The Complete Health Improvement Program (CHIP)
And Reduction of Chronic Disease Risk Factors in Canada

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ABSTRACT

Purpose: The short-term effectiveness of the nutrition-centred Complete Health Improvement Program (CHIP) lifestyle intervention for improving selected chronic disease risk factors was examined in the Canadian setting.

Methods: A total of 1003 people (aged 56.3 ± 12.1 years, 68% female) were self-selected to participate in one of 27 CHIP interventions hosted in community settings by Seventh-day Adventist churches throughout Canada, between 2005 and 2011. The program centred on the promotion of a whole-food, plant-based eating pattern, and daily physical activity was also encouraged. Biometric measures, including body mass index (BMI), blood pressure (BP), blood lipid profile, and fasting blood sugar (FBS), were determined at program entry and 30 days into the intervention.

Results: Over 30 days, significant overall reductions ($P<0.001$) were recorded in the participants' BMI (-3.1%), systolic BP (-7.3%), diastolic BP (-4.3%), total cholesterol ([TC] -11.3%), low-density lipoprotein cholesterol ([LDL-C] -12.9%), triglycerides ([TG] -8.2%), and FBS (-7.0%). Participants with the highest classifications of TC, LDL-C, TG, and FBS at program entry experienced approximately 20% reductions in these measures in 30 days.

Conclusions: The CHIP intervention, which centres on a whole-food, plant-based eating pattern, can lead to rapid and meaningful reductions in chronic disease risk factors in the Canadian context.

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RÉSUMÉ

Objectif. L'efficacité à court terme de l'intervention sur le style de vie axée sur la nutrition Complete Health Improvement Program [Programme global d'amélioration de la santé] (CHIP) à améliorer certains facteurs de risque de maladies chroniques a été examinée en contexte canadien.

Méthodes. Au total, 1003 personnes (âgées de 56,3 ± 12,1 ans, 68 % de femmes) se sont portées volontaires entre 2005 et 2011 pour participer à l'une de 27 interventions CHIP chapeautées dans la communauté par des églises adventistes du septième jour de partout au Canada. Le programme était axé sur la promotion d'habitudes alimentaires à base d'aliments entiers de source végétale, et l'activité physique quotidienne était également encouragée. Des mesures biométriques, dont l'indice de masse corporelle (IMC), la tension artérielle (TA), le profil lipidique sanguin et la glycémie à jeun (GJ) ont été prises au commencement du programme puis 30 jours après le début de l'intervention.

Résultats. Après 30 jours, des réductions globales significatives ($p < 0,001$) ont été notées chez les participants en ce qui a trait à l'IMC (-3,1 %), à la TA systolique (-7,3 %), à la TA diastolique (-4,3 %), au cholestérol total ([CT] -11,3 %), au cholestérol à lipoprotéines de faible densité ([C-LDL] -12,9 %), aux triglycérides ([TG] -8,2 %) et à la GJ (-7,0 %). Les participants présentant les résultats les plus élevés pour le CT, le C-LDL, les TG et la GJ au début du programme ont connu une réduction d'environ 20 % de ces mesures en 30 jours.

Conclusions. L'intervention CHIP, qui est axée sur des habitudes alimentaires à base d'aliments entiers de source végétale, peut rapidement mener à une réduction significative des facteurs de risque de maladies chroniques en contexte canadien.

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INTRODUCTION

Worldwide, chronic diseases are burgeoning (1,2). In Canada, chronic diseases are the major cause of mortality (3). Because of the need to manage the growing epidemic of chronic disease, interest in nutrition-centred lifestyle interventions is increasing (1,2). Many chronic diseases are influenced by lifestyle factors, and therefore they are responsive to lifestyle modifications, especially dietary modification (4).

