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Research paper

Impact of a preventive cardiology clinic focusing on lifestyle and nutrition counseling: A pilot analysis

Mohammed Elzeneini [a], Jerin George [a], Hassan Ashraf [a], Ke Xu [b], John Petersen [c], R. David Anderson [c], Eileen M. Handberg [c], Carl J. Pepine [c], Monica Aggarwal [c,*]

[a] Department of Internal Medicine, University of Florida, Gainesville, FL, USA
[b] Department of Health Outcomes and Biomedical Informatics, University of Florida, Gainesville, FL, USA
[c] Division of Cardiovascular Medicine, University of Florida, Gainesville, FL, USA

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ABSTRACT

Standard cardiology practice often defers preventive strategies to primary care providers. We aimed to evaluate the effectiveness of a preventive cardiology clinic focused on lifestyle and nutrition counseling combined with guideline-directed medical therapy on reducing cardiovascular disease (CVD) risk. We queried the University of Florida-Health database for patients enrolled in the preventive cardiology clinic, and a general and interventional cardiology clinic from January 2016 to October 2019. Mean change in weight and blood cholesterol including LDL cholesterol (LDL-C), total cholesterol (TC) and triglycerides (TG) were compared in the three clinics in the initial cohort and stratified into primary and secondary prevention. A propensity score-matched analysis was done to adjust for CVD risk factors and statin use. Among a cohort of 239 patients, enrollment in the preventive clinic (n = 99) was associated with greater weight loss at 6 months compared to other clinics (n = 140) (mean −1.7 vs +0.1 kg, p 0.007). Preventive clinic was also associated with greater mean reduction in LDL-C (−24.8 vs −7.1 mg/dl, p 0.021), TC (−29.3 vs −2.0, p 0.003) and TG (−19.7 vs +13.3, p 0.002) at both initial and last follow-up (median time 6 and 16 months). The association with reduction in TG was observed in both primary and secondary prevention, but reduction in LDL-C and TC was only significant in secondary prevention. In a propensity-matched linear regression analysis, preventive clinic was independently associated with LDL-C reduction (b −14.7, r −0.3, p 0.038). A preventive cardiology clinic focused on patient education can be effective in reducing CVD risk.

1. Introduction

Cardiovascular disease (CVD) is the leading cause of death in the United States (US) [1] and globally [2]. Despite mortality decreasing over the last several decades, the prevalence of CVD remains high due to the burden of risk factors as poor diet, obesity, hypertension and diabetes/prediabetes [3]. Each of these risk factors has a prevalence rate of almost 40% among US adults [4], and contributes to more than 5% of CV mortality [3]. The American Heart Association (AHA) identified seven simple metrics and goals for achieving ideal cardiovascular (CV) health; namely, stop smoking, eat better, get active, lose weight, and manage blood pressure, blood cholesterol and blood sugar [5]. Several population-based studies demonstrated a stepwise inverse association between the number of these health metrics achieved and CV mortality [6–8]. However, the prevalence of these metrics in the US remains very low [9]. As of 2016, only 18% of US adults met five of these metrics, 5% met six and virtually 0% met all seven [1]. The most recent dietary guidelines outline the poor state of the average American diet, and advocate the intake of more fruits, vegetables, and whole grains, as well as 150 min of moderate-intensity exercise a week [10–12]. Per the most recent AHA statistics, only 24% of US adults report adequate physical activity and <10% report the recommended healthy dietary intake [4]. Physician counseling may be impactful in effecting change in patients' diet and lifestyle, for example adopting a Mediterranean or plant-based diet which have both been shown to reduce CV events [13,14]. However, a recent survey showed that less than 3 min of the average cardiology outpatient visit is spent on nutrition education [15]. A preventive cardiology clinic was established at our institution in January 2016 with the goal of improving CV health by promoting change to patients' nutrition and lifestyle along with optimizing guideline-directed medical

* Corresponding author at: Division of Cardiovascular Medicine, University of Florida, 1600 SW Archer Road, P.O. Box 100277, Gainesville, FL 32610-0277, USA.
E-mail address: Monica.Aggarwal@medicine.ufl.edu (M. Aggarwal).

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therapy (GDMT). In this analysis, we describe the clinic design and report its impact on reducing CVD risk compared to standard general and interventional cardiology clinics.

2. Methods

We queried the University of Florida (UF)-Health Integrated Data Repository (IDR) database for patients enrolled in three UF-Health cardiology clinics in the period from January 2016 to October 2019. The three clinics were the UF-Health preventive cardiology clinic, a general cardiology clinic and an interventional cardiology clinic. All patients in the preventive clinic (held monthly) and a similar random number of patients in the general and interventional clinics (held weekly) were queried. Only patients establishing their first cardiology clinic visit were included (n = 375). Patients with only one cardiology clinic visit without a follow-up within 1 year were excluded (lost to follow-up or discharged from clinic). Patients who had visits in more than one type of cardiology clinic were also excluded. Specific clinic allocation was dependent on patient's request. A total of 239 patients were included in our final cohort. The study was approved by the Institutional Review Board at UF and informed consent was waived.

