health budget and reduce productivity losses in other sectors.[5]

Up to 90% of CVD is accounted for by nine modifiable risk factors, with lifestyle factors alone accounting for over three-quarters of CVD.[6] CVD prevention may be undertaken at a population level or through a high-risk strategy, targeting individuals most likely to experience CVD for aggressive risk factor reduction. Although it was conventionally accepted that the impact of this high-risk approach on population levels of a disease would be small,[7] recent improvements in our ability to manage risk factors and identify high-risk individuals at greatest risk have led to a consensus that a combination of both methods leads to the greatest reductions in mortality.[8]

The efficacy of both methods of CVD prevention is well established. In many Western countries, some reductions in CVD mortality have been achieved in recent years[9] which can be attributable to improved management of risk factors.[10] In Ireland, application of the IMPACT model confirms the benefits of aggressive risk factor modification in reducing CVD mortality.[11] However, rising levels of obesity and type 2 diabetes could begin to negate the benefits achieved through better control of CVD risk factors.[4,12] Additionally while risk factor management has improved, European-wide data suggest that usual care of high-risk patients in general practice is suboptimal.[13]

Using the Systematic Cardiovascular Risk Estimation (SCORE) chart, high-risk individuals may be identified.[14] Reduction of cholesterol and blood pressure in such individuals is a proven method of reducing long-term mortality.[15,16] Multifactorial interventions, which incorporate lifestyle modifications, have also demonstrated benefits.[17] Although many previous trials had demonstrated that control of individual risk factors could improve outcomes, there was a need to develop a single integrated programme aimed at modifying multiple risk factors. The EUROACTION trial, conducted across eight European countries demonstrated that an intensive nurse-led programme resulted in effective and substantial lowering of CVD risk factors in a high-risk group of patients.[18] Following the EUROACTION trial the MyAction programme for CVD prevention was developed at Imperial College London in the UK.[19]

Until 2009, no such programme for CVD prevention was available in Ireland although risk factors were known to be prevalent at high levels.[12,20] The National Cardiovascular Health Policy document has since formulated key recommendations for CVD prevention, including the establishment of preventive services.[4] To address this, Croí (pronounced kree, meaning 'heart' in the Irish language), an Irish heart and stroke charity commissioned the MyAction nurse-led, multifactorial, integrated programme, which was established in the west of Ireland and delivered in a community setting. We report results from the first 3 years of this intervention, 'Croí MyAction'.

Methods

An observational, descriptive study was conducted, evaluating the effect of the Croí MyAction programme at 16-weeks and 1-year follow up; data are presented for both these time frames. The protocol for this study met the requirements of the local research ethics committee. The criteria for inclusion were patients > 40 years at increased risk of CVD (SCORE $\geq 5\%$) and/or patients with newly diagnosed type 2 diabetes with two other risk factors (smoking, hypertension, or dyslipidaemia). Patients with known CHD (if they previously attended a cardiac rehabilitation service), heart failure (NYHA class III or IV), known familial hypercholesterolaemia, type 1 diabetes, severe cognitive impairment, and severe physical disability were excluded from the programme. The programme was delivered over a 16-week period by a specially trained multidisciplinary team which included a cardiovascular nurse specialist, dietician, exercise specialist, and physician. Motivational interviewing[21] and stages of change assessment techniques[22] were used by all members of the team. Patients and their family members received an individualized assessment at baseline, at end of programme, and at 1 year. This assessment included: smoking habit (self-report validated by breath CO using Smoke Check SCO1, Micro Medical) and nicotine dependence (Fagerstrom test[23]); diet (diet history, food habit questionnaire, and Mediterranean diet score[24]); physical activity levels (7-day physical activity recall[25]) and functional capacity (Chester step test[26]); weight (Seca 877) and height (Seca Leicester), body mass index (BMI) and waist circumference; psychosocial measures (Hospital Anxiety and Depression Scale (HADS),[27] EQVAS,[28] and Dartmouth CO-OP[29]); blood pressure (Omron 705IT), fasting lipids and glucose; and use of cardioprotective medications. The care pathway of participants through the programme is shown in Figure 1. All outcome targets for both patients and partners were derived from the 2007 European Society of Cardiology (ESC) guidelines, the only exception being blood pressure targets which were based on Joint British Societies' Guidelines JBS2 for Blood Pressure.[30,31] Data, collected between June 2009 and December 2011, were stored on a secure database hosted by Imperial College London.