The Complete Health Improvement Program (CHIP) is an intensive, community-based lifestyle intervention that focuses on the promotion of a whole-food, plant-based eating pattern,

Table 1
Mean changes in selected chronic disease risk factors from baseline to post-intervention

Factor	n	Baseline mean (SD)	Post-intervention mean (SD)	Mean change	% change	*P* value	Cohen's d
BMI (kg/m^2)	971	31.4 (7.0)	30.4 (6.7)	-1.0	-3.1%	<0.001	0.15
SBP (mm Hg)	961	135.6 (19.1)	128.3 (15.7)	-7.3	-5.4%	<0.001	0.42
DBP (mm Hg)	961	81.0 (10.7)	76.7 (9.6)	-4.3	-5.3%	<0.001	0.42
TC (mmol/L)	969	5.22 (1.14)	4.63 (1.04)	-0.59	-11.3%	<0.001	0.54
LDL-C (mmol/L)	960	3.13 (0.98)	2.72 (0.89)	-0.41	-12.9%	<0.001	0.44
HDL-C (mmol/L)	969	1.34 (0.39)	1.21 (0.34)	-0.12	-8.8%	<0.001	0.36
TG (mmol/L)	967	1.68 (0.91)	1.54 (0.80)	-0.14	-8.2%	<0.001	0.16
FBS (mmol/L)	967	5.83 (1.87)	5.42 (1.44)	-0.41	-7.0%	<0.001	0.25

BMI = body mass index; DBP = diastolic blood pressure; FBS = fasting blood sugar; HDL-C = high-density lipoprotein cholesterol; LDL-C = low-density lipoprotein cholesterol; SBP = systolic blood pressure; SD = standard deviation; TC = total cholesterol; TG = triglycerides

and also encourages daily moderate-intensity physical activity. The program is managed and coordinated by the not-for-profit Lifestyle Medicine Institute; it has been used in clinical settings (5), workplace environments (6), and community settings, and has been facilitated by Seventh-day Adventist churches (7,8). Over the past 15 years, an estimated 50,000 people have completed the CHIP program, which has demonstrated significant benefits for the management of cardiovascular disease (CVD) (5,7-9), type 2 diabetes mellitus (7,10), and depression (11,12).

PURPOSE

While the program was developed for a United States audience, a recent study has shown similar levels of effectiveness when it is used in Australasia (8), despite the inherent cultural differences. The short-term effectiveness of CHIP in reducing selected chronic disease risk factors was examined in the Canadian context; the program was delivered in the community through churches.

METHODS

Participants

The study involved an examination of changes in selected chronic disease risk factors among 1003 people aged 56.3 ± 12.1 years (68% female), who chose to participate in one of 27 CHIP interventions delivered throughout Canada between 2005 and 2011. The programs had eight to 226 participants, with a median group size of 25. Ethics consent for the study was obtained through the Avondale College Human Research Ethics Committee (Approval No. 20:10:07).

The CHIP interventions were advertised in the local media (newspapers, radio) of communities in which the programs were offered, and in some instances local medical practitioners recommended the program to patients. Participants were encouraged to engage in the program in consultation with their personal health care provider.

Of the 1003 participants who enrolled in the program, 971 (97%) completed the initial 30 days of the intervention by attending 13 of the 16 sessions and undergoing both pre- and post-intervention biometric assessments. At program entry, participants were representative of an at-risk population, with a mean body mass index (BMI) in the "obese" category, "prediabetic" fasting blood sugar (FBS) levels, and elevated systolic blood pressure (SBP) and low-density lipoprotein cholesterol (LDL-C) levels (Table 1).

Program facilitation

The programs were facilitated by teams of volunteers, sourced through Seventh-day Adventist churches, who had an interest in influencing the health of their local community positively. The volunteer facilitators were not required to be health professionals, although some were. They had two days of training to learn about the CHIP intervention and develop group facilitation skills. The facilitators were then provided with a comprehensive CHIP resource package, which included a curriculum guide for program delivery, 16 prerecorded educational lectures presented by Dr. Hans Diehl (a clinical professor of preventive medicine at Loma Linda University and founder of the not-for-profit Lifestyle Medicine Institute), a plant-based eating cookbook, and a participant textbook and journal. The books and resources were developed by a consortium of health professionals, including health educators, dietitians, exercise physiologists, and physicians, but were published under the name Lifestyle Medicine Institute. The role of the volunteer director was to organize and facilitate the proceedings of the group sessions, not to educate, as this occurred through the video presentations. Even when the facilitator had medical or nutrition training, the supplied resources were used.

