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Impact of Performance Improvement Continuing Medical Education on Cardiometabolic Risk Factor Control: The COSEHC Initiative

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Abstract

Introduction—The Consortium for Southeastern Hypertension Control (COSEHC) implemented a study to assess benefits of a performance improvement continuing medical education (PI CME) activity focused on cardiometabolic risk factor management in primary care patients.

Methods—Using the plan-do-study-act (PDSA) model as the foundation, this PI CME activity aimed at improving practice gaps by integrating evidence-based clinical interventions, physician-patient education, processes of care, performance metrics, and patient outcomes. The PI CME intervention was implemented in a group of South Carolina physician practices, while a comparable physician practice group served as a control. Performance outcomes at 6 months included changes in patients' cardiometabolic risk factor values and control rates from baseline.

We also compared changes in diabetic, African American, the elderly (> 65 years), and female patient subpopulations and in patients with uncontrolled risk factors at baseline.

Results—Only women receiving health care by intervention physicians showed a statistical improvement in their cardiometabolic risk factors as evidenced by a -3.0 mg/dL and a -3.5 mg/dL decrease in mean LDL cholesterol and non-HDL cholesterol, respectively, and a -7.0 mg/dL decrease in LDL cholesterol among females with uncontrolled baseline LDL cholesterol values. No other statistical differences were found.

Discussion—These data demonstrate that our PI CME activity is a useful strategy in assisting physicians to improve their management of cardiometabolic control rates in female patients with abnormal cholesterol control. Other studies that extend across longer PI CME PDSA periods may be needed to demonstrate statistical improvements in overall cardiometabolic treatment goals in men, women, and various subpopulations.

Keywords

PI CME; hypertension; lipid disorders; medical education; performance improvement CE; quality improvement/Six Sigma/TQM; profession-physicians

Introduction

Metabolic syndrome—defined as the presence of 3 of 5 risk factors, including abdominal obesity, elevated serum triglycerides, low high-density lipoprotein (HDL) cholesterol, hypertension, and elevated fasting blood glucose^{1–3}—affects over one-third of American adults, and is estimated to also be present in individuals with subclinical cardiovascular disease.⁴ Associated national medical expenditures in the United States exceed \$80 billion annually, of which \$27 billion is spent on prescription drugs.⁵ Despite these large expenditures, metabolic syndrome is often undertreated; for example, only 48% to 65% of patients receive recommended clinical treatments for hypertension and hyperlipidemia.^{6–8} One contributor to undertreatment identified in Healthy People 2020 is lower-than-desired adherence to evidence-based practice guidelines by health care providers.^{9,10}

To address this performance gap in the application of cardiometabolic risk factor reduction guidelines^{6,11–13}, the Consortium for Southeastern Hypertension Control (COSEHC) designed a number of performance improvement continuing medical education (PI CME) activities that integrate evidence-based clinical interventions, physician-patient education, processes of care, performance metrics, and the evaluation of patient outcomes. PI CME is one of several COSEHC initiatives aimed at addressing the high prevalence of vascular disease in the southeastern United States.¹⁴

CME activities have been used often to improve patient care and reduce cardiovascular risk factors.¹⁵ Previous studies evaluating the impact of CME workshops, seminars, and group learnings^{16–20}; academic detailing²¹; and continuous performance improvement²¹ on blood pressure have shown mixed results. Studies with positive results often used computerized decision support systems. One PI CME study²² found that process mapping led to improvement in 10 of 16 hypertension-related measures, including blood pressure control in patients on antihypertensive medication. CME workshops incorporating plan-do-study-act

(PDSA) principles resulted in improved hemoglobin A_{1c} (HgA_{1c}) clinical outcomes in diabetic patients in long-term care facilities.²³ While traditional lecture-style CME^{24,25} has been effective in disseminating cardiovascular guidelines, few studies have evaluated the impact of PI CME²⁶ on patient cardiovascular clinical outcomes.^{27,28} Reviews of CME effectiveness studies suggest that there is influence with simple interventions, multiphasic interventions, and interventions sequenced for predisposing, enabling, and reinforcing change.¹⁵

