Published in final edited form as:

Public Health Nurs. 2015 May ; 32(3): 246–255. doi:10.1111/phn.12130.

My Family Medical History and Me: A pilot feasibility study of a cardiovascular risk reduction intervention

Christopher C. Imes, PhD, RN,

University of Pittsburgh School of Nursing, Health Promotion and Development, Pittsburgh, PA 15261

Frances M. Lewis, PhD, FAAN [Professor],

University of Washington, School of Nursing, Family and Child Nursing, Seattle, WA 98195

Melissa A. Austin, PhD, MS [Professor, Epidemiology], and

University of Washington, School of Public Health, Seattle, WA 98195

Cynthia M. Dougherty, PhD, ARNP, FAHA, FAAN [Professor]

University of Washington, School of Nursing, Biobehavioral Nursing and Health Systems, Seattle, WA 98195

Christopher C. Imes: imesc@pitt.edu; Frances M. Lewis: fmlewis@uw.edu; Melissa A. Austin: maustin@uw.edu; Cynthia M. Dougherty: cindyd@uw.edu

Abstract

Objective—Evaluate the feasibility and acceptability of a behaviorally-focused intervention designed to increase perceived cardiovascular disease (CVD) and coronary heart disease (CHD) risk in young adults with a family history (FH) of CVD/CHD.

Design—Single group, pre-post-test design.

Sample—Fifteen, mostly female (n=13, 86.7%), White, young adults (mean age 20.8 years) with a minimum of a high school education with a FH of CVD/CHD.

Measurements—Feasibility examined the recruitment strategy, study procedures, appropriateness and quality of the study instruments, and problems that occurred during delivery of the intervention. Acceptability examined participants' engagement in the in person sessions and at home exercises and their feedback about the intervention.

Intervention—Two, in person sessions provided personalized, tailored messages about ten-year and lifetime CHD risk based on risk factors, FH from a three-generation pedigree, lipid levels, blood pressure, and smoking status, and brief counseling about how to engage in a healthy lifestyle to decrease CVD/CHD risk.

Results—The intervention was feasible and acceptable. Participants requested more information on healthy food choices, including which foods to avoid and which exercises most improve cardiovascular health.

Conclusions—Although requiring refinement, the intervention has potential public health implications and deserves further testing.

Keywords

Cardiovascular diseases; family history; feasibility study; health behaviors; health promotion

Introduction

Cardiovascular disease (CVD) remains the leading cause of mortality in the United States (Go et al., 2013) and worldwide (World Health Organization, 2012). Although symptoms and death related to CVD are rare in young and middle-aged adults (Roger et al., 2012), significant atherosclerosis, the underlying cause of most CVD, is relatively common in this population. For example, one study found that 15.1% of African-American and Caucasian men and 5.1% of African-American and Caucasian women between the ages of 33 and 45 had prevalent coronary artery calcification (Loria et al., 2007).

Extensive epidemiological evidence has shown that family history (FH) is an independent risk factor for the development of coronary heart disease (CHD; Friedlander et al., 2001; Lloyd-Jones et al., 2004; Silberberg, Wlodarczyk, Fryer, Robertson, & Hensley, 1998). Having a single first-degree relative (FDR) with a history of a cardiovascular event doubles an individual's lifetime cardiovascular risk compared to someone without a FH (Ciruzzi et al., 1997; Friedlander et al., 2001; Silberberg et al., 1998). When the individual has a FDR with a premature cardiovascular event, defined as a cardiovascular event before age 55 in males and before age 65 in females, the risk is up to four times greater (Friedlander et al., 2002; Silberberg et al., 1998). However, lifestyle choices, specifically diet, physical activity, and smoking, influence atherosclerosis formation and can be modified to decrease morbidity and mortality later in life (Grundy, 1990; US Department of Health and Human Services, 2010).

The American Heart Association (AHA) recently created a new set of Impact Goals for 2020 to improve the cardiovascular health of all Americans by 20% while reducing deaths from CVD and stroke by 20% (Lloyd-Jones et al., 2010). The centerpiece of these new goals is the novel concept of “cardiovascular health” that includes seven health dimensions: body mass, smoking status, physical activity, diet, total cholesterol (TC), blood pressure, and blood glucose level. Cardiovascular health can range from “ideal” to “poor” (Lloyd-Jones et al., 2010). However, “ideal” cardiovascular health is rare, with less than 1% of adults >20 years old meeting the criteria based on 2009-2010 National Health and Nutrition Examination Survey data (Go et al., 2013). Given the new 2020 AHA goals, health education and promotion must begin early and should have a special focus on those at increased risk, such as individuals with a FH of CVD.