The UF-Health preventive cardiology clinic was established in January 2016 to provide both primary and secondary prevention for patients with or at risk of CVD. The clinic emphasizes education on healthy lifestyle, and counseling on nutrition, exercise and stress reduction (Fig. 1), along with optimization of GDMT. Initial visits are all one-hour long. During the initial visit, patients complete an in-depth 5-page lifestyle-based questionnaire (Supplemental material) as well as a brief 8-item dietary assessment questionnaire named 'Starting The Conversation' (STC) which has been previously validated for use as an assessment and intervention tool [16]. These assessments are the basis for patient counseling on adopting healthier nutrition and lifestyle. During the first visit, patients are given varying education based on their specific needs but the majority of patients are provided in-depth nutrition counseling (Supplemental material). This nutrition counseling focuses on eating a primarily whole food plant-based diet. This involves removal of refined, processed foods and animal products that are high in saturated fat and increasing intake of fruits and vegetables, whole grains, beans and legumes. Patients also receive a personalized meal plan, grocery list and guide on how to tackle eating out. There is non-dietary counseling as well where patients are taught how to perform different strength building exercises and taught how to conduct meditative breathing and/or other mind-body techniques. This is primarily done by the preventive cardiologist. Counseling is continued in subsequent follow-up visits scheduled at 3 and 6 months. Lab-work including fasting lipid panel, hemoglobin A1C and high-sensitivity CRP are drawn at the initial and one of the 3/6 months follow-up visits. Guideline-directed medical therapy is used when indicated, including the use of antiplatelet, antihypertensive, lipid-lowering and hypoglycemic therapy. Referral to other clinics is made when indicated. Further follow-up after 6 months is made on an individual basis.

Patients were retrospectively followed up till October 2020. Chart review was performed for all data collection. CVD risk profile including risk factors, weight, body mass index (BMI), blood pressure, hemoglobin A1c and lipid profile including total cholesterol (TC), LDL cholesterol (LDL-C) and triglycerides (TG) were collected at the index clinic visit. The change in weight, BMI, TC, LDL-C and TG at each follow-up clinic visit and lipid panel was collected, including the time of that follow-up. The presence of coronary artery disease was documented, based on a functional or anatomical diagnostic assessment rather than symptoms alone. Statin use and dosage were also collected and categorized into low-intensity, moderate-intensity and high-intensity statin use. Our two measures of clinic outcome were reduction in weight and BMI at 6 months, and reduction in TC, LDL-C and TG at first follow-up (>2 months) and last follow-up. All data was entered into a REDCap electronic data capture tool hosted at our institution [17].

For descriptive analysis of patients' baseline risk profiles, continuous variables were presented as mean values ± standard deviation, and categorical variables were presented as counts and percentages. Preventive clinic was compared to a pooled data of the two non-preventive (conventional) clinics as well as each of the general and interventional clinics separately. Categorical variables were compared using the Chi-squared test. Mean age and mean reduction in weight, BMI, TC, LDL-C and TG were compared using the Student's *t*-test. A significance level of $p < 0.05$ was used to indicate statistical significance. We stratified our patient cohort by the presence of coronary artery disease into primary prevention and secondary prevention cohorts, and repeated the comparative analysis of reduction in TC, LDL-C and TG at first follow-up. A propensity score-matched linear regression analysis was then done to investigate the independent association of preventive clinic (compared to conventional clinics) with reduction in LDL-C at first follow-up. Baseline variables (age, gender, diabetes and hypertension) and statin

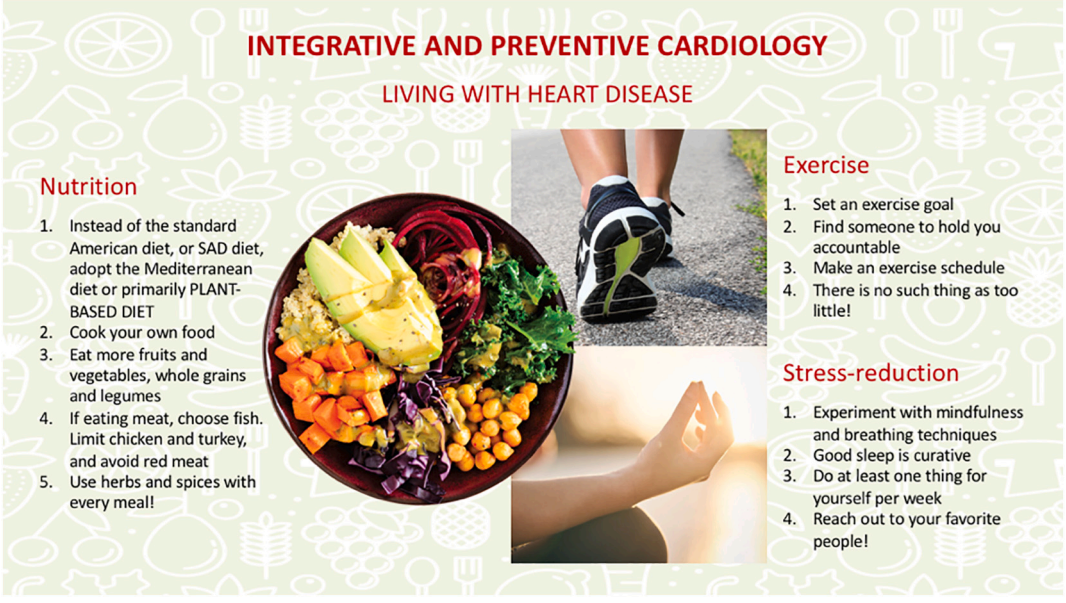

Fig. 1. Patient education and lifestyle counseling in a preventive cardiology clinic encompassing three aspects: nutrition, exercise and stress reduction.

use were used for the propensity score matching. A correlation coefficient (r) and beta regression coefficient (b) were calculated for linear regression analysis, and a $p < 0.05$ was used to indicate statistical significance. The statistical software SPSS (IBM SPSS Version 26 for Mac) was used for statistical analysis.