Drawing on conclusions from the CME effectiveness literature, we developed the COSEHC Customized Model of Intervention and Care (COSMIC) intervention. COSMIC is a PI CME activity that incorporates (1) acquisition and use of patient clinical and laboratory values from the patient's medical record (typically an export from an electronic health record) to identify gaps in physician performance; (2) evidenced-based education and performance improvement interventions customized to the learning physician's unique performance gaps; (3) learner-developed intervention plans with ongoing updates using a PDSA cycle format; (4) sequential patient clinical data abstraction, analysis and performance reports to assess physicians' effectiveness in achieving changes in patients' clinical outcomes; and (5) ongoing recommendations for educational interventions focused on improving persistent or new identified educational gaps. The purpose of the present study was to evaluate the effectiveness of COSEHC's PI CME activity in improving patients' cardiovascular clinical outcomes.

Methods

The study was carried out at the Palmetto Primary Care Physicians (PPCP) network in Charleston, South Carolina, a COSEHC-designated Cardiovascular Center of Excellence™. This network was chosen because it was large enough to allow us to complete the project within 1 geographical area and 1 network with similar care options so that the results would have fewer limitations. It was hypothesized that COSMIC intervention group physicians would, after the PI CME intervention, achieve higher hypertension and associated cardiometabolic risk factor control rates and demonstrate improved cardiometabolic clinical values over the 6 months of the study compared to baseline. The clinical outcome measures used in the study were mean sitting systolic (SBP) and diastolic (DBP) blood pressures, low-density lipoprotein (LDL) cholesterol (LDL-C), non-HDL cholesterol (non-HDL-C), HDL-cholesterol (HDL-C) and HgA_{1c}. Risk factor control goals were SBP < 140 mm Hg nondiabetic, < 130 mm Hg, diabetic; DBP < 90 mm Hg nondiabetic, < 80 mm Hg, diabetic; blood pressure (BP) < 140/90 mm Hg nondiabetic, < 130/80 mm Hg diabetic; HDL-C 40 mg/dL; non-HDL-C < 130 mg/dL, and HgA_{1c} < 7.0%. Study outcomes were assessed in the total study patient population and 4 subgroups that can receive disparate care or have underlying circumstances (health, socioeconomic, attitudes) that can influence their health: diabetics, African Americans, elderly subjects (> 65 years), and females.

Study Design and Population

For the study, an intervention/control design was used; during the first 6 months of the study, cluster 1 (CL1) received the COSMIC intervention, while cluster 2 (CL2) served as the control group.

The study was conducted in 12 clinical sites located within the PPCP Healthcare Network. These sites were organized into 2 clusters (6 clinical sites per cluster). To recruit practices and physicians, the COSEHC executive director traveled to each office to talk with the chief executive officer and assess the level of interest. After obtaining a commitment and signed consent forms, we examined statistics on patients, providers, demographics, and insurance. These data were used to identify pairs of similar practices, one of which was randomly assigned to receive the COSMIC intervention in the first 6 months, and the other to receive it after the first 6 months. Physicians were the study subjects. They signed informed consent forms after study orientation and agreement to participate. This project was reviewed and approved by the Wake Forest University Health Sciences Institutional Review Board (IRB). A waiver of patient informed consent was granted by the IRB.