Unfortunately, young adults often do not understand their personal risk of developing CVD nor the long-term consequence of high blood pressure and elevated cholesterol (Deskins et al., 2006; Lynch, Liu, Kiefe, & Greenland, 2006). Many avoid screening because they fear that it may reveal a health problem (Bost, 2005; Deskins et al., 2006). The overall focus on short term risk results in many younger patients not receiving information about lifestyle

changes or medications that would decrease their lifetime risk for CVD (Karmali & Lloyd-Jones, 2013).

Strategies aimed at the modifiable risk factors in young adults have the potential to reduce the morbidity and mortality related to CVD (Go et al., 2013; Lloyd-Jones et al., 2010). Physical activity reduces all-cause mortality by 27% among adults without existing chronic conditions such as diabetes, cancer, CHD, angina, CVD, stroke, or respiratory diseases and by 45.9% among people with chronic co-morbidities (Schoenborn & Stommel, 2011). On average, male smokers die 13.2 years earlier than male nonsmokers and female smokers die 14.5 years earlier than female nonsmokers (Office of the Surgeon General, 2010). In the Framingham Heart Study, being overweight or obese was associated with an increased risk for CVD. The increased age-adjusted relative risk for CVD, among those who were overweight was 21% in males and 20% in females; among those who were obese, the increase was 46% in males and 64% in females (Wilson, D'Agostino, Sullivan, Praise, & Kannel, 2002). Nonetheless, many young and middle-aged individuals are unaware of their increased lifetime CVD risk and do not receive preventive therapy or make lifestyle changes that slow disease progression.

Despite the magnitude of importance of raising awareness of CVD risk in young adults, there are no known feasibility studies to recruit asymptomatic, young adults with a known FH of CVD/CHD into an educational counseling intervention. Such feasibility studies are essential first steps in the development and testing of interventions to reduce their long-term risk. Feasibility studies include an evaluation of study methods, assessments of the recruitment strategy, and an assessment of the appropriateness of study instruments (Polit & Beck, 2008). When a new intervention is being developed and tested, feasibility studies provide information on the acceptability of the intervention to the intended beneficiaries and the adequacy and clarity (content) of the intervention (Polit & Beck, 2008). Results from feasibility studies are typically under-reported, eliminating the opportunity to learn from the experiences of other researchers.

Purpose

The purpose of the current paper is to report on the feasibility and acceptability of the My Family Medical History and Me program, a cognitive-behavioral intervention for young adults with a FH of CVD or CHD risk factors whose goals are to change perceived lifetime CVD risk and intention to engage in heart-healthy lifestyle behavior.

Methods

Sample

Data were collected from a student population attending a large university in the Pacific Northwest. Recruitment occurred through fliers placed throughout campus, a website that advertised research studies for healthy volunteers and by word-of-mouth. All recruitment was through self-referral, not provider referral. This meant that it was up to the individual to contact the researcher to learn more about the study.

Participants were eligible if they were between 18 and 25 years old, able to speak, read, and write English, and had a known FH of CVD or conditions known to increase CHD risk. Potential participants were ineligible for the study if they were pregnant; had a history of congenital heart defects; had a current diagnosis of hypertension, dyslipidemia, or diabetes; or were unable to gather the medical histories of their blood-relatives. Screening over the phone occurred before enrollment and obtaining signed informed consent.

The study received approval from the IRB. All sessions were digitally recorded.

Intervention

The intervention (Figure 1) consisted of two, in person sessions in which participants were provided personalized messages about lifetime CVD risk based on their FH and other risk factors including blood pressure and lipid levels. After reviewing the study participants' CVD risk factors, the researcher counseled the participants about ways to engage in a healthy lifestyle to reduce their CVD risk.

Theoretical framework—The content and structure of the intervention were derived from Protection Motivation Theory (PMT), a health behavior theory that explains the processes by which protective behaviors are initiated or maintained (Floyd, Prentice-Dunn, & Rogers, 2000). In PMT, two cognitive processes, threat appraisal and coping appraisal, combine to form “protection motivation,” an individual's behavioral response (action or inaction) to a potential or real threat. Threat appraisal consists of maladaptive response rewards (the aspects of a negative behavior that feels good or is enjoyed), severity of the threat, and an individual's perceived vulnerability to the threat. Coping appraisal consists of response efficacy (how effective an action is at preventing/lessening the threat), self-efficacy (the belief that the individual can successfully perform the action), and response cost (how much money, time, or effort is required to perform the action). For a person to engage in an action to reduce a threat, the coping appraisal must “outweigh” the threat appraisal (Floyd et al., 2000).