Program content

Each program involved 16 two-hour group sessions over 30 days. The program commenced by educating the participants

Table 2
Changes in chronic disease risk factor levels within 30 days, according to initial risk factor classification

Risk factor	Baseline number	Post-intervention number	χ^{2a} (*P*)	Baseline mean (SD)	Post-intervention mean (SD)	Mean change	% Mean change	*P* value	Cohen's d
BMI (kg/m²)									
18.5-24.9	176	215	78 (<0.001)	22.6 (1.6)	22.1 (1.6)	-0.5	-2.4%	<0.001	0.31
25-30	263	281		27.4 (1.5)	26.6 (1.5)	-0.8	-3.0%	<0.001	0.53
>30	532	475		36.3 (5.5)	35.1 (5.4)	-1.2	-3.3%	<0.001	0.22
SBP (mm Hg)									
<120	207	313	180 (<0.001)	111.6 (7.6)	113.8 (11.8)	2.2	2.0%	0.005	-0.22
120-139	377	435		130.1 (5.3)	125.8 (11.4)	-4.3	-3.3%	<0.001	0.48
140-160	293	191		148.5 (6.3)	136.8 (11.5)	-12.6	-8.5%	<0.001	1.26
>160	84	22		174.3 (12.1)	148.6 (16.6)	-25.6	-14.7%	<0.001	1.77
DBP (mm Hg)									
<80	495	649	128 (<0.001)	73.1 (6.3)	72.0 (8.1)	1.1	1.5%	0.001	0.15
80-89	274	213		84.8 (2.6)	78.3 (7.2)	-6.4	-7.6%	<0.001	1.20
90-100	157	90		93.5 (3.1)	85.3 (7.4)	-8.3	-8.8%	<0.001	1.45
>100	35	9		107.9 (8.2)	91.9 (9.7)	-16.0	-14.8%	<0.001	1.78
TC (mmol/L)									
<4.00	124	284	357 (<0.001)	3.47 (0.41)	3.25 (0.53)	-0.22	-6.2%	<0.001	0.46
4.00-5.20	376	401		4.65 (0.34)	4.20 (0.59)	-0.44	-9.6%	<0.001	0.93
5.21-5.99	242	181		5.57 (0.21)	4.89 (0.62)	-0.68	-12.1%	<0.001	1.47
6.00-6.99	166	83		6.43 (0.30)	5.66 (0.69)	-0.78	-12.1%	<0.001	1.45
>7.00	61	20		7.67 (0.64)	6.26 (1.05)	-1.41	-19.1%	<0.001	1.62
LDL-C (mmol/L)									
<2.50	262	414	256 (<0.001)	1.98 (0.43)	1.84 (0.53)	-0.14	-12.6%	<0.001	0.29
2.50-2.99	162	186		2.74 (0.13)	2.41 (0.45)	-0.33	-14.3%	<0.001	1.00
3.00-4.00	375	289		3.45 (0.30)	2.99 (0.56)	-0.46	-18.3%	<0.001	1.02
>4.00	161	71		4.67 (0.53)	3.87 (0.68)	-0.80	-23.1%	<0.001	1.31
HDL-C (mmol/L)									
<1.00	195	282	144 (<0.001)	0.86 (0.12)	0.83 (0.14)	-0.03	-3.5%	0.546	0.23
1.00-1.55	531	548		1.27 (0.15)	1.17 (0.18)	-0.10	-7.6%	<0.001	0.60
>1.55	243	139		1.86 (0.29)	1.63 (0.32)	-0.23	-12.4%	<0.001	0.75
TG (mmol/L)									
<1.00	204	243	26 (<0.001)	0.78 (0.15)	0.90 (0.48)	0.12	15.1%	<0.001	-0.34
1.00-2.25	573	577		1.54 (0.34)	1.46 (0.51)	-0.08	-5.4%	<0.001	0.18
>2.25	192	149		3.06 (0.98)	2.48 (0.93)	-0.58	-18.8%	<0.001	0.61
FBS (mmol/L)									
<5.60	652	742	84 (<0.001)	5.01 (0.41)	4.88 (0.48)	-0.13	-2.5%	0.067	0.29
5.60-7.00	192	151		6.08 (0.35)	5.59 (0.62)	-0.49	-8.0%	<0.001	0.97
>7.00	123	74		9.77 (2.68)	8.02 (2.52)	-1.76	-18.0%	<0.001	0.67