The COSMIC Intervention

The COSMIC intervention used multiple performance improvement strategies directed at the management of cardiometabolic risk factors. Educational content was delivered in modules based on evidence-based clinical therapies and included suggestions for practice system changes such as having the nurse review the plan of care with the patient before leaving the physician visit, and instruction and use of PDSA principles of setting treatment and process goals with the individual practices. Other areas promoted via face-to-face presentations, webinars, and faculty-peer discussion included physician-patient relationships and education tools to engage patients in lifestyle modifications. Baseline aggregated performance benchmarking reports allowed us to compare the groups with each other and with comparable national data.^{6,12} These reports were provided to the intervention (CL1) groups and discussed via webinars. A COSEHC physician faculty member then developed and provided a customized, on-site, 2-hour, in-person education session for each intervention site aimed at improving their unique baseline practice gaps. This interactive session included faculty selected slides from a study-approved deck of evidence-based interventions for the management of hypertension, dyslipidemia, and diabetes. The interactive sessions also included supportive handouts/materials that complemented the discussions. Examples of these and other subject matter discussed in the sessions include: patient adherence, advanced strategies in treating resistant hypertension, effective diet and weight management (ie, DASH diet) strategies, drug therapeutic management (ie, use of combination therapy, benefits and risks of certain drug types, etc). Only generic drug names were used, and no defined treatment algorithm was used or promoted at any time in the project.

An action plan was developed during this session that described the intervention that the practice clinics would implement to improve their professional performance gaps. Clinical and process interventions included such examples as retraining medical assistants in appropriate blood pressure techniques, retaking blood pressures when values were high to validate the readings, more aggressive management of LDL-C based on LDL risk

stratification, use of fixed-dose combinations, patient chart reminders, and more frequent follow-up visits for patients not at control levels. Physicians' feedback of successful changes obtained through the webinars was communicated to other practices with similar gaps as potential changes that practices could use to improve outcomes.

Three and 6 months after the educational session, patient outcome data were again collected from both the intervention and control groups, followed by presentation of performance reports and webinar discussion to only the intervention group (CL1) physicians. These webinar sessions included a review of PDSA changes made from a practice's intervention plan. Updates or changes to the intervention plan were made if needed during the webinar discussion. Additional education was provided during the follow-up webinars by an expert project faculty physician if requested by the practice or if improvements were not seen on the 3-month follow-up performance reports. Topics most frequently requested included setting expectations with patients, basal insulin protocols, addressing noncompliance in patients, HDL-C management, resistant hypertension management, and a protocol for obtaining accurate blood pressure measurements. Control group (CL2) sites did not receive baseline or follow-up performance reports and webinars or the on-site education modules and intervention plan.

Outcome Tracking

At baseline, a list of active patients from the COSMIC clinical sites was created for both clusters. Patients were included if they (1) had a baseline office visit between April 1, 2009, and March 31, 2010; (2) had been previously diagnosed with hypertension (ICD code 401); (3) had at least 2 previous SBP measurements during the baseline office visit time period; and (4) were 18 years of age. This study did not consider current clinical or drug therapy regimens in determining patient inclusion, and blood pressure and lab readings were in accordance with the PPCP network protocols.

A total of 2400 patient records (200 patient records per 6 groups per 2 clusters) were randomly selected for prospective tracking from those meeting inclusion criteria. The 200 patient record sample size for each group was based on a power calculation for the primary outcome variable of SBP (alpha level = 0.05; power = 80%, standard deviation = 5.0 mm Hg; difference between the 2 clusters = 2.0 mm Hg). Each cluster started with a tracking sample of 1200 patients. Practice site clinical data that included patients' cardiometabolic risk factor values and control rates was exported and analyzed at baseline and quarterly during the project. The analysis reported here reflects the point in time when CL1 had implemented the intervention for 6 months while CL2 had not implemented the intervention at all.

For this study, the cardiometabolic risk factor target treatment goals recommended by the Joint National Committee (JNC-7), Adult Treatment Panel (ATP III), and 2009 American Diabetes Association (ADA) guidelines were used. However, for our study, an aggressive LDL-C therapeutic target cut point of < 100 mg/dL was implemented since many patients in this study exhibited multiple risk factors, including obesity. Serum LDL-C levels < 100 mg/dL were considered optimal, and since coronary heart disease (CHD) risk can exist even

in the absence of other risk factors,²⁹ no attempt was made to quantify cardiovascular risk to determine specific ATP III LDL-C targets.