3. Results

Our study cohort for analysis included 239 patients (Fig. 2). Among all clinics, the mean age was 64 years and there was an equal number of males and females. Coronary artery disease was present in 38%. There were differences in the baseline characteristics of patients between the 3 clinics, as outlined in Table 1. Patients in the preventive clinic were younger than those in other clinics (mean age 59 vs 67 years), had a higher percentage of females (59% vs 44%), had a lower prevalence of coronary artery disease (30% vs 44%), and were less likely to have diabetes or symptoms of chest pain or dyspnea. They were more likely to be seen for two follow-up visits in the first 6 months since enrollment: initial visit, 3-months and 6-months follow-up. They had higher baseline LDL-C and were less likely to be on a statin (54% vs 69%), although they were equally likely to be on a high-intensity statin.

The mean change in weight after 6 months, and the mean change in blood cholesterol on initial and final follow-up lipid panels were compared in all 3 clinics (Table 2). There was a more favorable change in both weight and blood cholesterol observed with patients in the preventive clinic compared to other clinics. Patients in the preventive clinic lost an average of 1.7 kg of body weight (0.6 kg/m^2 reduction in BMI) compared to almost no change in other clinics (p-value 0.007). Patients in the preventive clinic also had a mean reduction of 29.3, 24.8 and 19.7 mg/dl in their TC, LDL-C and TG respectively, at initial follow-up, compared to only 2.0, 7.1 and 1.6 in other clinics (p-value 0.003, 0.021 and 0.002 respectively). A similar change between clinics in TC, LDL-C and TG reduction was maintained on final follow-up (see Table 2). Median time for initial follow-up lipid panel in the preventive, general and interventional clinics was 4, 6 and 10.5 months respectively, while median time for last follow-up lipid panel was 14, 13.5 and 30 months respectively. Lipid panel analysis only included patients who had a baseline and follow-up lipid panel (n = 137).

Patients were stratified into primary and secondary prevention according to the presence of coronary artery disease, and the mean change in blood cholesterol on initial follow-up lipid panel compared (Table 3). There was a greater reduction in TG in the preventive clinic compared to other clinics in both primary prevention (16.9 vs 8.7, p-value 0.016) and secondary prevention cohorts (24.8 vs +16.8, p-value 0.035). There was also a greater reduction in TC and LDL-C in the preventive clinic compared to other clinics in secondary prevention (41.8 and 37.0 vs 4.1 and 5.0, p-value 0.010 and 0.015, respectively), but there was no significant difference in primary prevention.

Propensity score matching was done to adjust for differences in the baseline characteristics of the patients in the 3 clinics. Propensity score matching included age, gender, diabetes, hypertension and statin use. A propensity-matched linear regression analysis showed that preventive clinic compared to other clinics was independently associated with LDL-C reduction on initial follow-up lipid panel (b −14.7, r −0.3, p 0.038).

4. Discussion

In this pilot study, we evaluated the potential effectiveness of a preventive cardiology clinic in reducing patients' CVD risk by comparing the mean change in patients' weight and lipid profile to those in other cardiology clinics. Patients who came to the preventive clinic had a greater weight loss after 6 months, and a greater reduction in TC, LDL-C and TG that was sustained for the entire duration of follow-up. Mean reduction in LDL-C with the preventive clinic was 24.8 mg/dl after a median time of 4 months, compared to only 7.1 mg/dl in other clinics (p-value 0.021). This effect in LDL-C was greater and only statistically significant for patients with established coronary artery disease pursuing secondary prevention (37.0 vs 5.0, p-value 0.015). Preventive clinic compared to other clinics was independently associated with LDL-C reduction in a propensity-matched linear regression analysis matching baseline risk profile and statin use (b −14.7, r −0.3, p 0.038). Overall, this pilot analysis suggests that enrolling patients in a preventive cardiology clinic may be effective in reducing patients' CVD risk, with a greater effect in those pursuing secondary prevention.

