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Increasing Knowledge of Cardiovascular Risk Factors Among African Americans by Use of Community Health Workers: The ABCD Community Intervention Pilot Project

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Abstract

African Americans have higher rates of cardiovascular disease (CVD) and poorer outcomes compared to others. The American Diabetes Association and the National Diabetes Education Program have promoted use of the ABC approach (glycated hemoglobin A_{1c}, blood pressure, cholesterol) for identifying and controlling the leading indicators of CVD risk. In the present study, researchers added a D factor, for depression, because this disorder is common and also predictive of CVD risk and of control of diabetes. Particularly among low-income African Americans, depression is frequently not targeted or treated. The current study tests the effectiveness of recruiting African Americans in churches and training community health workers (CHWs) to educate their peers about CVD and risk reduction. For the intervention group, CHWs participated in a 16-hour training session and delivered a 6-week tailored educational program with counseling sessions and demonstrations. The control group received a weekly lecture by clinical experts. The CHW active-learning intervention was more effective than lectures by clinical experts in increasing the knowledge of CVD risk. The only significant difference in clinical measures reflected a worsening of HbA_{1c} levels in the control group; the CHW intervention group showed a slight improvement. Participants also learned self-management skills, such as taking blood pressure, measuring glucose, and reading labels. Nevertheless, more longitudinal research and a larger sample size are needed to confirm the impact of CHWs in community settings to change factors associated with CVD risk.

Keywords

knowledge, attitudes, and beliefs; hypertension; diabetes; cardiovascular; risk factors; community health workers; African Americans

INTRODUCTION

Although control of cardiovascular disease (CVD) risk factors reduces morbidity and mortality, most Americans at risk for CVD-related events have not achieved therapeutic goals for management of these factors. The American Diabetes Association and the National Diabetes Education Program have promoted use of the ABC indicators, which include: (A) glycated hemoglobin (HbA_{1c}) for control of diabetes mellitus, (B) blood pressure, and (C) cholesterol (total and low-density lipoprotein cholesterol [LDL-C] and high-density lipoprotein cholesterol [HDL-C])¹ as modifiable indicators targeted for treatment in order to reduce CVD risk. The D factor (depression) has been added by the current researchers as an additional risk factor. Depression, which is highly prevalent but underdiagnosed,² is predictive of poor control of diabetes mellitus²⁻⁴ and may influence an individual's ability to control blood pressure⁵ and cholesterol secondary to poor diet and physical inactivity.

The most recent National Health and Nutrition Examination Survey shows that, as of 2007–2008, a total of 50.1% of persons with elevated blood pressure were adequately diagnosed and treated—up from 27.3% in 1988–1994—but the proportion of patients whose hypertension was treated and controlled was higher in Caucasian Americans compared to African Americans.⁶ There are similar levels of underdiagnosis and under-treatment for those with diabetes mellitus and hyperlipidemia.^{7,8} The growing obesity epidemic contributes to these CVD risk factors. For example, from 1976 to 2006, obesity among persons with diabetes mellitus increased 58%, with the result that an estimated two-thirds of diabetics are also obese⁹ (body mass index [BMI] >30 kg/m²). The values are even higher for minority populations and those with low income.¹⁰ Non-Hispanic African American women have higher rates of obesity and diabetes mellitus compared to other racial and ethnic groups.¹¹ As a result, rates of death and disability due to stroke, heart disease, and complications of uncontrolled diabetes mellitus are 1.5 to 2.5 times higher in African American and other minority populations.¹¹ Thus, it is appropriate that health care providers identify high-risk groups, tailor educational materials to educate these groups, intervene promptly to reach therapeutic levels of physiologic measures, and monitor outcomes. Increasing knowledge of risk factors, addressing low literacy, and enhancing self-management skills help African Americans control risk factors.¹²

Guided by Bandura's social learning theory,¹³ the current pilot study evaluated the effectiveness of partnering with local churches and use of community health workers (CHWs) to deliver educational programs on CVD to increase knowledge of ABCD risk factors. Specifically, the following questions were posed: Do African American church members who participate in a 6-week, tailored, interactional community program with biweekly counseling delivered by a CHW gain greater knowledge of the ABCD risk factors than those who participate in lecture-based sessions delivered by a physician? Secondly, are there differences in HbA_{1c} levels, cholesterol, blood pressure, depression, and health literacy between the CHW intervention group and the control group at the end of the 6-week intervention period?