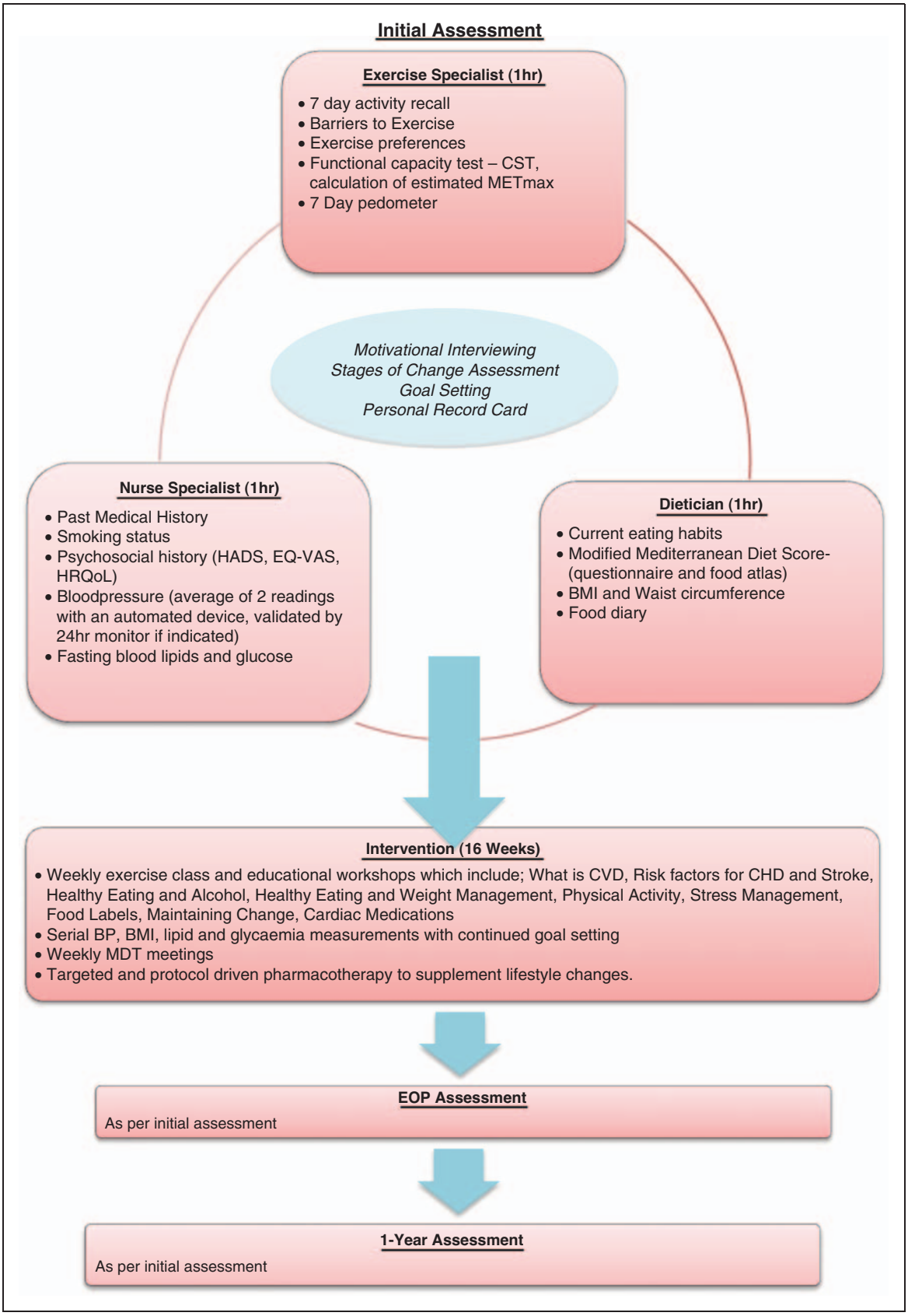

Figure 1. Patient care pathway.