LDL-C reduction has widely been shown to reduce major CV events and mortality. A meta-analysis of randomized trials by the Cholesterol Treatment Trialists' group reported a 20% reduction in CV mortality with every 1 mmol/l reduction in LDL-C (equivalent to 38.7 mg/dl) [18]. Achieving lower targets than the traditional 100 mg/dl in patients with CVD has been shown to further reduce CV events and mortality in trials utilizing statins [19], ezetimibe [20] and PCSK9 inhibitors [21]. However, pooled data from 3 major trials showed that a significant

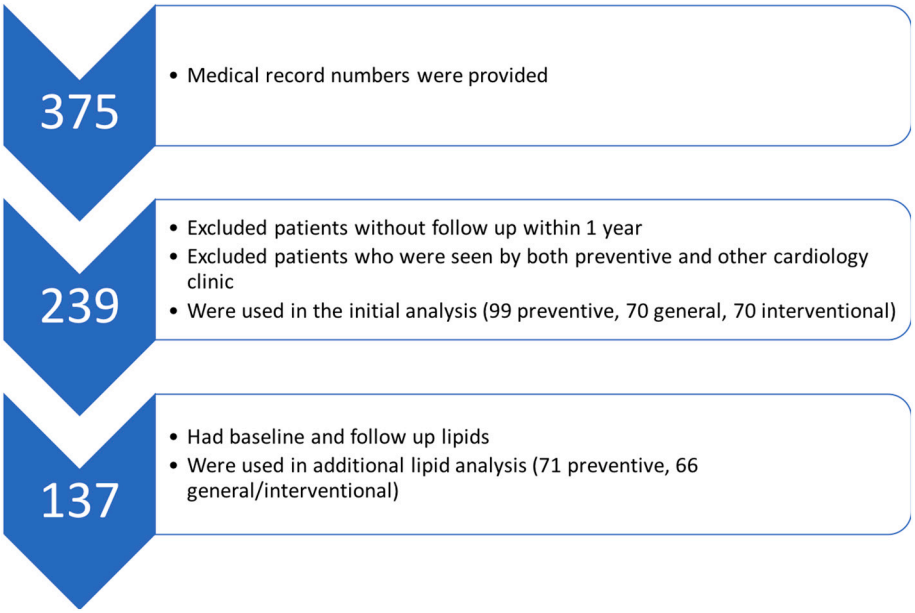

Fig. 2. Flow diagram of our patient cohort used for analysis.

Table 1
Baseline cardiovascular risk profile of each clinic cohort.

	Preventive clinic (n = 99)	Conventional clinics (n = 140)[a]	General clinic (n = 70)	Interventional clinic (n = 70)	p-Value
Age, years	59.2 ± 14.0	67.3 ± 12.4	68.0 ± 12.9	66.6 ± 11.9	**<0.001**
Female gender	58 (59%)	62 (44%)	35 (50%)	27 (39%)	**0.029**
Hypertension	67 (68%)	108 (77%)	53 (76%)	55 (79%)	0.104
Coronary artery disease	30 (30%)	62 (44%)	25 (36%)	37 (53%)	**0.029**
Diabetes mellitus	15 (15%)	69 (49%)	21 (30%)	48 (69%)	**<0.001**
Symptoms (CP/SOB)[b]	23 (23%)	69 (49%)	26 (37%)	43 (61%)	**<0.001**
Two follow-ups in 6 months[c]	50 (51%)	30 (21%)	11 (16%)	19 (27%)	**<0.001**
Baseline LDL-C	116.7 ± 53.2	94.2 ± 37.1	95.3 ± 35.4	93.2 ± 39.1	**<0.001**
Statin use					
None	46 (46%)	43 (31%)	24 (34%)	19 (27%)	**0.014**
Low to Moderate intensity	24 (24%)	57 (41%)	28 (40%)	29 (41%)	
High intensity	29 (29%)	40 (29%)	18 (26%)	22 (31%)	

Age is presented as mean ± standard deviation, and all other values are presented as number (percentage). p-Values are based on a comparison between the preventive and conventional clinics using the Student's t-test for age and the Chi-squared test for all other variables. Bold values statistically significance at p-Values < 0.05.

[a] Conventional clinics are a combination of both the general and interventional clinic.

[b] CP: chest pain; LDL-C: low-density lipoprotein cholesterol; SOB: shortness of breath.

[c] Two follow-ups refers to 2 follow-up clinic visits in 6 months from initial index clinic visit.

Table 2
Mean change in weight after 6 months of follow-up, and mean change in blood cholesterol at initial and final follow-up, in each of the three clinics.

	Preventive clinic (n = 99)	Conventional clinics (n = 140)[a]	p-Value	General clinic (n = 70)	p-Value	Interventional clinic (n = 70)	p-Value
Mean change in weight at 6 months							
Weight, kg	−ve 1.7 ± 4.8	0.1 ± 4.9	**0.007**	−ve 0.5 ± 4.8	0.126	0.7 ± 5.1	**0.003**
BMI, kg/m^2	−ve 0.6 ± 1.7	−ve 0.01 ± 1.6	**0.007**	−ve 0.2 ± 1.6	0.128	0.2 ± 1.5	**0.003**
Mean change in blood cholesterol at initial follow-up (median 6 months)[b]							
TC, mg/dl	−ve 29.3 ± 60.7	−ve 2.0 ± 41.2	**0.003**	0.6 ± 46.0	**0.010**	−ve 4.0 ± 37.8	**0.009**
LDL-C, mg/dl	−ve 24.8 ± 54.3	−ve 7.1 ± 30.9	**0.021**	−ve 11.1 ± 32.4	0.126	−ve 4.1 ± 29.8	**0.012**
LDL-C, % change	−ve 12.6 ± 35.8	−ve 1.6 ± 37.2		−ve 6.5 ± 28.9		2.1 ± 42.3	
TG, mg/dl	−ve 19.7 ± 59.0	13.3 ± 62.7	**0.002**	14.5 ± 37.8	**0.001**	12.4 ± 77.0	**0.029**
Mean change in blood cholesterol at final follow-up (median 16 months)[b]							
TC, mg/dl	−ve 28.1 ± 59.2	−ve 5.9 ± 36.8	**0.010**	−ve 6.6 ± 42.5	**0.048**	−ve 5.3 ± 32.7	**0.011**
LDL-C, mg/dl	−ve 22.6 ± 57.2	−ve 6.6 ± 31.8	**0.047**	−ve 10.8 ± 36.7	0.227	−ve 3.5 ± 27.8	**0.021**
LDL-C, % change	−ve 13.1 ± 38.0	−ve 2.3 ± 32.5		−ve 5.1 ± 31.5		−ve 0.3 ± 33.4	
TG, mg/dl	−ve 20.1 ± 63.3	12.2 ± 45.3	**0.001**	13.9 ± 41.6	**0.003**	10.9 ± 48.4	**0.005**