Based on this framework, the intervention included multiple methods to increase the participants' threat appraisal by increasing perceived threat severity and threat vulnerability. Specifically, CVD risk information was provided based on: (1) FH, (2) TC, low-density lipoprotein cholesterol (LDL-C), and high-density lipoprotein cholesterol levels (HDL-C), (3) and the Framingham Risk Calculator (National Cholesterol Education Program Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults [Adult Treatment Panel III], n.d.).

To address coping appraisal within PMT, the intervention included information on small, easy-to-make lifestyle changes that had a potential long-term impact on CVD morbidity and mortality. This discussion was designed to increase the individual's understanding of the response efficacy of a healthy lifestyle and the person's self-efficacy to make those changes. Table 1 shows the links between the theoretical concepts in PMT and the intervention components.

Session One—In the first session, baseline study measures, which included questionnaires and a blood sample for a fasting lipid panel, were obtained. Next, FH was collected from the participant by interview on the participant's parents, siblings, grandparents, and aunts and uncles. Specific questions were asked about cause of death, age of death, diagnoses related to CVD and age when these conditions were diagnosed. This information was entered in Progeny Clinical (Progeny Software, LLC, 2011), a pedigree and clinical data management program used to create a three-generation pedigree. At the end of Session One, the participant was given a copy of the pedigree and instructed to validate the information with as many family members as possible.

Session Two—Session Two occurred approximately two weeks after Session One and involved updating the pedigree based on any new medical history information found by the participant, followed by two verbally administered single-item questions about the participant's perceived risk for developing CVD in his/her lifetime and his/her likelihood to take action to modify his/her risk. After administering the questions, the pedigree was reviewed with the participant and the pattern of inheritance of CVD was discussed. Next, the participant was told his/her CVD risk based on: (1) his/her overall FH (“low” if he/she had no family members with CVD, “moderate” if he/she had one family member with CVD, or “high” if he/she had more than one family member with CVD); and (2) the number of FDRs with CVD or premature CVD. The participant was then asked the same two single-items questions to assess pre-post changes on his/her perceived risk and his/her likelihood to take action to modify his/her risk factors.

Following the discussion of CVD risk based on FH, the researcher gave the participant the results of his/her lipid panel (TC, LDL-C, and HDL-C). For each of the lab tests, the participant was told if the values were within or outside of the recommended range based on his/her risk factors.

Finally, the participant's short-term risk for developing “hard CHD,” defined as a myocardial infarction or coronary death, was calculated using the Risk Assessment Tool for Estimating 10-year Risk of Developing Hard CHD (Adult Treatment Panel III, n.d.). This tool determines a person's 10-year risk for having or dying from a heart attack based on his/her age, gender, TC, HDL-C, smoking status, systolic blood pressure, and use of anti-hypertensive medications. First, the participant was given his/her current risk. Then the data were altered (e.g., age increased, smoke status changed, TC changed) to show how his/her risk changed with different variables. It was stressed that the estimate did not include FH information and that a FH further increased his/her estimated risk.

After discussing the participant's risk for CVD, the principal investigator (PI) offered the participant information on lifestyle behavior changes that could decrease his/her risk; these included increasing physical activity and eating a healthy diet to meet the AHA recommendations. This discussion was interactive and included information on how small changes in physical activity and diet could have a significant long-term impact on subsequent development of CVD. The discussion was supplemented with pamphlets from the AHA.

At the end of the session, several open-ended questions were asked to assess which components of the intervention were perceived as most helpful and how the intervention can be improved (Table 2).

For this pilot feasibility study, the intervention was delivered by the PI, a BSN-prepared doctoral student. To maximize the reproducibility of the intervention and to protect intervention fidelity, all aspects of the intervention were scripted (see Supplemental Table 1 for an excerpt of the intervention script for one component of Session 2). The intervention script included the telephone screening, family history collection, review of the pedigree, and the delivery of risk information based on the data collected. Additionally, all sessions were reviewed to ensure the fidelity of the intervention; see details below on methods.

Measures of Feasibility and Acceptability

Feasibility—Assessment of the feasibility of the study included an examination of the: (1) overall recruitment strategy (ability to attract the intended population), (2) the adequacy of the study procedures (intervention fidelity), and (3) the appropriateness of the study instruments (subject burden and completion rate).

To evaluate intervention fidelity, a list of 37 “required” elements, 15 in Session One and 22 in Session Two, was developed before any sessions were conducted. The list contained the essential components of the intervention (See Supplemental Table 2 for an example). The recorded sessions were reviewed by the PI to determine if participants received each of these required elements.

Acceptability—The acceptability of the intervention was measured by: (1) the retention rate and willingness of participants to engage in the intervention by gathering their family members' medical history; (2) study participants' perception of the importance of the intervention; and (3) the participants' feedback from open-ended interview questions at the end of Session Two.