BMI = body mass index; DBP = diastolic blood pressure; FBS = fasting blood sugar; HDL-C = high-density lipoprotein cholesterol; LDL-C = low-density lipoprotein cholesterol; SBP = systolic blood pressure; SD = standard deviation; TC = total cholesterol; TG = triglycerides
[a] McNemar's chi-square test

on the causes of chronic disease and the benefits of positive lifestyle choices, with particular attention to diet and physical activity. The merits of nutrition and physical activity as therapy for conditions including obesity, type 2 diabetes, and CVD were then explored. The primary focus was a whole-food, plant-based eating pattern *ad libitum*. The consumption of whole grains, legumes, and fresh fruits and vegetables was recommended for the achievement of a daily target of fewer than 20% of calories from fat, fewer than 10 tsp of added sugar, less than 5000 mg of salt (2000 mg of sodium), and less than 50 mg of cholesterol. Participants were also encouraged to consume 2 to 2.5 L of water daily (9). In addition, daily exercise (30 minutes at moderate intensity or 10,000 steps) was advocated. The last three sessions in the program focused on themes from the positive psychology literature known to influence long-term health habits, including stress management, forgiveness, and self-worth.

The objective of the CHIP intervention was to educate and empower individuals to provide intelligent self-care. The program involved a conglomerate of behaviour change strategies but was principally founded on the theory of planned behaviour, which asserts that behaviour is determined by intentions;

these, in turn, are formed by attitudes, social norms, and perceived behavioural control (13). The program endeavoured to change participants' attitudes toward positive lifestyle choices through education, create new social norms through a group setting, and increase perceived behavioural control by providing an intensive experience in which positive changes were experienced in a short time.

Each session typically involved viewing a 60-minute prerecorded lecture, a cooking demonstration, group discussion, and a behaviour change challenge. The cooking demonstrations usually involved food assemblage demonstrations in which recipes from the CHIP cookbook, supplied as part of the program by the Lifestyle Medicine Institute, were demonstrated and discussed. Pre-prepared samples of the recipes were available.

Participants paid approximately $250 to cover the cost of venue hire, food samples distributed throughout the program, resources (including reading materials and a pedometer), and biometric assessments.

Biometric measures

At program entry and after 30 days, participants' height, weight, blood pressure (BP), and 12-hour FBS were measured. Height, weight, and resting BP were measured at the site where the CHIP intervention was conducted. Because the CHIP interventions were at different sites, the same equipment was not shared between the sites; however, in order to increase reliability, the same equipment and protocol were used for the pre- and post-assessments within each site. Height and weight were measured at the same time of day; participants removed their shoes and wore the same clothing on each occasion. For the sake of consistency, resting BP was measured by the same health professional at each site. The blood samples were collected by trained phlebotomists not involved in the program and were analyzed at local pathology laboratories for total cholesterol (TC), LDL-C, high-density lipoprotein cholesterol (HDL-C), triglycerides (TG), and FBS.

Statistical analysis

The data were analyzed with PASW Statistics (version 18, SPSS, Chicago, IL, 2009). Data are expressed as means ± standard deviations. Paired *t*-tests were used to assess changes in the biometric measures from baseline to post-intervention, both for the overall and stratified data. McNemar's chi-square testing was used to determine changes from program entry to 30 days in the distribution of participants across the various risk factor categories. Cohen's d statistic was calculated to determine effect size.

RESULTS

Participants' mean changes from baseline to post-intervention are presented in Table 1. Significant reductions were recorded in all biometric measures, with the most notable being in TC, LDL-C, and TG. While HDL-C also decreased following the intervention, the TC-to-HDL-C ratio improved from 3.90:1 to 3.83:1 ($P<0.001$).