Laboratory analysis

Laboratory analysis of serum concentrations of total cholesterol, HDL cholesterol, and triglycerides were measured by enzymic colorimetric tests using Roche Modular Analytics. Plasma glucose concentrations were determined using the hexokinase method (Roche Modular Analytics). Glycosylated haemoglobin was measured using the Menarini HA8160 automated haemoglobin analyser in EDTA anticoagulated whole blood.

Statistical analysis

Primary outcomes were analysed descriptively at baseline, end of programme, and 1-year follow up. Statistical differences between the groups were assessed using the two-sided chi-squared test for the categorical variables, the unpaired t-test for normally distributed continuous variables, and the Mann–Whitney test for non-normally distributed continuous variables. Analyses comparing time points were performed using either the paired t-test or Wilcoxon signed-rank test for continuous variables, and either the McNemar's test or paired exact test for categorical variables.

Results

Of 737 patients referred, 562 were eligible and invited to participate. Of these, 524 (92.7%) participants attended the initial assessment and 521 (99.4%) enrolled in the programme. The mean age of participants was 57.5 years, with 49.4% being male. All participants were invited to bring a partner to the programme, with an uptake rate of 61% among those who had a partner. Adherence to the programme was high, with 375 (87.2%) participants and 181 (84.6%) partners having completed the programme to date, with 1-year data being obtained from 235 (93.6%) patients and 107 (90.7%) partners. Eighty per cent of patients were referred to the programme by local general practitioners, with the remainder from hospital departments. Smoking at baseline (14.9 vs. 30.9%; $p = 0.003$), high anxiety score (34.1 vs. 48.1% for HADS-A of ≥ 8; $p = 0.05$), and depression score (18.7 vs. 36.5%; $p = 0.003$) were the only significant factors predictive of programme non-completion. Tables 1 and 2 present data relating to achievement of predefined targets for lifestyle and biomedical outcomes. Among diabetic patients, glycaemic control improved during the programme. At baseline, 18.9% of patients and 4.7% of partners were known to have type 2 diabetes mellitus (T2DM). A further 3.6% of patients and 2% or partners were diagnosed during the initial assessment. Results for glycaemic control in Tables 1 and 2 relate to these participants. Prescription of all cardioprotective medications, with the exception of beta-blockers, increased significantly during the programme (Table 3). In addition to biomedical improvements, patients derived significant psychosocial benefits from the programme, with fewer patients having raised levels of either anxiety or depression at end of programme and 1 year (Tables 1 and 2).

Discussion

As in the case of EUROACTION, participants in the current study completed a programme of risk factor reduction through lifestyle modification, supplemented by target-driven pharmacological interventions. Significant benefits were achieved with respect to a cardioprotective lifestyle, anthropometry, biomedical measures, and psychosocial indices. High cessation rates were observed among smokers, there was increased adherence to the cardioprotective diet, and physical activity increased with an associated improvement in physical fitness. Coupled with these changes significant reductions in BMI and abdominal obesity were observed.

There were definite improvements in the control of blood pressure and glycaemia for patients. Mean levels of all blood lipid fractions improved significantly during the programme and at 1-year follow up. Higher rates of statin and antihypertensive medications were prescribed on this programme relative to the high multifactorial risk arm of EUROACTION. This may account for the higher percentage of participants in our programme achieving the targets for blood lipid and blood pressure control than in the high-risk arm of EUROACTION.

Multiple factors are likely to have contributed to the improvement in psychosocial and quality of life indices for patients and their partners. Improvements in diet, physical activity, and anthropometry are known to impact positively on mental health.[32–37] Social support received from group interactions is likely to have positively influenced psychological wellbeing as this is known to be important for many groups of patients.[38]

Outcomes from this programme surpassed those achieved in the EUROACTION trial. The results of EUROACTION were presented as differences between intervention and usual care groups at 1-year follow up. While the present programme did not involve a control group, it is possible to make comparisons between the absolute change in outcome measures in the high-risk arm of the EUROACTION trial and the changes observed on this programme. Compared with the high-risk patients who received an intervention in EUROACTION, greater mean reductions in BMI and waist circumference were achieved on