Statistical Analysis

Changes in cardiometabolic risk factor control rates and cardiometabolic risk factors mean values were evaluated by (1) an intention-to-treat analysis using the last observation carried forward (LOCF) method of imputation across all patients per cluster and (2) a per-protocol analysis on only those patients with follow-up measurements in the 6-month time period who were not at target goal levels at baseline. The unpaired Student's *t*-test (SAS statistical program, Cary, NC) was used to evaluate changes at 6 months compared to baseline among patients' cardiometabolic risk factor control rates and mean cardiometabolic risk factor values between the intervention and control groups in both the intention-to-treat and per-protocol analyses. These analyses were completed for all patients meeting the requirements and among various subpopulations, including diabetics, African Americans, females, and aging patients (≥ 65 years old). Significance was determined as $p < 0.05$.

Results

Participants

A total of 14 and 12 individual physicians participated in CL1 and CL2, respectively. All physicians were Caucasian and graduates of United States schools of medicine except for one physician in the control group who was Black and graduated from an international school of medicine. Physician Board certification was not assessed. Physicians enrolled in the intervention group were on average 44 years old, 29% female, and saw on average 22 patients per day. Physicians enrolled in the control group were on average 48 years old, 45% female, and saw on average 21 patients per day. While Level 1 (participation) and Level 2 (satisfaction) of the expanded outcomes framework for CME activities described by Moore et al³⁰ were assessed, the main focus of the study was on Level 6, patient health outcomes. The 14 physicians participating in the intervention group reported no commercial bias and excellent ratings (scale: poor, good, excellent) for the CME activity's objectivity, effectiveness, format, overall knowledge, answering of questions, meeting objectives, and perceived improved knowledge. This report focuses on the changes in patient outcomes as a result of the project.

Baseline Patient Demographics, Clinical Values, and Control Rates

Patients in the intervention group were 54% females, 11% African Americans, and 11% smokers, while the control group consisted of 59% females, 17% African Americans, and 13% smokers. On average, patients in both groups were clinically obese (CL1 = 31 ± 7 ; CL2 = 32 ± 7 kg/m², $p > 0.05$). At baseline, there were no differences between clusters in age or in the distribution of patients with cardiometabolic diagnoses, insurance types, hypertension stage, lipid profile, or diabetes medication use. There were also no statistically significant clinical differences between patients in CL1 and CL2 for average values of LDL-C (CL1 = 103 ± 33 ; CL2 = 104 ± 34 mg/dL), HDL-C (CL1 = 47 ± 15 ; CL2 = 48 ± 15 mg/dL), or HgA_{1c} (CL1 = 6.9 ± 1.2 ; CL2 = $7.0 \pm 1.3\%$, diabetic patients only). However, in CL2 patients, average SBP was 2 mm Hg higher (CL1 = 131 ± 15 ; CL2 = 133 ± 17 mm Hg, $p =$

0.001) and DBP was 1 mm Hg lower (CL1 = 77 ± 9 ; CL2 = 76 ± 10 mm Hg, $p = 0.001$) than CL1 at baseline. Additionally, patients receiving care from physicians in both clusters had higher than national average control rates for cardiometabolic risk factors at baseline. For example, 67% and 60% of CL1 and CL2 patients, respectively, exhibited BP control at baseline, which is higher than the national average of 50.1%.¹²

Changes in Mean Cardiometabolic Risk Factor Values and Control Rates at 6-Month Follow-up

There were no statistical differences in the change in mean SBP, DBP, HDL-C, or HgA_{1c} values at 6-month follow-up compared to baseline in total and subpopulation patients between the intervention (CL1) or control (CL2) group physicians (TABLE 1). However, for females patients in the intervention group, there was a statistically significant ($p = 0.02$) total LDL-C change of -3.0 mg/dL as a result of a -1.5 mg/dL reduction in LDL-C in the intervention group and a $+1.5$ mg/dL increase in LDL-C in the control group (TABLE 1). Concurrent with this, we also observed a statistically significant ($p = 0.01$) change in non-HDL-C in females in the intervention group by -3.5 mg/dL as compared to the control group, as the intervention group reduced non-HDL-C by -1.7 mg/dL, while the control group increased non-HDL-C by $+1.8$ mg/dL during the same 6-month time frame (TABLE 1).