Table 3
Comparison of the mean changes in selected chronic disease risk factors from baseline to post-intervention in the current CHIP study participants and CHIP participants in Australasia and the United States (US)

Factor	Canadian CHIP (n=1003)	Australasian CHIP[a] (n=787)	US CHIP[b] (n=5070)
BMI	-3.1%	-3.8%	-3.2%
SBP	-5.4%	-5.6%	-4.9%
DBP	-5.3%	-4.6%	-5.3%
TC	-11.3%	-14.7%	-11.0%
LDL-C	-12.9%	-17.9%	-13.0%
HDL-C	-8.8%	-8.3%	-8.6%
TG	-8.2%	-12.5%	-7.7%
FBS	-7.0%	-5.6%	-6.1%

BMI = body mass index; CHIP = Complete Health Improvement Program; DBP = diastolic blood pressure; FBS = fasting blood sugar; HDL-C = high-density lipoprotein cholesterol; LDL-C = low-density lipoprotein cholesterol; SBP = systolic blood pressure; TC = total cholesterol; TG = triglycerides
[a] Data from Morton et al. (8)
[b] Data from Rankin et al. (7)

Table 2 displays the stratified data, using conventional risk factor categories. The National Cholesterol Education Program Adult Treatment Panel III (ATP III) classification system (14) was used to categorize participants for all risk factors except TC. The Framingham classification (15) was used for the TC data as it includes five categories, rather than the three in the ATP III classification, and thus allows a more detailed analysis of the effect of the intervention on participants at highest risk. Participants who entered with the highest risk factor classifications tended to have the greatest improvements and the effect sizes were large.

As Table 2 indicates, many participants who entered the program with the highest risk factor classifications had moved to lower risk factor classifications by the end of the intervention. Only 20 of the 61 individuals with TC levels above 7.0 mmol/L at program entry maintained these levels post-intervention. Among the 469 individuals with elevated TC levels (>5.2 mmol/L) at program entry, this biometric was normalized in 185 (39%). Similarly, of the 123 individuals with FBS levels indicative of diabetes at baseline, 49 (40%) experienced a reduction in scores to below 7.0 mmol/L in the 30 days.

A comparison of the risk factor reductions in this study with those recently reported in the United States (7) and Australasia (8) appears in Table 3. Similar outcomes were observed in the three cohorts.

DISCUSSION

Early reductions in risk

The current study findings suggest that the CHIP intervention, which centres on a whole-food, plant-based eating pattern, can lead to rapid and meaningful reductions in chronic disease risk factors in the Canadian context. Further, individuals at greatest risk experience the greatest benefits. That these outcomes can be achieved with a volunteer-delivered, community-based intervention is significant, given the burgeoning rise in chronic disease in Canada.

Lifestyle interventions have merit at all levels of prevention.

Of note is the fact that in only 30 days, improvements of approximately 20% were observed in participants with the highest classifications of TC (19%), LDL-C (23%), TG (19%), and FBS (18%). The changes in TC and LDL-C compare favourably with those achieved by pharmaceutical interventions involving statins (16), and exceed the typical expectations of dietary interventions for lowering blood lipids (17). These large changes observed with the CHIP intervention are likely a result of the program's emphasis on a whole-food, plant-based eating pattern, which is largely free from exogenous cholesterol, low in saturated fat, and high in fibre. The substantial reduction in serum TC and LDL-C, leading to a decreased need for reverse cholesterol transport, may also explain the acute reduction in HDL-C seen in this study and others that advocated a plant-based eating pattern (8,18,19).

Lifestyle interventions and prevention

Because many chronic diseases have lifestyle underpinnings (1,4), awareness is growing that lifestyle interventions have merit at all levels of prevention. In terms of primary prevention, results of the 52-country INTERHEART study (20) indicated that positive lifestyle practices, such as the consumption of fruits and vegetables, physical activity, and avoidance of tobacco use, can prevent up to 90% of myocardial infarctions. In terms of secondary prevention, the Diabetes Prevention Program Research Group (21) showed a 16-session lifestyle education program to be twice as effective as pharmaceuticals (metformin) for preventing the progression of prediabetes to diabetes in at-risk patients.