Table 1. Participants achieving lifestyle and biomedical targets

	Patients								Partners							
	From IA to EOP ($n=375$)				From IA to 1 year ($n=235$)				From IA to EOP ($n=181$)				From IA to 1 year ($n=107$)			
	IA (%)	EOP (%)	% change	*p*-value	IA (%)	1 year (%)	% change	*p*-value	IA (%)	EOP (%)	% change	*p*-value	IA (%)	1 year (%)	% change	*p*-value
Smoking	14.7	8.3	−6.4 (−9.2 to −3.7)	<0.001	13.4	6.0	−7.4 (−11.3 to −3.3)	<0.001	9.4	7.2	−2.2 (−4.9 to 0.5)	0.13	4.7	4.7	0.0 (−0.9 to 0.9)	1.00
Diet																
Fruit + vegetables > 400 g/d	11.0	41.7	30.7 (25.7 to 35.8)	<0.001	11.7	42.9	31.2 (24.6 to 37.7)	<0.001	18.2	40.9	22.7 (15.3 to 30.0)	<0.001	17.9	41.5	23.6 (12.3 to 34.8)	<0.001
Fish consumption ≥ 2/week	37.1	69.4	32.2 (26.8 to 37.7)	<0.001	36.1	73.9	37.8 (30.3 to 45.3)	<0.001	36.1	73.3	37.2 (29.3 to 45.2)	<0.001	35.9	80.2	44.3 (32.6 to 56.1)	<0.001
No added salt	35.5	73.1	37.6 (32.1 to 43.1)	<0.001	30.9	82.6	51.7 (44.8,58.6)	<0.001	33.9	73.3	39.4 (31.6 to 47.3)	<0.001	28.3	80.2	51.9 (40.7 to 63.0)	<0.001
Physical activity																
≥30 min moderate -intensity physical activity 5 days/week	12.9	62.1	49.2 (43.4,54.9)	<0.001	11.9	58.2	46.30 (38.8 to 53.7)	<0.001	25.0	63.4	38.4 (30.0 to 46.7))	<0.001	22.2	59.6	37.4 (26.4 to 48.3)	<0.001
≥10,000 steps/day	24.1	34.1	10.0 (3.3 to 16.5)	0.003	30.7	30.7	0.0 (−9.6 to 9.6)	1.00	27.9	36.0	8.1 (−1.5 to 17.7)	0.11	29.7	32.8	3.1 (−9.0 to 15.3)	0.77
Anthropometry																
BMI < 25 kg/m^2	5.7	7.3	1.6 (−0.3 to 3.5)	0.11	5.7	7.4	1.7 (−1.1 to 4.6)	0.29	18.9	23.9	5.0 (1.3 to 8.7)	0.004	21.9	27.6	5.7 (−0.4 to 11.8)	0.07
Waist circumference ≤ 80 cm for females/ ≤ 94 cm for males	2.5	5.5	3.0 (0.7 to 5.4)	0.007	2.7	4.1	1.4 (−1.4 to 4.1)	0.45	10.2	15.3	5.1 (1.3 to 8.9)	0.004	9.8	12.8	3.0 (−3.1 to 9.0)	0.45
Blood pressure < 140/85 or < 130/80 mmHg (as appropriate)[a]	51.6	76.9	25.3 (19.2 to 31.3)	<0.001	56.3	73.8	17.5 (9.3 to 25.6)	<0.001	76.4	87.6	11.2 (3.9 to 18.6)	0.002	75.2	81.0	5.8 (−5.1 to 16.5)	0.34
Cholesterol																
TC < 5 mmol/l	40.9	71.6	30.7 (25.1 to 36.5)	<0.001	41.7	72.8	31.1 (23.4 to 38.9)	<0.001	38.8	63.5	24.7 (17.3 to 32.2)	<0.001	41.0	61.0	20.0 (8.7 to 31.3)	<0.001
LDL < 3 mmol/l	40.7	75.6	34.9 (29.2 to 40.6)	<0.001	41.0	78.9	37.9 (30.3 to 45.4)	<0.001	45.5	66.9	21.4 (14.0 to 28.7)	<0.001	49.5	70.5	21.0 (10.6 to 31.3)	<0.001
TC < 4.5 mmol/l	22.3	49.6	27.2 (21.6 to 32.9)	<0.001	21.5	51.8	30.3 (23.3 to 37.3)	<0.001	27.0	41.6	14.6 (7.6 to 21.6)	<0.001	26.7	34.3	7.6 (−2.0 to 17.2)	0.14
LDL < 2.5 mmol/l	25.2	49.0	23.8 (18.0 to 29.6)	<0.001	23.8	54.6	30.8 (23.7 to 38.0)	<0.001	23.0	42.1	19.1 (12.2 to 26.0)	<0.001	23.8	44.8	21.0 (11.4 to 30.5)	<0.001
TC < 4.5 and LDL < 2.5 mmol/l	19.4	40.7	21.3 (15.8 to 26.9)	<0.001	18.1	44.9	26.8 (19.8 to 33.9)	<0.001	21.3	33.7	12.4 (5.8 to 18.9)	<0.001	21.0	31.4	10.4 (1.2 to 19.7)	0.03