No statistical differences in cardiometabolic control rates at 6 months compared to baseline were seen between the 2 clusters for SBP, DBP, LDL-C, non-HDL-C and HgA_{1c} (FIGURES 1 and 2). However, the intervention group exhibited a statistical ($p < 0.05$) improvement in HDL-C control rates among diabetic patients at 6 months as compared to the control group (FIGURE 2).

Uncontrolled Baseline Patient Demographics and Variable Differences

The number of patients without controlled cardiometabolic risk factors at baseline were similar between CL1 and CL2 but varied when evaluating specific clinical variables. For example, 85 patients for both CL1 and CL2 had uncontrolled HgA_{1c}, while 357 and 415 patients for CL1 and CL2, respectively, had uncontrolled SBP. Patients with uncontrolled SBP rates at baseline were obese [CL1 = 32 ± 7 kg/m²; CL2 = 33 ± 7 kg/m²]. Mean values among patients with uncontrolled baseline cardiometabolic risk factors were similar between the intervention (CL1) and control (CL2) groups for DBP (CL1 = 87 ± 8 ; CL2 = 88 ± 8 mm Hg), LDL-C (CL1 = 127 ± 24 ; CL2 = 130 ± 24 mg/dL), HDL-C (CL1 = 34 ± 4 ; CL2 = 33 ± 4 mg/dL), non-HDL-C (CL1 = 159 ± 26 ; CL2 = 161 ± 26 mg/dL), and HgA_{1c} (CL1 = 8.0 ± 1.2 ; CL2 = $8.2 \pm 1.5\%$, diabetic patients only). However, the control group had an initial mean SBP that was 2 mm Hg higher (CL1 = 146 ± 12 ; CL2 = 148 ± 13 mm Hg, $p = 0.01$) than the intervention group among patients with uncontrolled SBP at baseline.

Changes in Cardiometabolic Risk Factor Values and Control Rates at 6-Month Follow-up Among Patients With Uncontrolled Cardiometabolic Risk Factors at Baseline

There were no statistically significant differences in any of the cardiometabolic risk factor variables across all uncontrolled patients at baseline or subpopulations with the exception of LDL-C in females (TABLE 2). Among females with uncontrolled LDL-C at baseline, the

intervention group (CL1) demonstrated a statistically significant ($p = 0.03$) reduction in LDL-C by -7 mg/dL as compared to the control group (CL2). There were also no statistical differences in cardiometabolic control rates at 6 months compared to baseline between the 2 clusters for SBP, DBP, LDL-C, HDL-C, non-HDL-C, or HgA_{1c} (FIGURES 3 and 4) with the exception of SBP in aging patients (> 65 years). The intervention group (CL1) had statistically improved ($p = 0.03$) control rates that were 11% higher than those of the control group in aging patients with uncontrolled SBP at baseline (CL2; FIGURE 3A).

Discussion

This study demonstrated that lipid management in women improved over a 6-month intervention period with the implementation of the COSMIC PI CME activity, while the intervention appeared to have no significant impact in other patient groups. The improvements in lipid management can provide beneficial cardiovascular risk reduction in women since dyslipidemia is a major risk factor for cardiovascular disease and is reported in 50% to 80% of hypertensive patients.³¹ Traditionally, cholesterol is measured more often and treated more aggressively in men than women, with more men than women receiving lipid-regulating drugs.^{32,33} Evidence suggests that female patients with cardiovascular disease³⁴ or diabetic females with established coronary heart disease³⁵ are less likely to have their LDL-C controlled and less likely to receive treatment intensification as compared to male counterparts.³³ Suboptimal dyslipidemia management has also been attributed to physician bias or inaction.³⁶ These factors were not assessed in this study.