At the tertiary level, several studies have included an exploration of lifestyle medicine interventions for potential chronic disease regression (22-24), and most have been centred on a whole-food, plant-based diet high in fibre (>30 g) and low in fat (<20%), cholesterol, and refined sugar. Esselstyn (23) showed regression of heart disease when a low-fat (<10%) plant-based diet alone was used, while the Lifestyle Heart Trial (22) demonstrated CVD reversal through plant-based nutrition combined with exercise, social support, and stress management techniques. Barnard et al. (24) reported that approximately 40% of people with type 2 diabetics mellitus treated with insulin could discontinue its use through participation in a 26-day residential program involving a near-vegetarian, low-fat diet in conjunction with exercise. Interestingly, in the current study, 40% of participants who entered the program with FBS levels indicative of diabetes experienced reductions to levels below this classification in 30 days. This observation is comparable to our findings in almost 6000 CHIP participants from the United States and Australasia (7,8).

Confounders and biometric risk factors

Several confounders may explain the magnitude of the changes observed in the biometric risk factors measured in this study. First, as the participants were self-selected, they likely entered the program with an elevated readiness for change and hence willingness to engage in the intervention (25). Evidence for this can been seen in the very high program completion rate (97%), which was likely influenced by the fact participants had to pay to be involved. The generalizability of the findings to less motivated populations needs to be determined. Second, the extent to which regression to the mean explains the observed improvements is undetermined, as the study had no control group. However, given the large sample size and the fact that for some of the biometrics the high-risk categories moved up to 1.5 standard deviations, regression to the mean likely is only a small component of the changes. A randomized controlled trial of the CHIP intervention in the United States, which involved a smaller sample, indicated magnitudes of change in the treatment group that were similar to those observed in the current study (5). Notwithstanding the limitations in the research design, the current study results are noteworthy, given the size of the sample and the large effects observed.

Medication doses and compliance

Finally, in the current study, several anecdotal reports indicated that personal physicians decreased doses or even discontinued participants' medications (e.g., for hypertension, hypercholesterolemia, or hyperglycemia) during the 30 days of the intervention. While this is a desirable outcome, reduced medication usage may have caused the results to be understated. A study limitation is that medication changes were not recorded, and this will be done in future studies.

Similarly, program compliance data were not collected, and, while the biometric changes suggest participants changed their health behaviours, the extent to which this occurred is unknown. Presumably, the participants entered the program with different health behaviours and made varying degrees of change throughout the intervention. Further studies are in process to explore the influence of these factors on the outcomes achieved in the program.

Sustainability of lifestyle practices

A randomized controlled trial is warranted to investigate the effectiveness and sustainability of the lifestyle practices acquired during the CHIP intervention and the associated long-term improvements in chronic disease risk factors. Maintenance of behaviour change following the CHIP intervention has been

documented for up to 18 months in the United States (26), but a sustainability study is needed in Canada.

The Canadian context

The results indicate that, within the Canadian context, the CHIP intervention can meaningfully improve chronic disease risk factors within 30 days, especially among at-risk individuals. The nutrition-centred CHIP intervention, which can be delivered in a community setting, shows promise for assistance with the management of chronic diseases in Canada.

RELEVANCE TO PRACTICE

Nutrition-centred programs like the CHIP lifestyle intervention can achieve meaningful reductions in risk factors for chronic disease in the Canadian setting. This finding highlights the value of nutrition education for combatting the rise of chronic disease. The study suggests that good outcomes can be achieved inexpensively through community-run programs with volunteers.