(continued)

Table 1. Continued

	Patients								Partners							
	From IA to EOP ($n = 375$)				From IA to 1 year ($n = 235$)				From IA to EOP ($n = 181$)				From IA to 1 year ($n = 107$)			
	IA (%)	EOP (%)	% change	*p*-value	IA (%)	1 year (%)	% change	*p*-value	IA (%)	EOP (%)	% change	*p*-value	IA (%)	1 year (%)	% change	*p*-value
Glycaemia (among T2DM patients)																
FBG < 6 mmol/l	18.1	38.9	20.8 (7.3 to 34.4)	0.003	20.5	48.7	28.2 (8.3 to 48.1)	0.007	10.0	30.0	20.0 (−14.8 to 54.5)	0.50	11.1	33.3	22.2 (−16.1 to 60.5)	0.50
HbA1 c < 6.5%	26.7	56.7	30.0 (15.8 to 44.1)	<0.001	31.3	56.3	25.0 (4.6 to 45.4)	0.02	33.3	66.7	33.4 (−21.1 to 87.7)	0.50	–	–	–	–
Psychosocial factors																
HADS anxiety score ≥ 8	32.5	20.4	−12.1 (−17.0 to −7.4)	<0.001	30.5	20.2	−10.3 (−17.0 to −3.7)	0.002	27.6	17.8	−9.8 (−17.5 to −2.2)	0.01	25.3	10.5	−14.8 (−25.5 to −4.0)	0.007
HADS depression score ≥ 8	18.2	7.3	−10.9 (−15.5 to −6.4)	<0.001	15.3	8.4	−6.9 (−12.2 to −1.6)	0.009	11.8	7.2	−4.6 (−11.4 to 2.2)	0.21	15.8	12.1	−3.7 (−21.6 to −5.7)	<0.001

[a]BP target of 140/85 mmHg, unless history of T2DM or a coronary event.

IA, initial assessment; EOP, end of programme; 1 year, 1-year follow up; BMI, body mass index; FBG, fasting blood glucose; HbA1c, glycosylated haemoglobin; HADS, Hospital Anxiety and Depression Scale; LDL, low-density lipoprotein; T2DM, type 2 diabetes mellitus; TC, total cholesterol; –, insufficient data.

this programme. Improvements in achievement of smoking cessation and physical activity guidelines and patient retention rates were also more pronounced. Other factors not included in the primary care arm of EUROACTION which are likely to have been important are the inclusion of a weekly exercise class and a designated multidisciplinary team.

The MyAction preventive cardiology programme was first piloted in London and demonstrated the feasibility of running such a programme in the community.[19] It was subsequently commissioned by NHS Westminster and other primary care trusts in England. The results of the Croi MyAction programme demonstrate its applicability in another population which illustrates its generalizibility in clinical practice. If maintained, the improvements achieved on the Croi MyAction programme would be expected to reduce future CVD mortality. A moderate sustained weight reduction in obese patients is known to be beneficial.[39] Increases in physical fitness of the magnitude achieved in this study improve long-term cardiovascular outcomes. For every 1 MET increment in MET-max, survival increases by 12% for men[40] and 17% for women.[41] Consumption of a Mediterranean-style diet is strongly associated with lower CVD and all-cause mortality[42] and the increased adherence to the Mediterranean diet achieved on our programme compares favourably with a recent trial which demonstrates the benefits of a Mediterranean diet in reducing the incidence of major cardiovascular events in high-risk patients.[43]