p-Values are based on the Student's *t*-test comparing the preventive clinic with each of the following: conventional clinics, general clinic and interventional clinic, respectively. Bold values statistically significance at p-Values < 0.05

BMI: body mass index; LDL-C: low-density lipoprotein cholesterol; TC: total cholesterol; TG: triglycerides.

[a] Conventional clinics are a combination of both the general and interventional clinic.

[b] Change in blood cholesterol analysis only included patients with a baseline and follow-up lipid panel (Preventive clinic n = 71, Conventional clinics n = 66).

proportion of patients failed to achieve pre-specified LDL-C targets despite aggressive intervention in these trials [22]. This brings up the need for implementation of new strategies to help patients achieve these targets. Our preventive clinic model has been associated with a mean 25 mg/dl reduction in LDL-C (37 mg/dl in secondary prevention), which may be partly secondary to the use of statins, however the clinic model alone compared to other clinics showed an independent effect in a propensity-matched analysis.

Our preventive clinic model emphasizes patient education and counseling on healthy lifestyle and dietary practices, in addition to optimizing GDMT. It implements a much-needed model for lifestyle counseling and intervention into the clinical setting [23]. Strategies of extended care and skills training are used, in the form of prolonged clinic visits, surveys, nutrition education and mind-body techniques, to change patient behavior. These strategies have been shown to improve patient adherence to lifestyle changes [24,25], and sustain improvements in quality of life over time [26]. Models of cardiac rehabilitation programs have shown high compliance and with that high compliance, have been shown to reduce angina, coronary stenosis and CVD risk [27,28]. Similarly, a post-myocardial infarction multi-disciplinary clinic model focusing on patient education and medication compliance has been shown to reduce 30-day re-admission rates [29]. Most of these clinic models, however, promote patient education after a causal event; rather than prior.

Studies looking at clinics that focus exclusively on prevention are limited. One study showed improved LDL-C reduction when using advanced practice providers in a preventive cardiology clinic compared to patients who were seen in primary care practices only. This was primarily due to an increased use of coronary artery calcium scoring and more aggressive risk stratification allowing for uptitration of GDMT [30]. Another focused comparison study showed adherence to a lipid prevention clinic achieved better LDL-C goals that conventional cardiology care after three years of enrollment in the prevention clinic. A multidisciplinary approach was used involving cardiologists and pharmacists, and provided patient and family education to promote lifestyle changes [31]. In comparison, our preventive clinic provided more time for patient education and strategies to improve compliance rather than involving more providers. Our prevention clinic was also able to show improvements within a shorter period of time. All these strategies could be described under three previously described clinic-based processes for achieving prevention goals: increasing visit frequency, overcoming therapeutic inertia and improving medication compliance [32]. With current data showing that cardiologists spend less than 3 min on counseling on nutrition, our study serves as a reminder that spending time with patients on counseling has a significant impact on lipid parameters which has the potential benefit of improving CV mortality. With the recent change in International Classification of Disease (ICD) codes allowing for more flexibility in time-based billing, opportunities to focus

Table 3
Mean change in blood cholesterol at initial follow-up in each of the three clinics stratified by primary and secondary prevention according to the presence of coronary artery disease.

Primary prevention cohort			
	Preventive clinic (n = 46)	Conventional clinics (n = 28)[a]	p-Value
TC, mg/dl	−ve 22.5 ± 59.3	0.8 ± 47.7	0.068
LDL-C, mg/dl	−ve 18.2 ± 51.9	−ve 9.9 ± 32.7	0.401
LDL-C, % change	−ve 6.3 ± 36.9	−ve 2.1 ± 46.6	
TG, mg/dl	−ve 16.9 ± 49.8	8.7 ± 39.2	**0.016**

Secondary prevention cohort			
	Preventive clinic (n = 25)	Conventional clinics (n = 38)[a]	p-Value
TC, mg/dl	−ve 41.8 ± 62.4	−ve 4.1 ± 36.2	**0.010**
LDL-C, mg/dl	−ve 37.0 ± 57.7	−ve 5.0 ± 29.8	**0.015**
LDL-C, % change	−ve 24.1 ± 31.3	−ve 1.1 ± 38.2	
TG, mg/dl	−ve 24.8 ± 73.9	16.8 ± 76.3	**0.035**

p-Values are based on the Student's *t*-test.
LDL-C: low-density lipoprotein cholesterol; TC: total cholesterol; TG: triglycerides.
[a] Conventional clinics are a combination of both the general and interventional clinic.

on lifestyle-based interventions now exist [33,34].