Analytic Strategy

The PI used SPSS 21.0 (IBM, 2012) to analyze the descriptive data and NVivo 7 (QSR International, 2006) for the qualitative data analysis. Digitally recorded sessions were reviewed to assess the intervention fidelity. Feasibility and acceptability assessment utilized descriptive statistics and thematic analysis from the open-ended interview questions.

After transcribing and verifying the accuracy of the transcriptions, thematic analysis was conducted. Initial codes were generated across all the open-ended interviews. These initial codes were examined and compared carefully in order to note points of agreement and disagreement. Potential themes were created and reviewed. Finally, through ongoing analysis to refine the specifics of the themes and the overall story, themes were defined and named (Braun & Clarke, 2006; Vaismoradi, Turunen, & Bondas, 2013).

Results

Sample

The study sample consisted of 13 females (86.7%) and 2 males (13.3%); Table 3. The participants were mostly Caucasian (n=10, 66.7%) with some college education (n=11, 73.3%); Table 3. The mean age $\pm$ SD was 20.8 ($\pm$ 2.2) years; range 18-25. None of the study participants smoked. Based on blood pressure and lipid levels, the sample was, overall, healthy. Twelve (80%) of the participants had at least one FDR with diagnosed CHD. At baseline, mean lifetime perceived CVD risk based on age, sex, race, lifestyle, and FH was 4.3 ($\pm$ 1.8) as assessed by a single-item visual analogue scale from 0-10.

Feasibility

Recruitment—A total of 30 individuals requested more information about the study by either calling the research office or e-mailing the PI during the enrollment period. Four individuals could not be reached to provide more information about the study or to be screened for eligibility.

Eligibility screening of 26 individuals occurred. Eight people did not meet the inclusion criteria: five (19.2% of all screened) did not have a FH of CVD; two (7.7% of all screened) were too old to participate; and one (3.8% of all screened) had already been diagnosed with hyperlipidemia. A final study sample of 18 young adults were accrued into the study (69.2% of all screened). Of these 18 individuals, three (11.5% of all screened; 16.7% of all eligible) were lost before Session One. Of the 15 participants enrolled in the study, all completed both sessions (57.7% of all screened; 83.3% of all eligible).

Of the individuals screened, half (n=13; 50.0%) learned about the study by seeing a flyer advertising the study on campus; seven (27.0%) learned about the study through a website that listed on-going research studies at the university; and three (11.5%) were told about the study by a friend. Three (11.5%) individuals were not asked how they learned about the study.

Intervention Fidelity—All of the “required” elements of the intervention were delivered to all 15 participants.

Subject burden—The average amount of time for Session One was 76 minutes (range 65-94 minutes) and 47 minutes (range 36-64 minutes) for Session Two. During Session One, participants spent an average of 7 minutes (range 6-7.5 minutes) completing demographic and study questionnaires. During Session Two, participants spent an average of 3.5 minutes (range 2-5.5 minutes) completing study questionnaires, not including time spent answering the open-ended questions at the end of the session. The completion rate for the questionnaires was over 99% for both sessions, with only three pieces of missing data.

Acceptability

Retention rate—All 15 of the individuals who enrolled in the study completed the full two-session intervention.

Engagement in the intervention—All participants talked with at least one family member about their FH between Sessions One and Two. The majority spoke to only one or both parents who provided them with information about their health and the health of the other family members listed in their pedigree (n=11, 78.6%). Only one participant (7.1%) spoke to all of her living family members. With this individual, a family event occurred between the two sessions, giving her an opportunity to talk with all of her family members.

Analysis of the open-ended questions

The thematic analysis initially produced 16 codes that were later consolidated into seven codes. These seven codes were: awareness of risk; behavioral changes to decrease CVD risk; denial; less risk than I thought; more information would be useful; the three-generation pedigree; and what I learned from the intervention. All seven consolidated codes were identified within the first six transcripts. These seven codes were collated into four themes: What increased perceived risk; Improving my lifestyle; Denial of risk; and More information.

What increased my perceived risk—The first theme, “What increased my perceived risk,” was defined as the components of the intervention that were perceived as useful by the participants and influenced their perceived risk. It consisted of three codes: awareness of risk, the three-generation pedigree, and what I learned from the intervention.

Seven (47%) participants reported that receiving the results of their own fasting lipid levels had the greatest impact on their perceived CVD risk. One individual stated, “Well, definitely the cholesterol test was very informative. I had never had that tested before.” As part of the intervention, the effects of LDL-C and HDL-C on atherosclerosis were explained. This was very useful for this participant, “What really helped was that cartoon. It helps you visualize what happens, what are the effects of having the bad cholesterol and how the good one helps.”