THEORETICAL FRAMEWORK

Bandura's social learning theory suggests that people learn from others, by observation, imitation, and modeling.^{13,14} The social learning theory explains human behavior in terms of continuous reciprocal interactions between cognitive, behavioral, and environmental influences. The current study encompasses Bandura's social learning theory within the educational interventions by allowing the participants to acquire information from CHWs who also model desired behaviors. As the participants interact with the CHWs, they increase their belief that they can reduce their personal risk and begin to participate more actively in the self-management of their ABCD risk factors.

METHODS

Sample and Setting

For recruitment into this study, churches within a 10-mile radius of an area identified as the city's high-disparity urban core were targeted. The communities in this area are predominantly African American, and the rate for high school completion is less than 70%. The residents have a median annual income of less than \$29 000, and approximately one-third live below the poverty level. Inclusion criteria for participating churches were: (a) location within the urban core; (b) a congregation more than 50% African American; and (c) an established health ministry within the church. Based on knowledge of the community and previous work with churches in the area, the project manager used a purposive approach to identify churches and to discuss the study with the church's senior pastor. Four pastors agreed to participate; these congregations were 95% to 100% African American. The churches were randomly assigned to either the CHW intervention group (n = 2) or the control (n = 2) group. This study was approved by the Morehouse School of Medicine institutional review board prior to implementation.

Procedures

Recruiting community health workers from targeted churches—Pastors were asked to recommend people from their congregations who were considered candidates for the role of a CHW. Inclusion criteria for CHWs were: African American race, age of at least 18 years, ability to speak English, being a member of the church or surrounding community, and diagnosis of 1 or more of the ABCD risk factors that were therapeutically controlled, as determined by self-report. The research team interviewed these persons and selected individuals based on inclusion criteria and availability to attend required training and conduct workshops. CHWs (N = 12) selected for participation in the study were randomly assigned to the intervention or control group.

Training of community health workers—The CHWs participated in 16 hours of training delivered at the churches by the study's principal investigator or project manager. The CHWs, who were required to attend all of the sessions, worked with the project manager to make up the time if they had to miss a session. They were also required to pass an online course on protection of human subjects. The training was designed to prepare the CHWs to: (1) recruit participants for the study; (2) teach participants about ABCD risk

factors; (3) teach participants how to take their blood pressure and glucose readings and how to interpret the physiological measures (blood pressure, HbA_{1c}, cholesterol); (4) teach participants about signs and symptoms of depression; (5) teach participants to read nutrition labels; (6) teach participants effective and assertive skills for communicating with their providers; and (7) teach participants to read a prescription bottle and an appointment reminder card. The CHWs assigned to the intervention churches received extra training in how to make the sessions interactive, using a hands-on approach with return demonstrations from the participants. They were also trained in how to respond to questions and to defer answering questions regarding clinical management and treatment to a health care professional. The training was based on the standards from the National Diabetes Education Program¹; the National Cholesterol Education Program Adult Treatment Panel III Guidelines¹⁵; the Seventh Report of the Joint National Committee on the Prevention, Detection, Evaluation and Treatment of High Blood Pressure guidelines¹⁶; and the health literacy tool kit of the American Medical Association Foundation.¹⁷ For their participation in the project, CHWs received a stipend covering their time and travel to study sites.

Recruiting participants for the intervention and control groups—The CHWs were responsible for recruiting participants for their groups. This was accomplished primarily at health fairs held at each church. There was additional recruitment by placing fliers in the church bulletin with contact information for the CHW, as well as by word of mouth within the church. The goal was to recruit 15 participants from each church. The following inclusion criteria were used to screen for eligibility: (1) African American race; (2) age of at least 18 years; (3) ability to speak English; (4) being a member of the church or residence in the community surrounding the church; and (5) diagnosis with 1 of the ABC risk factors by self-report; being at risk for ABC risk factors by either self-reported family history of diabetes, hypertension, or hyperlipidemia; and/or being overweight (BMI 25–29.9) or obese (BMI >30).