This study has a number of limitations. The sample size is small, making it hypothesis-generating only and limiting the generalizability of our findings. However, we involved all patients enrolled in the preventive clinic and excluded those attending more than one type of cardiology clinic, which provides a good pilot analysis of the potential effectiveness of the clinic model. Second, all data was obtained by retrospective chart review, which made us unable to control for unidentified or unmeasured CVD risk factors such as socioeconomic and psychosocial. Moreover, our analysis involved weight and lipid management and excluded other forms of CVD risk factor management including blood pressure and glucose management. These were measured at interval clinic visits; however, it was felt that these had a fluctuating course and clinic measurements would only reflect measurements at a single point of time. A different prospective study design may be more suitable to assess for changes in these CVD risk factors.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ahjo.2021.100032.

References

[1] E.J. Benjamin, P. Muntner, A. Alonso, M.S. Bittencourt, C.W. Callaway, A. P. Carson, A.M. Chamberlain, A.R. Chang, S. Cheng, S.R. Das, F.N. Delling, L. Djousse, M.S.V. Elkind, J.F. Ferguson, M. Fornage, L.C. Jordan, S.S. Khan, B. M. Kissela, K.L. Knutson, et al., Heart disease and stroke Statistics—2019 update: a report from the American Heart Association, Circulation 139 (10) (2019), https://doi.org/10.1161/CIR.0000000000000659.

[2] GLOBAL STATUS REPORT on Noncommunicable Diseases, Attaining the Nine Global Noncommunicable Diseases Targets; a Shared Responsibility, 2014.

[3] C.J.L. Murray, A.H. Mokdad, K. Ballestros, M. Echko, S. Glenn, H.E. Olsen, E. Mullany, A. Lee, A.R. Khan, A. Ahmadi, A.J. Ferrari, A. Kasaeian, A. Werdecker, A. Carter, B. Zipkin, B. Sartorius, B. Serdar, B.L. Sykes, C. Troeger, et al., The state of US health, 1990–2016: burden of diseases, injuries, and risk factors among US states, JAMA, J. Am. Med. Assoc. 319 (14) (2018) 1444–1472, https://doi.org/10.1001/jama.2018.0158.

[4] S.S. Virani, A. Alonso, H.J. Aparicio, E.J. Benjamin, M.S. Bittencourt, C. W. Callaway, A.P. Carson, A.M. Chamberlain, S. Cheng, F.N. Delling, M.S.V. Elkind, K.R. Evenson, J.F. Ferguson, D.K. Gupta, S.S. Khan, B.M. Kissela, K.L. Knutson, C. D. Lee, T.T. Lewis, et al., Heart disease and stroke statistics—2021 update: a report from the American Heart Association, Circulation 143 (2021) 254–743, https://doi.org/10.1161/cir.0000000000000950.

[5] D.M. Lloyd-Jones, Y. Hong, D. Labarthe, D. Mozaffarian, L.J. Appel, L. Van Horn, K. Greenlund, S. Daniels, G. Nichol, G.F. Tomaselli, D.K. Arnett, G.C. Fonarow, P. M. Ho, M.S. Lauer, F.A. Masoudi, R.M. Robertson, V. Roger, L.H. Schwamm, P. Sorlie, et al., Defining and setting National Goals for cardiovascular health promotion and disease reduction, Circulation 121 (4) (2010) 586–613, https://doi.org/10.1161/CIRCULATIONAHA.109.192703.

[6] Q. Yang, M.E. Cogswell, W.D. Flanders, Y. Hong, Z. Zhang, F. Loustalot, C. Gillespie, R. Merritt, F.B. Hu, Trends in cardiovascular health metrics and associations with all-cause and CVD mortality among US adults, JAMA 307 (12) (2012) 1273, https://doi.org/10.1001/jama.2012.339.

[7] J.T. Wilkins, H. Ning, J. Berry, L. Zhao, A.R. Dyer, D.M. Lloyd-Jones, Lifetime risk and years lived free of total cardiovascular disease, JAMA 308 (17) (2012) 1795, https://doi.org/10.1001/jama.2012.14312.

[8] N. Fang, M. Jiang, Y. Fan, Ideal cardiovascular health metrics and risk of cardiovascular disease or mortality: a meta-analysis, Int. J. Cardiol. 214 (2016) 279–283, https://doi.org/10.1016/j.ijcard.2016.03.210.

[9] A. Younus, E.C. Aneni, E.S. Spatz, C.U. Osondu, L. Roberson, O. Ogunmoroti, R. Malik, S.S. Ali, M. Aziz, T. Feldman, S.S. Virani, W. Maziak, A.S. Agatston, E. Veledar, K. Nasir, A systematic review of the prevalence and outcomes of ideal cardiovascular health in US and non-US populations, Mayo Clin. Proc. 91 (5) (2016) 649–670, https://doi.org/10.1016/j.mayocp.2016.01.019.