About 40% of study participants (n=6) reported that the three-generation pedigree and risk information based on the number of family members with CVD or the conditions known to increase CVD risk, had the most impact on their perceived lifetime CVD risk. Regarding her pedigree and lifetime CVD risk, one participant referred to it has a “wake-up call.” Another participant stated that the pedigree helped to showed how the CVD risk “trickles down” from one generation to the next. One participant commented on how the pedigree helped her to “see” her risk:

I pretty much knew about all of it [my family medical history]. But like I said earlier, I didn't really add it all up. It is kind of hard to in your head. But, when you see it on that paper, it, it... that's really when I guess I learned. My entire family, almost every family member, to be honest, has a risk.

A smaller number of participants (n=5, 33%) reported that the discussion of their family history with their family members had the most influence on their FH knowledge. One participant said: “We don't normally talk about this [family medical history], so I was just learning about all this stuff about my family...” Another participant commented about how

her Mom helped to increase her perceived risk. She said, “Talking to my Mom about it, she is like, ‘You are definitely at high risk right now’.”

Improving my lifestyle—The second theme, “Improving my lifestyle” was defined as the actions the participants intended to take to improve their lifestyle and reduce their long-term CVD risk. It consisted of one code, behavioral changes to decrease CVD risk.

All participants spoke of lifestyle changes to decrease their long-term CVD risk. Most intended to exercise more and eat a healthier diet (n=12, 80%). Two (13.3%) intended to eat a healthier diet. One participant (6.6%), who was a vegetarian, planned to increase her exercise.

Denial of risk—The third theme, “Denial of risk,” was defined as statements in which a participant refused to acknowledge their long-term CVD risk. It consisted of two codes: denial and less risk than I thought.

When discussing the lab values, one participant (6.6%) said, about her low HDL-C, “I did not know that having poor HDL-C could affect you negatively and I did not know that that was in my family.” However, this participant expected her LDL-C level to be elevated. When she was told that her LDL-C level was within the recommendations, she perceived her overall risk to be low, despite the newly discovered low HDL-C level.

There were several situations in which the three-generation pedigree was not helpful at increasing perceived CVD. One participant had a strong family history of hypertension in her first- and second-degree relatives. However, her relatives had yet to develop any complications related to the hypertension and the participant's blood pressure was normal. For this individual, the FH of hypertension and normal BP reading did not convey increased personal risk.

Another participant could not see the risk within her family. She had one first-degree relative and several second-degree relatives with CVD risk factors. When discussing the impact of the three-generation pedigree, the participant stated it was “not as worrisome as I thought it was.” When asked why her FH was not a real concern, she replied that she was not a smoker. She believed, based on what her father told her, that if you don't smoke there is very little risk for having a heart attack.

More information—The fourth theme, “More information,” was defined as any additional information requested by the participants to better understand their risk or ways to reduce their risk. It consisted of one code: more information would be useful. Participants wanted to know what foods to avoid or eat to lower cholesterol (n=4), what exercises were best to decrease CVD risk (n=2), more detailed information on how saturated fats contributed to cholesterol levels (n=1), and how dietary sodium influenced blood pressure (n=1).

Discussion

Overall, the My Family Medical History and Me program was feasible and acceptable. All individuals who attended Session One also attended Session Two. This suggests that the

current two-session format was acceptable. The two sessions were fairly brief, about an hour each, and only a few minutes were needed to collect the data, suggesting low subject burden.

Slight changes to the recruitment strategy, along with additional recruitment sites, are needed in future studies to increase the number of individuals screened and to enroll in a larger and more diverse population. Recruitment sites that see more young adult patients, such as sport medicine clinics and women's reproductive services clinics, are among future sites to be considered. Although the study attempted to recruit males and female, the majority of the sample was female. More aggressive recruitment at sport medicine clinics could also increase the number of male participants. All recruitment was passive, meaning that the impetus for participation rested with the individual. If more clinicians were involved in screening or referring individuals or if medical records were screened, more potential participants could be identified in future studies.

Two elements of the intervention were especially important in raising participants' awareness of their personal risk for CVD. Discussion of the three-generation pedigree and the increased lifetime CVD risk associated with family members with CVD and the review of lipid levels were the two most influential components, based on participants' report. However, given the extremely low risk of having a heart attack for a 25 year old, even with multiple risk factors, the 10-year Framingham Risk Scores were not a useful part of the intervention. In future studies, a 30-year prediction algorithm for CVD, like the one developed by Pencina and colleagues (2009), could provide young adults with risk information that parallels the natural history of CVD/CHD.