Assessment of knowledge, anthropometric, and physiologic measures—At the initial meeting, baseline surveys were completed and physiological measures (blood pressure, glucose, cholesterol) were taken by the CHWs in both the intervention and control groups. These measures were also repeated at the final workshop in both groups. All participants signed consent forms to release elevated laboratory values to their primary care providers. The 2 participants that did not have a primary care medical home were given a list of local primary care providers. All Patient Health Questionnaire (PHQ)-9 scores over 5 were reviewed the same day with participants by a Morehouse School of Medicine primary care or behavioral health faculty member to privately discuss scores and obtain pertinent personal and family history. None of the participants with PHQ-9 scores greater than 5 were suicidal. All were instructed to follow up with their primary care provider the following week.

Community health worker intervention group—The intervention consisted of 6 weekly sessions held at each of the churches and led by the CHWs. At the initial meeting, baseline surveys were completed and physiological measures (blood pressure, glucose, cholesterol) were taken by the CHWs. The sessions covered a different topic each week

(Table 1). Each topic included a predetermined set of objectives. For example, the objectives for the topic on obesity were: (a) define *obesity* and *overweight*; (b) name the chronic illnesses associated with obesity and overweight; (c) define *BMI* and how to calculate it; d) learn to read food labels; and e) learn how to incorporate physical activity into daily routines. Demonstration and role playing were used to emphasize key concepts. For example, when the topic was how to read a food label, actual labels were used and participants were allowed to interpret the labels. The CHWs gave feedback and provided tips to make sure the participants mastered the concept. The discussion of blood pressure was followed with an interactive session on teaching the participant to take their blood pressure and to interpret the readings. Between weekly sessions, CHWs were available via phone for peer counseling or to help participants navigate through the health care system. These sessions were initiated by the participant. During the 16 weeks, 12 participants in the intervention churches contacted the CHWs for advice or counseling.

Control group

Participants in the control group also attended 6 weekly sessions at each of the 2 churches. Topics (same as for the intervention group) were presented by a physician from the principal investigator's academic facility instead of by the CHW's facility. Sessions were presented in a lecture format (40 min) with a 20-minute question-and-answer period, and the CHWs were not available to answer questions or provide support after the weekly sessions.

Data Collection Instruments

Knowledge of cardiovascular risk factors—A 19-item, investigator-developed survey was used to assess knowledge of cardiovascular risk factors. One point was added for each correct response; higher scores indicated greater knowledge of risk factors (range, 0–19 points). The questions focused on risk factors, signs and symptoms of cardiovascular disease, and interpretation of food and prescription labels.

Health literacy measure—For both groups, the short version for the Test of Functional Health Literacy in Adults (s-TOFHLA) was used to assess health literacy at the beginning and end of the 6-week sessions. The s-TOFHLA is a shorter version of the parent tool (TOFHLA) used to measure patients' ability to read and understand health-related materials; it has established reliability and validity.¹⁸

Depression—Depression was assessed by use of the PHQ-9, a 9-item depression scale of the PHQ that assists clinicians in diagnosing depression and in selecting and monitoring treatment.^{19,20} Participants are asked to reflect on the past 2 weeks and answer 9 questions on a 4-point Likert scale ranging from “not at all” (0 points) to “nearly all the time” (3 points). Summed scores of 10 or higher have 88% sensitivity and 88% specificity for major depression. Scores of 5, 10, 15, and 20 represent mild, moderate, moderately severe, and severe episodes of depression, respectively.¹⁹

Clinical measures—A glucometer (Accu-Chek Instant Plus, Roche Diagnostics Corp, Indianapolis, Indiana) was used to measure blood glucose. HbA_{1c} was measured by use of kits from Metrika A_{1c} Now, Sunnyvale, California. DINAMAP Pro 1000 monitoring

systems (Wipro GE Healthcare, Bangalore, India) were used to assess blood pressure, and cholesterol was measured with Cholestech LDX monitors (Hayward, California). Measurements of weight, height, and waist circumference were also taken.