The COSMIC intervention focused on the importance of early and aggressive management of cardiometabolic risk factors in patients. In the evaluation of this project, we concluded that there may have been more emphasis placed on LDL-C management in women because of the early identification of performance practice gaps noted at baseline in this subpopulation. The quarterly performance reports received by physician included females as one of the subpopulation categories but did not categorize men separate from the total patient population. This focus could have promoted more aggressive lipid management in women by physicians, as the same outcomes were not seen in men. It is also known that women tend to be more willing to listen to advice and usually have a greater number of preventative health care visits as compared to men.³⁷ Since regular feedback typically motivates physicians to change their practice patterns to improve care,³⁸ the webinars conducted to discuss the quarterly performance trend reports, and continuing gaps in care may have encouraged improvements in specific target groups with lowest control, like LDL-C among women.

While CME has been shown to be effective in changing physician practice patterns,³⁹ the impact of CME on clinical outcomes remains unanswered,²⁷ with many traditional interventions failing at changing patient quality outcomes.⁴⁰ Several studies using formal CME activities, academic detailing, and even continuous performance improvement have reported negative results on enhanced blood pressure control.^{21,41} Therefore, not seeing large statistical differences in patients' hypertension and other cardiometabolic control rates between the baseline and 6-month period in this study was not surprising, especially given the short follow-up time period of observation.

Study limitations should be considered in interpreting our findings. First, the PPCP network began the project with higher than national average baseline hypertension and cardiometabolic risk factor control rates.^{6,12} It can be hypothesized that for medical practices starting with lower control rates at baseline, the COSMIC PI CME intervention may demonstrate greater improvements. Second, 6 months may be too short a time to demonstrate changes in cardiometabolic risk factors, especially since follow-up appointment periods were not uniform among patients in the study practice clinics. A longer period with opportunity for more clinical and performance improvement interventions may be required to achieve greater significant outcome changes. Third, this project was implemented in 1 geographical area; the results may be different if COSMIC were implemented in physician clinics in other locations. Fourth, while blood pressure and lab protocols were consistent across the PPCP network, the use of repeated blood pressures and continued training to ensure standardization across clinic personnel should be considered. Finally, data on Moore's educational outcome Levels 3 through 5^{8,30} were not captured in this project. While each level has a logical complementary relationship, all levels can be independent and warrant individual study to better understand the success and failure of each stage alone and the impact of intermediate knowledge and competence levels of physicians on the health status of their patients. Without these measures of behavior, it is not possible to determine if study physicians were fully engaged with the educational content such that they changed their behavior.

Despite the short follow-up time period, there were significant changes in dyslipidemic outcomes among female patients whose physicians participated in the COSMIC PI CME intervention. Physicians in this study also improved their knowledge about PI CME through a methodical process of analyzing patient population clinical data, identifying performance gaps, implementing changes to address the gaps, and follow-up evaluation by monitoring patient population clinical changes. PI CME activities that can effectively change physicians' performance in the treatment of patients with hypertension and other cardiometabolic risk factors can have significant benefit in affecting population health, quality of life, and possibly the reduction of health care costs. This is especially important with the emergence of value-based delivery models and the proposed associated restructuring of reimbursement. Finally, defining effective cardiometabolic care improvement processes, both in the southeastern United States and elsewhere, will assist COSEHC in achieving its mission of eradicating vascular disease in all people.

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Lessons for Practice

- As a result of the Consortium for Southeastern Hypertension Control (COSEHC) Customized Model of Intervention and Care (COSMIC) performance improvement continuing medical education (PI CME) initiative, intervention group physicians were more effective at managing cholesterol in female patients as evidenced by a statistically significant decreased 6-month follow-up LDL cholesterol and non-HDL cholesterol as compared to patients receiving health care from a control group of physicians.
- Physicians participating in PI CME interventions can be better skilled to assist female patients with cholesterol management. Longer interventions that include a review of emerging value-based care delivery models may be needed to determine the exact impact of performance improvement strategies on curtailing cardiometabolic risk in all patient groups.

FIGURE 1.

Changes in systolic [SBP] (A) and diastolic [DBP] (B) blood pressure control rates at 6 months compared to baseline. Values are means $\pm$ standard deviation

FIGURE 2.