The content of the intervention needs to be expanded to include: (1) more information about the long-term impact of hypertension; (2) more examples of which foods to eat to decrease CVD risk, and (3) more details on exercises to improve cardiovascular health.

This feasibility study is the first known intervention to use a three-generation pedigree as a FH tool to increase perceived CVD/CHD risk. It builds on previous studies, such as the Family Heathware Impact Trial, which showed that tailored message based on FH and heart disease risk increased vegetable consumption and physical activity compared to individuals who received only standardized messages (Ruffin et al., 2011). Another unique aspect of this intervention is its target population of young adults. Multiple studies have examined perceived CVD/CHD risk in young adults with a FH using a cross-sectional design (Hunt et al., 2000; Ponder et al., 1996) or a longitudinal design (Kip et al., 2002), but the current study is the only known intervention study with this at-risk population.

The intervention, although requiring additional refinement and testing, has potential for use in public health settings such as high schools and colleges, community health clinics, work environments and health fairs. By utilizing public health nurses with genetics and genomics knowledge and skills to collect the FH or Internet-based FH collection applications, such as the Surgeon General's "My Family Health Portrait" (<http://familyhistory.hhs.gov>), along with point-of-care lipid testing (Pluddemann, Thompson, Price, Wolestenholme, & Heneghan, 2012), the intervention could be moved into the community. In the community

setting, the intervention could reach more individuals, maximize its potential public health impact.

Strengths and Limitations

This is the first study to utilize a three-generation pedigree-based intervention to increase perceived CVD/CHD risk in young adults. The intervention allowed tailored lifetime CVD risk information to be provided to participants based on their risk factors and included personalized messages to promote physical activity and a healthy diet while still staying within a standardized scripted protocol.

Results from the study cannot be generalized to other populations of young adults. Recall that recruitment was limited to young adults, all of whom were enrolled in college, had a college degree, or pursuing advanced degrees. It is possible that the sample included the “walking well” or “worried well,” resulting in a biased sample of motivated young adults with a desire to complete the intervention.

Conclusion

Although the intervention and study protocol require further development and refinement, the intervention was both feasible and acceptable in a small sample of 18-25 year olds with a FH of CVD or CVD risk factors. The structure and content of the intervention had multiple components that were acceptable to study participants and also influenced their perceived risk for CVD/CHD. Changes are also needed: additional content on lifestyle behaviors, including exercises for heart health, need to be added. The 10-year risk calculator should be replaced with one that estimates long-term risk, such as the 30-year CVD risk calculator. Additional testing is warranted with a larger sample that is recruited from less resourced settings, e.g., a community health clinic or community-based health fairs, among others. Pending outcomes from future tests, the intervention has potential to affect public health outcomes in a variety of setting including schools and work environments. Interventions that focus on improving the lifestyles of individuals at risk for CVD are essential to attain the 2020 AHA goal of improving the cardiovascular health of all Americans.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

Funding sources: Grant T32NR007106 from the National Institute for Nursing Research of the National Institutes of Health and grant T32NR009759 from the National Institute for Nursing Research of the National Institutes of Health.

References

- Bost ML. A descriptive study of barriers to enrollment in a collegiate Health Assessment Program. *Journal of Community Health Nursing*. 2005; 22(1):15–22. [PubMed: 15695193]
- Braun V, Clarke V. Using thematic analysis in psychology. *Qualitative Research in Psychology*. 2006; 3(2):77–101.