Previous research has identified key factors critical to the success of preventive cardiology programmes.[44] From the outset, this programme was designed to incorporate these elements. The programme is integrated, protocol-driven and evidence-based, managing all risk factors in a community-based centre. It is truly multidisciplinary with participants meeting multiple, specially trained healthcare professionals who participate in joint decision-making at weekly meetings. The family-orientated approach is adopted since families tend to share risk factors[45] and people are more likely to succeed in behavioural change if the entire family are embracing lifestyle modification.[46] The programme is flexible, offering a range of attendance options tailored to the patient's individual needs, and we suspect that this type of approach most likely contributed to the high retention rates observed on the programme. The programme is nurse led, an approach which is known to be effective in the prevention and management of CVD.[5,47]

While the results achieved in this study are promising, there are a number of limitations. The programme was not designed as a randomized control trial so we cannot compare results to those of patients receiving usual care.

Table 2. Mean values for lifestyle and biomedical targets

	Patients								Partners							
	From IA to EOP ($n=375$)				From IA to 1 year ($n=235$)				From IA to EOP ($n=181$)				From IA to 1 year ($n=107$)			
	IA	EOP	Change	*p*-value	IA	1 year	Change	*p*-value	IA	EOP	Change	*p*-value	IA	1 year	Change	*p*-value
Diet																
mMDS	4.1 ± 2.3	8.1 ± 2.4	4. 0 (3.8 to 4.3)	<0.001	4.1 ± 2.2	9.3 ± 2.3	5.2 (4.9 to 5.5)	<0.001	4.2 ± 2.1	8.4 ± 2.4	4.2 (3.8 to 4.6)	<0.001	4.3 ± 2.0	9.7 ± 2.2	5.4 (4.8 to 5.9)	<0.001
Fruit and vegetable intake (g/d)	204 (136–325)	385 (254–485)	110 (89 to 142)	<0.001	216 (137–334)	385 (284–474)	130 (110 to 160)	<0.001	241 (158–348)	355 (275–474)	80 (80 to 107)	<0.001	243 (172–357)	385 (305–474)	110 (80 to 145))	<0.001
Fish intake (g/day)	31 (0–66)	66 (39–102)	9 (0 to 22)	<0.001	33 (0–66)	66 (42–102)	27 (19 to42)	<0.001	21 (0–66)	66 (40–102)	15 (0 to 33)	<0.001	21 (0–66)	66 (42–102)	38 (12 to 50)	<0.001
Alcohol (units/week)	6 (0–20)	3 (0–11)	−3 (−1 to 0)	<0.001	7 (0–18)	4 (0–11)	−3 (−2 to 0)	<0.001	3 (0–12)	1 (0–8)	−2 (0 to0)	<0.001	5 (0–11)	2 (0–11)	−3 (−1 to 0)	0.004
Physical activity																
Steps/day	7627 ± 3794	8759 ± 3887	1132 (744 to 1521)	<0.001	8038 ± 3936	8459 ± 4223	421 (−209 to 1051)	0.19	8206 ± 3938	9056 ± 3547	850 (244 to 1515)	0.008	8146 ± 4258	8312 ± 3703	166 (−839–1172)	0.74
Estimated MET max	7.5 ± 1.7	9.2 ± 2.0	1.7 (1.5 to 1.8)	<0.001	7.6 ± 1.6	9.2 ± 2.0	1.6 (1.4 to 1.8)	<0.001	8.1 ± 1.7	9.5 ± 1.8	1.4 (1.3 to 1.7)	<0.001	7.6 ± 1.4	9.4 ± 1.6	1.8 (1.5–2.1)	<0.001
Anthropometry																
BMI (kg/m^2)	33.4 ± 7.0	32.0 ± 6.2	−1.4 (−1.7 to−1.2)	<0.001	33.0 ± 7.4	31.7 ± 6.2	−1.3 (−1.8 to −0.8)	<0.001	29.8 ± 5.5	28.8 ± 5.2	−1.0 (−1.2 to −0.8)	<0.001	29.7 ± 5.5	28.9 ± 5.3	−0.8 (−1.1 to −0.5)	<0.001
Men waist circumference (cm)	117 ± 15	111 ± 15	−6 (−6 to −5)	<0.001	115 ± 15	111 ± 14	−4 (−5 to −3)	<0.001	112 ± 13	107 ± 13	−5 (−6 to −3)	<0.001	112 ± 14	108 ± 13	−4 (−6 to −2)	0.002
Women waist circumference (cm)	109 ± 15	104 ± 15	−5 (−5 to −4)	<0.001	106 ± 15	103 ± 14	−3 (−5 to −3)	<0.001	98 ± 15	94 ± 15	−4 (−5 to −3)	<0.001	97 ± 16	94 ± 15	−3 (−4 to −2)	<0.001
Blood pressure (mmHg)																
SBP	135.5 ± 16.7	126.9 ± 10.6	−8.6 (−10.3 to −7.0)	<0.001	134.6 ± 15.8	127.2 ± 10.0	−7.4 (−9.3 to −5.4)	<0.001	126.8 ± 15.2	123.3 ± 10.8	−3.5 (−5.5 to −1.3)	0.001	126.8 ± 14.8	124.8 ± 11.4	−2.0 (−4.6 to 0.6)	0.13
DBP	78.1 ± 9.5	74.8 ± 8.9	−3.3 (−4.4 to −2.2)	<0.001	78.0 ± 9.3	75.5 ± 8.0	−2.5 (−3.8 to −1.2)	<0.001	74.1 ± 9.5	73.4 ± 8.1	−0.7 (−2.1 to 0.6)	0.29	74.6 ± 8.6	75.4 ± 8.0	0.8 (−1.0 to 2.5)	0.39