RESULTS

Initially, 47 participants ($n = 19$ intervention, $n = 28$ control) were recruited for the study. Due to missing data and attrition, only 25 participants had pretest and posttest knowledge scores for analysis (intervention group, 14; control group, 11). Most of the participants ($N = 25$) were female (68%), all were African American, 60% had some college experience or a bachelor's degree. Of the participants at baseline, 14% had elevated HbA_{1c}, 89% had systolic blood pressure values above 139 mm Hg or diastolic blood pressure above 89 mm Hg, and 25% had elevated LDL cholesterol; 60% had more than 1 ABCD risk factor. At baseline, there were 3 participants in both the control and intervention groups with PHQ-9 scores of at least 5 and less than or equal to 10, but only 1 had a PHQ-9 score greater than 9 (raw score, 10). Regarding baseline health literacy (s-TOFHLA >23), both groups scored high (mean score, 31.87 in intervention group and 23 in control group). All of these participants had either Medicaid or Medicare. Both groups had comparable levels of overweight and obesity (BMI >25): 80% of the control groups and 83% of the intervention groups.

Comparison of Knowledge of AbCD Risk Factors

Baseline (pretest) knowledge scores between intervention and control groups

—Between participants in the intervention group and the control group, there was no significant difference at baseline in the scores relating to knowledge of CVD risk factors.

$$(\bar{X}=12.91) \text{ and } (\bar{X}=11.07) (df=36.28; t=1.70; p=.098)$$

Changes in Knowledge Scores within groups

Paired t tests comparing pretest and posttest scores were used to assess changes in knowledge within the CHW group following the 6-week intervention (Table 2). The knowledge score for this group had risen by 2.64 points from baseline ($p = .011$). There were no significant changes in TOFHLA or S-TOFHLA scores.

Changes in posttest knowledge scores in the intervention and control groups

—An independent-sample t test was used to compare change in knowledge of CVD risk factors between the 2 groups at 6 weeks post test (Table 3). The CHW intervention group had significantly higher change in knowledge (+ 2.64) of CVD risk factors compared to the control group, which had a 1.30 decline in score ($p = .0472$). There were, however, no significant differences in the change in health literacy score between the CHW and control group, as determined by TOFHLA and s-TOFHLA. Regarding the TOFHLA, only questions pertaining to the ability to reading a prescription label were asked.

Differences in Clinical Measures

The intervention group had a 6.92-mg/dL decrease in HDL-C ($p = .0480$) and a 6.31-mm Hg decrease in diastolic blood pressure ($p = .0507$). Other measures (HbA_{1c}, cholesterol, and depression) did not show a significant change after the intervention (Table 2). A rise of 0.5% in HbA_{1c} levels among control group participants combined with a slight HbA_{1c} decrease among the intervention group, however, resulted in significant difference change in HbA_{1c} between the 2 groups at the post-test measurement (difference = -0.59 , $p = .028$).

DISCUSSION

This pilot project demonstrates the feasibility of engaging African American churches and recruiting CHWs and training them to implement a 6-week educational intervention aimed at increasing knowledge and controlling physiological CVD risk factors among study participants. While generalization of these findings is limited due to nonrandom sampling, small sample sizes, and participant attrition at the posttest, the findings provide “lessons learned” and points for discussion that can guide future studies.

This study supports the effectiveness of targeting African American churches within communities to recruit study participants and CHWs, as well as the effectiveness of the CHWs in teaching key self-management skills, such as how to measure blood pressure and blood glucose, understand nutrition labels, read a prescription label, and interpret cholesterol results. The relationship between learning these skills and therapeutic control of these physiological measures will be assessed in future studies. The fact that CHWs, using interactive coaching and peer counseling techniques, outperformed lectures by medical school faculty in improving risk factor knowledge is consistent with Bandura’s social learning theory in that since the CHWs shared similar cultural values and CVD risk factors, they could speak directly to others about their experiences and model positive behaviors.