- Ciruzzi M, Schargrotsky H, Rozlosnik J, Pramparo P, Delmonte H, Rudich V, et al. Frequency of family history of acute myocardial infarction in patients with acute myocardial infarction. Argentine FRICAS (Factores de Riesgo Coronario en America del Sur) Investigators. *American Journal of Cardiology*. 1997; 80(2):122–127. [PubMed: 9230145]
- Deskins S, Harris CV, Bradlyn AS, Cottrell L, Coffman JW, Olexa J, Neal W. Preventive care in Appalachia: use of the theory of planned behavior to identify barriers to participation in cholesterol screenings among West Virginians. *Journal of Rural Health*. 2006; 22(4):367–374. [PubMed: 17010036]
- Floyd DL, Prentice-Dunn S, Rogers RW. A meta-analysis of research on Protection Motivation Theory. *Journal of Applied Social Psychology*. 2000; 30(2):407–429.
- Friedlander Y, Arbogast P, Schwartz SM, Marcovina SM, Austin MA, Rosendaal FR, et al. Family history as a risk factor for early onset myocardial infarction in young women. *Atherosclerosis*. 2001; 156(1):201–207. [PubMed: 11369015]
- Friedlander Y, Siscovick DS, Arbogast P, Psaty BM, Weinmann S, Lemaitre RN, et al. Sudden death and myocardial infarction in first degree relatives as predictors of primary cardiac arrest. *Atherosclerosis*. 2002; 162(1):211–216. [PubMed: 11947916]
- Go AS, Mozaffarian D, Roger VL, Benjamin EJ, Berry JD, Borden WB, et al. Heart disease and stroke statistics—2013 update: a report from the American Heart Association. *Circulation*. 2013; 127(1):e6–e245. [PubMed: 23239837]
- Grundey, SM. Cholesterol and atherosclerosis: Diagnosis and treatment. Philadelphia, PA: J. B. Lippincott Company; 1990.
- Hunt K, Davison C, Emslie C, Ford G. Are perceptions of a family history of heart disease related to health-related attitudes and behaviour? *Health Education Research*. 2000; 15(2):131–43. [PubMed: 10751372]
- Karmali KN, Lloyd-Jones DM. Adding a life-course perspective to cardiovascular-risk communication. *Nature Reviews Cardiology*. 2013; 10(2):111–115.
- Kip KE, McCreath HE, Roseman JM, Hulley SB, Schreiner PJ. Absence of risk factor change in young adults after family heart attack or stroke: the CARDIA Study. *American Journal of Preventive Medicine*. 2002; 22(4):258–66. [PubMed: 11988382]
- Lloyd-Jones DM, Nam BH, D'Agostino RB Sr, Levy D, Murabito JM, Wang TJ, et al. Parental cardiovascular disease as a risk factor for cardiovascular disease in middle-aged adults: a prospective study of parents and offspring. *Journal of the American Medical Association*. 2004; 291(18):2204–2211. [PubMed: 15138242]
- Lloyd-Jones DM, Hong Y, Labarthe D, Mozaffarian D, Appel LJ, VanHorn L, et al. Defining and setting national goals for cardiovascular health promotion and disease reduction: the American Heart Association's strategic Impact Goal through 2020 and beyond. *Circulation*. 2010; 121(4):586–613. [PubMed: 20089546]
- Loria CM, Liu K, Lewis CE, Hulley SB, Sidney S, Schreiner PJ, et al. Early adult risk factor levels and subsequent coronary artery calcification: the CARDIA Study. *Journal of the American College of Cardiology*. 2007; 49(20):2013–2020. [PubMed: 17512357]
- Lynch EB, Liu K, Kiefe CI, Greenland P. Cardiovascular disease risk factor knowledge in young adults and 10-year change in risk factors: the Coronary Artery Risk Development in Young Adults (CARDIA) Study. *American Journal of Epidemiology*. 2006; 164(12):1171–1179. [PubMed: 17038418]
- National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III). Retrieved from the Risk Assessment Tool for Estimating 10-year Risk of Developing Hard CHD (Myocardial Infarction and Coronary Death). n.dat <http://cvdrisk.nhlbi.nih.gov/calculator.asp>
- Office of the Surgeon General. The 2004 United States Surgeon General's Report: The Health Consequences of Smoking. *NSW Public Health Bulletin*. 2004; (15):107. [PubMed: 15543245]
- Pencina MJ, D'Agostino RB, Larson MG, Massaro JM, Vasan RS. Predicting 30-year risk of cardiovascular disease: The Framingham Heart Study. *Circulation*. 2009; 119(24):3078–3084. [PubMed: 19506114]