Changes in LDL cholesterol [LDL-C] (A), HDL cholesterol [HDL-C] (B), and non-HDL cholesterol [non-HDL-C] (C) control rates at 6 months compared to baseline. The intervention group had statistically higher HDL-C control rates among diabetic patients as compared to the control group. Values are means $\pm$ standard deviation

FIGURE 3.

Changes in systolic (SBP) (A) and diastolic blood pressure (DBP) (B) control rates at six months compared to baseline across baseline patients with uncontrolled SBP (A) or DBP (B), respectively. There were no statistical differences in changes in these cardiometabolic control rates between the intervention and control groups with the exception of SBP in aging patients where the intervention group had 11% higher SBP control rates as compared to the control group. Values are means $\pm$ standard deviation

FIGURE 4.

Changes in LDL cholesterol (LDL-C) (A), HDL cholesterol [HDL-C] (B), and non-HDL cholesterol (non-HDL-C) (C) control rates at 6 months compared to baseline across baseline patients with uncontrolled LDL-C (A), HDL-C (B), or non-HDL-C (C), respectively. Values are means $\pm$ standard deviation

TABLE 1

Comparison of Mean Changes in Cardiometabolic Values (6-Month Follow-up Minus Baseline) Between the Intervention (Cluster 1) and the Control Group (Cluster 2)

	Intervention group	Control Group	Difference	<i>p</i> value
A. Systolic blood pressure (mm Hg)				
All patients	-0.7 ± 16.4	-0.3 ± 16.8	-0.4 ± 16.6	0.525
Diabetic patients	-0.5 ± 17.0	-0.6 ± 17.5	0.0 ± 17.3	0.981
African American patients	2.8 ± 16.1	1.8 ± 16.9	1.1 ± 16.6	0.565
Aging (≥ 65 years old) patients	-0.7 ± 18.1	-1.1 ± 18.4	0.4 ± 18.3	0.747
Female patients	-0.3 ± 17.2	-0.1 ± 17.2	-0.2 ± 17.2	0.799
B. Diastolic blood pressure (mm Hg)				
All patients	-0.2 ± 9.9	-0.7 ± 9.7	0.5 ± 9.8	0.222
Diabetic patients	0.2 ± 10.9	-0.3 ± 9.4	0.5 ± 10.1	0.545
African American patients	1.5 ± 10.4	0.7 ± 9.8	0.7 ± 10.0	0.515
Aging (≥ 65 years old) patients	-0.5 ± 10.3	-1.3 ± 9.9	0.9 ± 10.1	0.158
Female patients	0.3 ± 10.1	-0.5 ± 9.8	0.8 ± 10.0	0.162
C. LDL cholesterol (mg/dL)				
All patients	-0.7 ± 22.3	0.9 ± 21.8	-1.6 ± 22.1	0.079
Diabetic patients	0.9 ± 22.9	0.7 ± 23.5	0.3 ± 23.2	0.879
African American patients	-0.2 ± 22.4	-0.3 ± 21.5	0.1 ± 21.9	0.962
Aging (≥ 65 years old) patients	0.5 ± 21.6	0.5 ± 21.9	-0.1 ± 21.8	0.967
Female patients	-1.5 ± 24.0	1.5 ± 21.6	-3.0 ± 22.8	0.015 ^a
D. HDL cholesterol (mg/dL)				
All patients	1.2 ± 6.6	1.2 ± 5.7	0.0 ± 6.1	0.960
Diabetic patients	1.8 ± 6.6	1.5 ± 5.3	0.3 ± 5.9	0.521
African American patients	-0.2 ± 22.4	-0.3 ± 21.5	0.3 ± 5.9	0.615
Aging (> 65 years old) patients	1.4 ± 7.0	1.1 ± 6.0	0.3 ± 6.5	0.518
Female patients	0.9 ± 7.0	1.1 ± 5.8	-0.2 ± 6.4	0.640
E. Non-HDL cholesterol (mg/dL)				
All patients	-0.7 ± 24.6	1.2 ± 24.0	-1.9 ± 24.3	0.058
Diabetic patients	1.3 ± 25.8	0.9 ± 26.0	0.4 ± 25.9	0.838
African American patients	0.6 ± 23.5	-0.4 ± 22.9	1.0 ± 23.1	0.685
Aging (> 65 years old) patients	0.2 ± 24.6	0.23 ± 23.8	-0.1 ± 24.2	0.950
Female patients	-1.7 ± 26.3	1.8 ± 23.6	-3.5 ± 24.9	0.011 ^a
F. Hemoglobin A_{1c} (%)				
Diabetic patients	0.03 ± 0.7	0.04 ± 0.8	-0.01 ± 0.76	0.932