[10] U.S. Department of Health and Human Services and U.S. Department of Agriculture, 2015–2020 Dietary Guidelines for Americans, 8th edition, 2015. http://health.gov/dietaryguidelines/2015/guidelines/. (Accessed 2 February 2021).

[11] L. Van Horn, J.A.S. Carson, L.J. Appel, L.E. Burke, C. Economos, W. Karmally, K. Lancaster, A.H. Lichtenstein, R.K. Johnson, R.J. Thomas, M. Vos, J. Wylie-Rosett, P. Kris-Etherton, Recommended dietary pattern to achieve adherence to the American Heart Association/American College of Cardiology (AHA/ACC) guidelines: a scientific statement from the American Heart Association, Circulation 134 (22) (2016) e505–e529, https://doi.org/10.1161/CIR.0000000000000462.

[12] D.K. Arnett, R.S. Blumenthal, M.A. Albert, A.B. Buroker, Z.D. Goldberger, E. J. Hahn, C.D. Himmelfarb, A. Khera, D. Lloyd-Jones, J.W. McEvoy, E.D. Michos, M. D. Miedema, D. Muñoz, S.C. Smith, S.S. Virani, K.A. Williams, J. Yeboah, B. Ziaeian, 2019 ACC/AHA guideline on the primary prevention of cardiovascular disease: a report of the american College of Cardiology/American Heart Association task force on clinical practice guidelines, Circulation 140 (11) (2019) e596–e646, https://doi.org/10.1161/CIR.0000000000000678.

[13] R. Estruch, E. Ros, J. Salas-Salvadó, M.-I. Covas, D. Corella, F. Arós, E. Gómez-Gracia, V. Ruiz-Gutiérrez, M. Fiol, J. Lapetra, R.M. Lamuela-Raventos, L. Serra-Majem, X. Pintó, J. Basora, M.A. Muñoz, J.V. Sorlí, J.A. Martínez, M. Fitó, A. Gea, et al., Primary prevention of cardiovascular disease with a Mediterranean diet supplemented with extra-virgin olive oil or nuts, N. Engl. J. Med. 378 (25) (2018) e34, https://doi.org/10.1056/NEJMoa1800389.

[14] A. Satija, S.N. Bhupathiraju, D. Spiegelman, S.E. Chiuve, J.A.E. Manson, W. Willett, K.M. Rexrode, E.B. Rimm, F.B. Hu, Healthful and unhealthful plant-based diets and the risk of coronary heart disease in U.S, Adults. J Am Coll Cardiol. 70 (4) (2017) 411–422, https://doi.org/10.1016/j.jacc.2017.05.047.

[15] S. Devries, A. Agatston, M. Aggarwal, K.E. Aspry, C.B. Esselstyn, P. Kris-Etherton, M. Miller, J.H. O'Keefe, E. Ros, A.K. Rzeszut, B.A. White, K.A. Williams, A. M. Freeman, A deficiency of nutrition education and practice in cardiology, Am. J. Med. 130 (11) (2017) 1298–1305, https://doi.org/10.1016/j.amjmed.2017.04.043.

[16] A.E. Paxton, L.A. Strycker, D.J. Toobert, A.S. Ammerman, R.E. Glasgow, Starting the conversation performance of a brief dietary assessment and intervention tool for health professionals, AMEPRE. 40 (1) (2011) 67–71, https://doi.org/10.1016/j.amepre.2010.10.009.

[17] P.A. Harris, R. Taylor, B.L. Minor, V. Elliott, M. Fernandez, L. O'Neal, L. McLeod, G. Delacqua, F. Delacqua, J. Kirby, S.N. Duda, The REDCap consortium: building an international community of software platform partners, J. Biomed. Inform. 95 (2019), https://doi.org/10.1016/j.jbi.2019.103208.

[18] C. Baigent, L. Blackwell, J. Emberson, L.E. Holland, C. Reith, N. Bhala, R. Peto, E. H. Barnes, A. Keech, J. Simes, R. Collins, J. De Lemos, E. Braunwald, M. Blazing, S. Murphy, J.R. Downs, A. Gotto, M. Clearfield, H. Holdaas, et al., Efficacy and safety of more intensive lowering of LDL cholesterol: a meta-analysis of data from 170 000 participants in 26 randomised trials, Lancet 376 (9753) (2010) 1670–1681, https://doi.org/10.1016/S0140-6736(10)61350-5.

[19] J.C. LaRosa, S.M. Grundy, D.D. Waters, C. Shear, P. Barter, J.-C. Fruchart, A. M. Gotto, H. Greten, J.J.P. Kastelein, J. Shepherd, N.K. Wenger, Intensive lipid lowering with atorvastatin in patients with stable coronary disease, N. Engl. J. Med. 352 (14) (2005) 1425–1435, https://doi.org/10.1056/NEJMoa050461.

[20] C.P. Cannon, M.A. Blazing, R.P. Giugliano, A. McCagg, J.A. White, P. Theroux, H. Darius, B.S. Lewis, T.O. Ophuis, J.W. Jukema, G.M. De Ferrari, W. Ruzyllo, P. De Lucca, K. Im, E.A. Bohula, C. Reist, S.D. Wiviott, A.M. Tershakovec, T.A. Musliner, et al., Ezetimibe added to statin therapy after acute coronary syndromes, N. Engl. J. Med. 372 (25) (2015) 2387–2397, https://doi.org/10.1056/nejmoa1410489.