- Polit, DF.; Beck, CT. Nursing research: Generating and assessing evidence for nursing practice. 8th. Philadelphia, PA: Lippincott Williams & Wilkins; 2008.
- Ponder M, Lee J, Green J, Richards M. Family history and perceived vulnerability to some common diseases: A study of young people and their parents. *Journal of Medical Genetics*. 1996; 33(6): 485–92. [PubMed: 8782049]
- Pludderman A, Thompson M, Price CP, Wolstenholme J, Heneghan C. Point-of-care testing for the analysis of lipid panels: Primary care diagnostic technology update. *The British Journal of General Practice*. 2012; 62(596):e224–e226. [PubMed: 22429442]
- Roger VL, Go AS, Lloyd-Jones DM, Benjamin EJ, Berry JD, Borden WB, et al. Heart disease and stroke statistics--2012 update: a report from the American Heart Association. *Circulation*. 2012; 125(1):e2–e220. [PubMed: 22179539]
- Ruffin MT, Nease DE, Sen A, Pace WD, Wand C, Acheson LS, et al. Effect of preventive messages tailored to family history on health behaviors: the Family Healthware Impact Trial. *Annals of Family Medicine*. 2011; 9(1):3–11. [PubMed: 21242555]
- Silberberg JS, Wlodarczyk J, Fryer J, Robertson R, Hensley MJ. Risk associated with various definition of family history of coronary heart disease: The Newcastle Family History Study II. *American Journal of Epidemiology*. 1998; 147(12):1133–1139. [PubMed: 9645791]
- Schoenborn CA, Stommel M. Adherence to the 2008 adult physical activity guidelines and mortality risk. *American Journal of Preventive Medicine*. 2011; 40(5):514–521. [PubMed: 21496750]
- Vaismoradi M, Turunen H, Bondas T. Content analysis and thematic analysis: Implications for conducting a qualitative descriptive study. *Nursing and Health Sciences*. 2013; 15(3):398–405. [PubMed: 23480423]
- Wilson PW, D'Agostino RB, Sullivan L, Parise H, Kannel WB. Overweight and obesity as determinants of cardiovascular risk: the Framingham experience. *Archives of Internal Medicine*. 2002; 162(16):1867–1872. [PubMed: 12196085]
- World Health Organization. Cardiovascular diseases fact sheet. 2012. Retrieved from <http://www.who.int/mediacentre/factsheets/fs317/en/index.html>
- US Department of Health and Human Services. How tobacco smoke causes disease: The biology and behavioral basis for smoking-attributable disease. Rockville, MD: US Department of Health and Human Services, Public Health Services, Office of the Surgeon General; 2010.

Figure 1. Study Activities for Each Session

Both sessions were recorded and reviewed to assess intervention fidelity using an investigator-developed fidelity checklist.

Table 1
Theoretical concepts and intervention components

Theoretical concept	Intervention component	Session Delivered
Threat appraisal		
Perceived severity	Review of FH information (number of family members with CVD/CHD, deaths related to CHD)	Session One
Perceived vulnerability	Discussion of the pattern of CVD/CHD in three-generation pedigree, risk information based on FDRs, lipid panel results, 10-year CVD risk calculator	Session Two
Coping appraisal		
Response efficacy	Discussion of small behavioral changes to reduce long-term CVD/CHD risk, a scripted text that engaged study participants in reflecting on their previous behavior, interactive discussion on enacting these small behavioral changes	Session Two
Self-efficacy	Example from intervention script: "Based on these tips, give me three examples of things that you currently do or can easily do in the future to eat a more healthy diet?"	Session Two
Response costs	Suggested behavioral changes that were small (take the stairs instead of the elevator, order salad dressing on the side) with minimal time or monetary costs	Session Two

Note. CHD = coronary heart disease; CVD = cardiovascular disease; FH = family history; FDR = first-degree relative

Table 2
Open-Ended Questions Asked at the End of Session Two

Question
What, if anything, have you gained by collecting your family history?
What, if anything, were you surprised to learn about your family's health?
Based on the information you have provided and your family's pedigree, do you think you have a family history of CVD?
What information that you received during your two sessions together, if any, was most influential on informing your personal knowledge of your family history of CVD?
What information that you received, if any, was most influential on informing your personal risk for CVD in the future?
Given what you have learned, what do you want to do to stay healthy and reduce your risk?
What, if anything, would you like to learn from a health expert to be as healthy as possible, given your family's health history?

Table 3
Demographic Data on Study Participants

Variable	Mean [SD]	Range
Age	20.8 [2.2 years]	18-25 years
Gender, n (%)	13 females (86.7%)	
Ethnicity, n (%)	10 Caucasian, Non-Hispanic (66.7%)	
	2 Asian (13.3%)	
	2 Hispanic or Latino (13.3%)	
	1 Asian and Native Hawaiian or other Pacific Islander (6.7%)	
Education, n (%)	11 Some college (73.3%)	
	2 Completed college (13.3%)	
	2 Some graduate school (13.3%)	
BMI (kg/m ²)	21.9 [3.4]	16-30.9
Systolic BP	110.6 [11.9 mmHg]	90-138 mmHg
Diastolic BP	82 [3.9 mmHg]	70-82 mmHg
Total cholesterol	168.9 [35.4 mg/dL]	109-245 mg/dL
LDL-C	93.5 [23.4 mg/dL]	58-132 mg/dL
HDL-C	58.6 [13.7 mg/dL]	39-86 mg/dL
Baseline perceived lifetime CVD risk [‡]	4.33 [1.8]	2-7

Note. SD = standard deviation; BP = blood pressure; LDL-C = low-density lipoprotein cholesterol; HDL = high-density lipoprotein cholesterol; FDR = first-degree relative; CHD = coronary heart disease, CVD = cardiovascular disease

[‡]Based on a visual analogue scale with a range of 0-10