These findings are also consistent with results of other research utilizing CHWs to deliver interventions. In a longitudinal, multicenter trial involving 32 churches and CHWs to deliver educational sessions and biweekly counseling on CVD risk (obesity, physical activity) to African American women over a 4-month study period, there were significant changes in knowledge of signs, symptoms, and CVD risk factors within the intervention group.²¹ Similarly, a randomized, controlled trial of an intensive diabetes mellitus self-management intervention (individual counseling, 12 group sessions, monthly telephone calls, and postcard contact) showed a significant decrease in HbA_{1c} within the intervention group, although there was no significant difference in HbA_{1c} change between the intervention and the control group (which received pamphlets in a setting of an African American church).²²

The fact that measures of global health literacy (s-TOFHLA) did not change significantly in a short-term, low-intensity intervention is not unexpected, since such knowledge and literacy are acquired over a lifetime. Studies that have used more intensive interventions specifically targeting literacy over longer times have shown success in enhancing literacy skills among African Americans with diabetes mellitus.²³ Further, health literacy tests may not capture the cultural attitudes, values, and beliefs that influence how a person receives and interprets information.²⁴

Implications for Research and Practice

The findings demonstrate the feasibility of the intervention and its impact on knowledge but showed limited impact on the more clinically related outcomes. Several implications for additional research are identified. Specifically, given the breadth of the questions, it is not known which aspects of CVD knowledge (based on the survey) were most improved. It may be feasible to tailor the intervention to focus on more specific areas of risk and posttest in these areas separately. In addition, it is not clear why the attrition rate for both groups was high. Based on attendance logs, participants who had only Hypertension or hyperlipidemia were more likely to attend the workshops targeting those conditions. Follow-up strategies must be built in to determine reasons for study dropout. Additionally, strategies to re-engage the participants should be developed. Perhaps the 6-week interval is too long, and the project needs to be broken down into 3-week intervals, although changes in clinical outcomes may require more prolonged intervention. Future studies will test the effectiveness of a condensed program with a follow-up maintenance phase to define the optimal timing of the program for achieving better clinical outcomes and lower attrition rates. Additionally, we plan to incorporate more time in the preimplementation phase by collaboratively working with church ministries to develop strategies for promoting and sustaining the program once implemented.

While there were no significant differences in these measures between the groups after the intervention, this pilot study lasted only 6 weeks and had a small number of participants. Longer follow-up would likely be required to measure such changes. Further research is needed on the impact of CHWs in the reduction of global CVD risk, ie, multiple risk reduction interventions. In addition, future studies should incorporate tighter integration with the medical home for primary care. For example, the relative efficacy of changes in lifestyle vs medication on reducing systolic blood pressure suggests that future CHW interventions will need to incorporate a direct link to a primary care medical home that can address effective “treat-to-target” pharmacologic interventions for controlling blood pressure. Assessing the cost-effectiveness of employing CHWs to reduce health risks is also an area of need for future research.

Future studies should add more intensive interventions and measurements for the D (depression) CVD risk factor. African Americans with diabetes mellitus are less likely than Caucasian Americans to take antidepressant medications, and untreated depression has been associated with difficulty in self-management of diabetes mellitus.² The severity of the depression and its influence on self-management activities for CVD risk should also be assessed. While the CHWs were trained to discuss signs and symptoms of depression with participants, they are not clinicians. Future studies should link participants to a primary care home for more intensive treatment of the D factor. Perhaps CHWs can be navigators in helping these individuals to seek medical care, identify a medical home, and effectively deal with the stigma that is often associated with mental health issues.

CONCLUSION

African American communities have a unique culture that may pose barriers to accessing health information. Simplifying the reading level of materials, previously developed for

high-literacy populations, or developing videos or graphics-driven print materials may not be sufficient to address these needs. Partnerships with churches and use of CHWs to tailor interventions with African Americans is an effective strategy for improving functional knowledge and self-management skills related to multiple CVD risk factors. Further research is needed to identify appropriate content, duration, and intensity of contact between CHWs and research subjects to achieve measurable improvements in health literacy, in individual CVD risk factors, and in overall cardiac risk.