Difference is the average value between the intervention (CL1) and control (CL2) groups. Values are expressed as mean ± standard deviation.

^a *p* < 0.05 (intervention group versus control group).

TABLE 2

Comparison of Mean Change in Cardiometabolic Values (6-Month Follow-up Minus Baseline) between the Intervention and the Control Groups Among Patients Who Were Not Reaching Individual Cardiometabolic Risk Factors Goals at Baseline and Who Had at Least 1 Measurement During the 6-Month Follow-up Period

	Intervention group	Control group	Difference	<i>p</i> value
A. Systolic blood pressure (mm Hg)				
All patients	-11 ± 18	-11 ± 17	-0.1 ± 17.4	0.946
Diabetic patients	-7 ± 17	-8 ± 17	0.7 ± 17.0	0.712
African American patients	-3 ± 18	-7 ± 17	3.8 ± 17.3	0.276
Aging (≥ 65 years old) patients	-10 ± 19	-11 ± 18	1.2 ± 18.4	0.515
Female patients	-11 ± 19	-9 ± 18	-1.3 ± 18.3	0.436
B. Diastolic blood pressure (mm Hg)				
All patients	-7 ± 10	-8 ± 10	0.4 ± 9.7	0.710
Diabetic patients	-6 ± 9	-6 ± 9	0.7 ± 9.1	0.575
African American patients	-5 ± 10	-6 ± 10	0.8 ± 9.8	0.725
Aging (≥ 65 years old) patients	-8 ± 11	-10 ± 10	1.3 ± 10.2	0.487
Female patients	-7 ± 10	-11 ± 10	4.1 ± 10.3	0.096
C. LDL cholesterol (mg/dL)				
All patients	-11 ± 31	-7 ± 30	-4.0 ± 30.3	0.079
Diabetic patients	-8 ± 33	-9 ± 37	0.8 ± 34.8	0.877
African American patients	-14 ± 33	-9 ± 31	-5.0 ± 32.0	0.468
Aging (≥ 65 years old) patients	-9 ± 30	-8 ± 29	-1.6 ± 29.2	0.630
Female patients	-12 ± 34	-5 ± 30	-7.0 ± 31.9	0.025 ^a
D. HDL cholesterol (mg/dL)				
All patients	4 ± 5	4 ± 5	0.2 ± 5.5	0.717
Diabetic patients	4 ± 6	4 ± 5	0.4 ± 5.7	0.601
African American patients	8 ± 7	6 ± 10	1.7 ± 8.9	0.521
Aging (> 65 years old) patients	4 ± 7	4 ± 6	0.3 ± 6.4	0.688
Female patients	5 ± 6	5 ± 5	0.1 ± 5.5	0.876
E. Non-HDL Cholesterol (mg/dL)				
All patients	-12 ± 35	-9 ± 33	-3.5 ± 34.1	0.190
Diabetic patients	-8 ± 38	-15 ± 38	6.6 ± 38.2	0.272
African American patients	-12 ± 39	-14 ± 33	2.4 ± 35.6	0.769
Aging (> 65 years old) patients	-13 ± 36	-11 ± 31	-1.8 ± 33.5	0.675
Female patients	-14 ± 38	-7 ± 32	-6.7 ± 35.1	0.059
F. Hemoglobin A1c (%)				
Diabetic patients	-0.2 ± 1.0	-0.3 ± 1.2	0.1 ± 1.2	0.485

Values expressed as mean ± standard deviation.

^a *p* < 0.05 (intervention group versus control group).