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References

1. Beaglehole R, Bonita R, Horton R, Adams C, Alleyne G, Asaria P, et al. Priority actions for the non-communicable disease crisis. Lancet. 2011;377:1438-47.
2. Alwan A. Global status report on non-communicable diseases 2010. World Health Organization; 2011 [cited 2012 Aug 31]; Available from: http://www.who.int/nmh/publications/ncd_report2010/en/
3. Milan A, Martel L. Mortality. In: Milan A, Dion P Coulombe S. Report on the demographic situation in Canada 2005 and 2006. Ottawa: Statistics Canada 2010. Catalogue No. 91-209-X.
4. Cecchini M, Sassi F, Lauer JA, Lee YY, Guajardo-Barron V, Chisholm D. Tackling of unhealthy diets, physical inactivity, and obesity: health effects and cost-effectiveness. Lancet. 2010;376:1775-84.
5. Englert HS, Diehl HA, Greenlaw RL, Willich SN, Aldana S. The effect of a community-based coronary risk reduction: the Rockford CHIP. Prevent Med. 2007;44:513-9.
6. Aldana SG, Greenlaw RL, Diehl HA, Salberg A, Merrill RM, Ohmine S. The effects of a worksite chronic disease prevention program. J Am Coll Occup Environ Med. 2005;47:558-64.
7. Rankin P, Morton DP, Diehl H, Gobble J, Morey P, Chang E. Effectiveness of a volunteer-delivered lifestyle modification program for reducing cardiovascular disease risk factors. Am J Cardiol. 2012;109:82-6.
8. Morton DP, Rankin P, Morey P, Kent L, Hurlow T, Chang E, et al. The effectiveness of the Complete Health Improvement Program (CHIP) in Australasia for reducing selected chronic disease risk factors: a feasibility study. N Z Med J. 2013;126:43-54.
9. Diehl HA. Coronary risk reduction through intensive community-based lifestyle intervention: the Coronary Health Improvement Project (CHIP) experience. Am J Cardiol. 1998;82:83T-7T.
10. Shurney D, Hyde S, Hulsey K. CHIP lifestyle program at Vanderbilt University demonstrates an early ROI for a diabetic cohort in workplace setting: a case study. J Manag Care Med. 2012;15(4):5-15.
11. Merrill RM, Taylor P, Aldana SG. Coronary Health Improvement Project (CHIP) is associated with improved nutrient intake and decreased depression. Nutrition. 2008;24:314-21.
12. Thieszen CL, Merrill RM, Aldana SG, Diehl HA, Mahoney ML, Greenlaw RL, et al. The Coronary Health Improvement Project (CHIP) for lowering weight and improving psychosocial health. Psychol Rep. 2011; 109:338-52.
13. Ajzen I. The theory of planned behavior: reactions and reflections. Psychol Health. 2011;26:1113-27.
14. Third report of the National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III) final report. Circulation. 2002;106:3143-421.
15. Wilson PWF, D'Agostino RB, Levy D, Belanger AM, Silbershatz H, Kannel WB. Prediction of coronary heart disease using risk factor categories. Circulation. 1998;97:1837-47.
16. Gould AL, Davies GM, Alemao E, Yin DD, Cook JR. Cholesterol reduction yields clinical benefits: meta-analysis including recent trials. Clin Ther. 2007;29:778-94.
17. Tang JL, Smith GD, Armitage JM, Lancaster T, Silagy CA, Fowler GH, et al. Systematic review of dietary intervention trials to lower blood total cholesterol in free-living subjects. BMJ. 1998;316:1213-20.
18. Ferdowsian HR, Barnard ND. Effects of plant-based diets on plasma lipids. Am J Cardiol. 2009;104:947-56.
19. Ornish D. Serum lipids after a low-fat diet. JAMA. 1998;279:1345-6.
20. Yusuf S, Hawken S, Ounpuu S, Dans T, Avezum A, Lanas F, et al. Effect of potentially modifiable risk factors associated with myocardial infarction in 52 countries (the INTERHEART study): case-control study. Lancet. 2004;364:937-52.
21. Knowler WC, Barrett-Connor E, Fowler SE, Hamman RF, Lachin JM, Walker EA, et al. Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. N Engl J Med. 2002;346:393-403.
22. Ornish D, Brown SE, Scherwitz LW, Billings JH, Armstrong WT, Ports TA, et al. Can lifestyle changes reverse coronary heart disease? The Lifestyle Heart Trial. Lancet. 1990;336:129-33.
23. Esselstyn CB Jr. Updating a 12-year experience with arrest and reversal therapy for coronary heart disease (an overdue requiem for palliative cardiology). Am J Cardiol. 1999;84:339-41.
24. Barnard RJ, Jung T, Inkeles SB. Diet and exercise in the treatment of NIDDM. The need for early emphasis. Diabetes Care. 1994;17:1469-72.
25. Norcross JC, Krebs PM, Prochaska JO. Stages of change. J Clinical Psychol. 2011;67:143-54.
26. Merrill RM, Aldana SG, Greenlaw RL, Diehl HA, Salberg A, Englert H. Can newly acquired healthy behaviors persist? An analysis of health behavior decay. Prevent Chronic Dis. 2008;5:A13.