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Table 1

ABCD Training Program

Topic	Content	Skills Taught
Orientation	Definition and role of <i>community health workers</i>	Teaching skills, communication skills, resource building, capacity building
Session 1: Health communication	<ul style="list-style-type: none"> Questions to ask during medical visit How to be assertive during medical visit Understanding food labels and medical instructions 	<ul style="list-style-type: none"> Ask Me 3 Reading labels
Session 2: Obesity	Definition, risk factors, prevention, and management of obesity	<ul style="list-style-type: none"> Calculating BMI Low-impact exercise
Session 3: Diabetes mellitus	<ul style="list-style-type: none"> Definition, risk factors, prevention, and management of diabetes mellitus HbA_{1c} 	<ul style="list-style-type: none"> Reading food labels for portion size, counting steps using pedometers Proper way to measure blood sugar using a glucometer
Session 4: Hypertension	Definition, risk factors, prevention, and management, blood pressure	<ul style="list-style-type: none"> Reading food labels for carbohydrate content Proper way to obtain blood pressure using hand-held blood pressure cuff Reading food labels for salt content, reading prescription labels
Session 5: Cholesterol	Definition, risk factors, prevention, and management	Reading food labels for fat content
Session 6: Depression	Definition, risk factors, recognizing signs, getting help	Taking the PHQ-9
Bioethics (core competency)	Human subjects protection	Privacy, confidentiality, Health Insurance Portability and Accountability Act regulations

Table 2

Pretest and Posttest Measures: Intervention Group, Mean Values

Measures	n	Pretest	Posttest	Difference	p Value ^a
Risk factor knowledge (scale, 0–19) ¹⁴		14.43	17.07	2.64	.011
Test of Functional Health Literacy in Adults prescription (scale, 0–12)	5	7.20	9.40	2.20	.2155
Test of Functional Health Literacy in Adults, Short Version (scale, 0–36)	15	31.87	32.67	0.80	.5959
Systolic blood pressure, mm Hg	13	137.69	133.54	–4.15	.3506
Diastolic blood pressure, mm Hg	13	84.69	78.38	–6.31	.0507
Low-density lipoprotein cholesterol, mg/dL	12	97.3	113.4	16.17	.2245
High-density lipoprotein cholesterol, mg/dL	13	51.23	44.31	–6.92	.0480 ^a
Total cholesterol, mg/dL	13	175.85	175.92	0.077	.9961
Triglycerides, mg/dL	12	128.4	103.7	–24.75	.1368
Glycated hemoglobin A _{1c} , %	13	6.44	6.38	–0.05	.6662
Weight, kg	12	90.2	89.39	–0.81	.2092
Waist, cm	13	15.35	14.32	1.03	.7452
Patient Health Questionnaire 9 (depression, scale, 0–27)	8	3.25	2.75	–0.5	.2275

^aPaired *t* test statistically significant at .05.

Table 3

Posttest Changes for Intervention and Control Groups Mean Values

Measures	Intervention	Control	Difference	<i>p</i> Value ^a
Cardiovascular risk factor knowledge (scale, 0–19)	2.64	–1.30	3.94	.0472 ^a
Test of Functional Health Literacy (scale, 0–19)	2.20	2.40	–0.20	.9264
Test of Functional Health Literacy, Short Version (scale, 0–36)	0.80	0.88	–0.08	.9888
Systolic blood pressure, mm Hg	–4.15	–6.5	2.35	.8012
Diastolic blood pressure, mm Hg	–6.31	2.38	–8.68	.1001
Low-density lipoprotein cholesterol, mg/dL	16.17	–14.5	30.67	.3551
High-density lipoprotein cholesterol, mg/dL	–6.92	0.25	–7.17	.2748
Total cholesterol, mg/dL	0.08	–20.5	20.58	.4968
Glycated hemoglobin A _{1c} , %	–0.054	0.54	–0.59	.0279 ^a
Weight, kg	–0.08	–0.84	0.04	.9905
Waist, cm	0.15	1.46	–1.31	.1101
Patient Health Questionnaire 9 (depression, scale, 0–27)	–0.5	0.6	–1.1	.5910

^aIndependent samples *t* test statistically significant at .05.