[21] M.S. Sabatine, R.P. Giugliano, A.C. Keech, N. Honarpour, S.D. Wiviott, S. A. Murphy, J.F. Kuder, H. Wang, T. Liu, S.M. Wasserman, P.S. Sever, T.R. Pedersen,

Evolocumab and clinical outcomes in patients with cardiovascular disease, N. Engl. J. Med. 376 (18) (2017) 1713–1722, https://doi.org/10.1056/NEJMoa1615664.
[22] M.E. Farkouh, W.E. Boden, V. Bittner, V. Muratov, P. Hartigan, M. Ogdie, M. Bertolet, S. Mathewkutty, K. Teo, D.J. Maron, S.S. Sethi, M. Domanski, R. L. Frye, V. Fuster, Risk factor control for coronary artery disease secondary prevention in large randomized trials, J. Am. Coll. Cardiol. 61 (15) (2013) 1607–1615, https://doi.org/10.1016/j.jacc.2013.01.044.
[23] A.L. Lehr, S.L. Driver, N.J. Stone, The ABCDs of lifestyle counseling, JAMA Cardiol. 1 (5) (2016) 505–506, https://doi.org/10.1001/jamacardio.2016.1419.
[24] S. Kambhampati, T. Ashvetiya, N.J. Stone, R.S. Blumenthal, S.S. Martin, Shared decision-making and patient empowerment in preventive cardiology, Curr. Cardiol. Rep. 18 (5) (2016) 49, https://doi.org/10.1007/s11886-016-0729-6.
[25] K.R. Middleton, S.D. Anton, M.G. Perri, Long-term adherence to health behavior change, Am. J. Lifestyle Med. 7 (6) (2013) 395–404, https://doi.org/10.1177/1559827613488867.
[26] Benefit of one week immersion in lifestyle-based program for sustainable improvements in cardiovascular risk factors over time Int. J. Dis. Reversal Prev. February 14, 2021 https://ijdrp.org/index.php/ijdrp/article/view/121.
[27] D. Ornish, S.E. Brown, J.H. Billings, L.W. Scherwitz, W.T. Armstrong, T.A. Ports, S. M. McLanahan, R.L. Kirkeeide, K.L. Gould, R.J. Brand, Can lifestyle changes reverse coronary heart disease? The Lifestyle Heart Trial, Lancet 336 (8708) (1990) 129–133, https://doi.org/10.1016/0140-6736(90)91656-U.
[28] T.M.H. Eijsvogels, M.F.H. Maessen, E.A. Bakker, E.P. Meindersma, N. van Gorp, N. Pijnenburg, P.D. Thompson, M.T.E. Hopman, Association of cardiac rehabilitation with all-cause mortality among patients with cardiovascular disease in the Netherlands, JAMA Netw. Open 3 (7) (2020) e2011686, https://doi.org/10.1001/jamanetworkopen.2020.11686.
[29] V.M. Cornielle-Caamano, M. Salerno, M.A. Millard, M.J. Loguidice, B.T. Lawlor, I. T. Shah, J.P. Chidester, F.H. Alhajri, I. Aktan, A.K. Blakeney, N.M. Fauber, K. K. Ward, A.L. Tucker, E.C. Keeley, Multidisciplinary clinic to identify near misses and decrease readmission rates after hospitalization for myocardial infarction, Circ. Cardiovasc. Qual. Outcomes 10 (9) (2017), https://doi.org/10.1161/CIRCOUTCOMES.117.003550.
[30] E. Fentanes, A.G. Vande Hei, R.S. Holuby, N. Suarez, Y. Slim, J.N. Slim, A.M. Slim, D. Thomas, Treatment in a preventive cardiology clinic utilizing advanced practice providers effectively closes atherosclerotic cardiovascular disease risk-management gaps among a primary-prevention population compared with a propensity-matched primary-care cohort, Clin. Cardiol. 41 (6) (2018) 817–824, https://doi.org/10.1002/clc.22963.
[31] K.K. Birtcher, A.J. Greisinger, B.J. Brehm, O.A. Wehmanen, L.M. Furman, C. C. Salinas, M. Mirzai-Tehrane, A. Nayak, H. Rashid, A. Mortazavi, A secondary prevention lipid clinic reaches low-density lipoprotein cholesterol goals more often than usual cardiology care with coronary heart disease, J Clin Lipidol. 4 (1) (2010) 46–52, https://doi.org/10.1016/j.jacl.2009.12.001.
[32] B.K. Bellows, N. Ruiz-Negrón, K. Bibbins-Domingo, J.B. King, M.J. Pletcher, A. E. Moran, V. Fontil, Clinic-based strategies to reach United States million hearts 2022 blood pressure control goals: a simulation study, Circ. Cardiovasc. Qual. Outcomes 12 (6) (2019), https://doi.org/10.1161/CIRCOUTCOMES.118.005624.
[33] E. Hill, Time is on your side: coding on the basis of time, Fam. Pract. Manag. 15 (9) (2008) 21.
[34] Published online AAP Division of Health Care Finance, 2021 office-based E/M changes affect time-based reporting, prolonged services, AAP News, 2021.