(continued)

Table 2. Continued

	Patients								Partners							
	From IA to EOP ($n=375$)				From IA to 1 year ($n=235$)				From IA to EOP ($n=181$)				From IA to 1 year ($n=107$)			
	IA	EOP	Change	*p*-value	IA	1 year	Change	*p*-value	IA	EOP	Change	*p*-value	IA	1 year	Change	*p*-value
Blood lipids (mmol/l)																
TC	5.25 ± 1.07	4.51 ± 0.82	−0.74 (−0.84 to −0.65)	<0.001	5.18 ± 0.99	4.51 ± 0.82	−0.67 (−0.80 to −0.55)	<0.001	5.23 ± 1.05	4.70 ± 0.85	−0.53 (−0.65 to −0.40)	<0.001	5.18 ± 1.08	4.74 ± 0.92	−0.44 (−0.63 to −0.26)	<0.001
LDL	3.16 ± 1.00	2.53 ± 0.74	−0.63 (−0.72 to −0.53)	<0.001	3.13 ± 0.93	2.49 ± 0.71	−0.64 (−0.76 to −0.52)	<0.001	3.18 ± 0.95	2.67 ± 0.75	−0.51 (−0.63 to −0.39)	<0.001	3.12 ± 0.97	2.65 ± 0.79	−0.47 (−0.64 to −0.30)	<0.001
HDL	1.33 ± 0.41	1.38 ± 0.39	0.05 (0.02 to 0.08)	<0.001	1.31 ± 0.37	1.41 ± 0.40	0.10 (0.07 to 0.14)	<0.001	1.46 ± 0.41	1.49 ± 0.45	0.03 (0.00 to 0.07)	0.7	1.46 ± 0.41	1.57 ± 0.46	0.11 (0.07 to 0.14)	<0.001
TG	1.5 ± 1.1−2.1	1.38 ± 0.39	−0.12 (−0.3 to −0.1)	<0.001	1.5 ± 1.1−2.0	1.2 ± 0.9−1.7	−0.3 (−0.2 to −0.1)	<0.001	1.2 ± 0.9−1.7	1.0 ± 0.8−1.4	−0.2 (−0.2 to 0.0)	<0.001	1.2 ± 0.9−1.7	1.0 ± 0.8−1.4	−0.2 (−0.3 to −0.1)	<0.001
Glycaemia																
FBG	7.65 ± 2.34	6.50 ± 1.48	−1.15 (−1.73 to −0.57)	<0.001	7.26 ± 1.93	6.39 ± 1.34	−0.87 (−1.59 to −0.16)	0.02	7.09 ± 0.98	6.46 ± 0.85	−0.63 (−1.44 to 0.18)	0.11	7.09 ± 1.04	6.34 ± 1.09	−0.75 (−1.47 to −0.03)	0.04
HbA1c	7.36 ± 1.57	6.43 ± 1.14	−0.93 (−1.30 to −0.57)	<0.001	7.13 ± 1.48	6.40 ± 0.72	−0.73 (−1.26 to −0.19)	0.01	6.76 ± 0.46	6.28 ± 0.35	−0.48 (−0.98 to 0.02)	0.06	–	–	–	–
Psychosocial factors																
HADS anxiety score	6 (3–8)	4 (2–7)	−2 (−1 to −1)	<0.001	5 (3–8)	4 (2–7)	−1 (−1 to 0)	<0.001	5 (3–8)	5 (2–7)	0 (−1 to 0)	<0.001	5 (3–8)	3 (1–6)	−2 (−2 to −1)	<0.001
HADS depression score	4 (2–6)	2 (1–4)	−2 (−2 to −1)	<0.001	3 (1–6)	2 (1–4)	−1 (−1 to 0)	<0.001	3 (1–5)	2 (1–5)	−1 (−1 to 0)	<0.001	3 (1–6)	2 (1–3)	−1 (−2 to 0)	<0.001
Dartmouth Coop score	20 (17–24)	17 (15–20)	−3 (−3 to −2)	<0.001	19 (16–23)	17 (15–21)	−2 (−2 to −1)	<0.001	19 (16–22)	16 (14–19)	−3 (−4 to −2)	<0.001	19 (16–22)	16 (14–19)	−3 (−4 to −2)	<0.001
EQ-VAS	65 (50–75)	76 (65–85)	11 (6 to 10)	<0.001	67 (50–80)	80 (65–85)	13 (5 to 10)	<0.001	70 (50–80)	80 (70–90)	10 (6 to 12)	<0.001	70 (50–80)	80 (70–90)	10 (5 to 20)	<0.001

IA, initial assessment; EOP, end of programme; 1 year, 1-year follow up; BMI, body mass index; EQ-VAS, visually assessed quality of life scale; FBG, fasting blood glucose; HADS, Hospital Anxiety and Depression Scale; LDL, low-density lipoprotein; MET, metabolic equivalent; mMDS, modified Mediterranean Diet Score to Chester step test; –, insufficient data.

Table 3. Prescription of cardioprotective medications from IA to EOP

	Patients ($n = 375$)				Partners ($n = 181$)			
	IA (%)	EOP (%)	% change	*p*-value	IA (%)	EOP (%)	% change	*p*-value
Antiplatelets	25.5	30.1	4.6 (1.6 to 7.5)	0.002	14.9	17.7	2.8 (−0.2 to 5.7)	0.06
Statins	40.3	65.1	24.8 (19.7 to 29.7)	<0.001	23.2	39.8	16.6 (10.2 to 23.0)	<0.001
ACE inhibitors/ARBs	38.4	43.3	4.9 (1.1 to 8.6)	0.01	19.3	21.0	1.7 (−1.7 to 5.1)	0.45
Beta-blockers	15.6	15.1	−0.4 (−2.8 to 1.2)	0.55	11.1	8.8	−2.3 (−4.9 to 0.5)	0.13
Calcium-channel blockers	17.5	23.1	5.6 (2.5 to 8.8)	<0.001	9.4	10.5	1.1 (−2.1 to 4.3)	0.69

IA, initial assessment; EOP, end of programme; ACE, angiotensin-converting enzyme; ARB, angiotensin receptor blockers.

The targets reported herein are based on the 2007 ESC Prevention and JBS2 guidelines prior to the publication of the updated ESC guidelines in 2012.[14]

There was potential for selection bias as GPs may have referred patients whom they thought were more likely to comply with the programme. Reporting bias may exist with regard to the dietary outcomes and achievement of physical activity guidelines. This was reduced by objective assessment of physical activity and physical fitness and use of a food atlas to determine portion sizes, coupled with anthropometric measurements. Due to a time lag, we report a smaller volume of data in relation to 1-year reassessment than to end of programme. This may limit the demonstration of statistical significance for some outcomes, especially among partners.

There is a recognized need for improved CVD preventive services in Ireland.[4] With appropriate training and investment, there is significant scope to expand the MyAction programme to newly established multiprofessional primary care centres.[48] Cost-effectiveness data will be published separately and it is hoped that further follow up of patients and partners at various time points will be possible.

In summary, the demonstration programme described in this study is an effective model for reducing the future CVD risk of high-risk patients, with reductions in all the major risk factors for cardiovascular disease being achieved.

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Conflict of interest

The authors declare that there is no conflict of interest.

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