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The Blood Pressure Effect of the Addition of the DASH Diet and Exercise to the Treatment Plan of Both Pre-hypertensive and Hypertensive Rural Adults

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Abstract

Hypertension is a significant problem in the United States. This is especially true of rural populations who have diets high in saturated fat and sodium and low in fruits, vegetables and potassium. Furthermore, research has shown that a large number of rural residents do not engage in regular physical activity. These lifestyle characteristics have been associated with increased blood pressure and the risk for the development of cardiovascular disease. Conversely, adoption of the Dietary Approaches to Stop Hypertension (DASH) diet and exercise has been associated with decreases in blood pressure in pre-hypertensive/hypertensive patients. **Purpose:** The purpose of this project was to observe how the adoption of the DASH diet and increased physical activity affected the blood pressures of pre hypertensive/hypertensive rural adults. **Theoretical Framework:** The Transtheoretical Model of Behavior Change (TTM) allowed for an assessment of the readiness to change and accounted for relapses. **Method:** Participants consisted of males/females (N=7) ages 24-78 years old with a diagnosis of pre-hypertension/hypertension. Using a qualitative design that utilized unstructured interviews and telephone follow-ups allowed the recording of information as it occurred. **Results:** At the conclusion of the project, 86% (n=6) of participants increased plant-based nutrition, 43% (n=3) decreased dietary saturated and 57% (n=4) increased physical activity. Forty-three percent (n=3) of participants decreased the systolic blood pressure by 8-10 mm Hg. **Conclusion/Implications:** This was a pilot project to assess the need/ value of conducting future detailed projects with rural populations. This project served as an indicator of the value and effectiveness of implementing educational programs concerning chronic disease and lifestyle changes in rural clinics.

Keywords: hypertension, DASH diet, exercise, rural populations

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Background

Hypertension affects more than 70 million people in the United States (U.S), and it is a significant risk factor for cardiovascular disease (Rigsby, 2011). The prevention and management of hypertension are major health challenges for the United States (U.S.) (US DH&HS, 2004). Reduced physical activity and the inadequate consumption of fruits, vegetables and potassium have been identified as contributing to the cause of hypertension (US DH&HS, 2004). Fewer than 20% of Americans engage in regular physical activity and fewer than 25% consume five or more servings of fruits and vegetables daily (US DH&HS, 2004).

According to the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure (JNC-7, 2004), blood pressure is classified as prehypertension (120-139/80-89mmHg), stage 1 hypertension (140-159/90-99mmHg) and stage 2 hypertension (≥160/or ≥100). Rural populations across the U.S. have an increased likelihood of developing hypertension and diabetes (Bale, 2010). Limited access to care due to geography or socioeconomic status significantly impairs control of hypertension most in rural populations resulting in poor health outcomes (Bale, 2010).

Lifestyle modifications should be the foundation of initial therapy for hypertension (NGC, 2010). Lifestyle modifications can be equivalent to drug monotherapy when it comes to decreasing blood pressure (NGC, 2010). The JNC-7 found that lifestyle modifications reduce blood pressure, prevent or delay the incidence of hypertension, enhance antihypertensive drug therapy and decrease cardiovascular risk (US DH&HS, 2004). Adoption of the Dietary Approaches to Stop Hypertension (DASH) diet along with regular aerobic exercise has shown to decrease blood pressure (US DH&HS, 2004).

Problem Statement

Pre-hypertension and hypertension are a major health problem among rural adults' ages 19 years old and older that live in northwestern North Carolina. These rural southern residents regularly consume a diet that is high fat and sodium, but low in fruits, vegetables and lean dairy products. These residents also lead a sedentary lifestyle that excludes most types of aerobic physical activity. Furthermore, when compared to other rural areas, research has shown that rural southern residents have higher poverty rates, more physical inactivity, more obesity and more deaths due to ischemic heart disease. Primary care clinicians are in a position to provide patient education; however, many patient visits are not utilized as an opportunity to assess exercise and nutritional status as well as educate patients concerning these topics. Primary care clinicians need to provide time during patient visits to assess and educate their pre-hypertensive and hypertensive patients about the association between diet and exercise and blood pressure reduction.

Review of the Literature

DASH Diet and Blood Pressure

Prior to the DASH study, the only non-pharmaceutical options for lowering blood pressure were sodium reduction, weight management and moderation in alcohol consumption (Karanja, Erlinger, Hwa, Miller & Bray, 2004). This approach had limited results; therefore, there was a need to increase the number of non-pharmaceutical options for people who were at risk for hypertension. Prior to 1997, the belief was that individual nutrients were responsible for lowering blood pressure (Karanja et al., 2004). However, when nutrients were individually tested, blood pressure only decreased modestly or not at all. Therefore, researchers hypothesized that overall dietary patterns that included a variety of food components (not individual nutrients) was the reason behind the beneficial effects of low fat, vegetarian diets on blood pressure. As a result, in 1997 the National Heart Lung and Blood Institute (NHLBI) organized and funded the DASH study.

The DASH clinical trial by Appel et al. (1997) was a multicenter 11-week feeding study that assessed the effects of dietary patterns on blood pressure. The sample used for the DASH trial consisted of 459 adult participants' ages 22 years and older with systolic blood pressures of less than 160mm Hg and diastolic blood pressures of 80 to 95 mm Hg. The study population was demographically heterogeneous and included 49% women (n=225), 60% African-Americans (n=275) and 37% with household incomes of less than $30,000/year (n=170). The average body mass index (BMI) (the ratio of weight in kilograms to height in meters squared) for males was 27.8 kg/m^2 and the average BMI for women was 28.7 kg/m^2. There was no mention of Hispanic or Asian participants in this study. Participants taking antihypertensive medications and supplements were required to stop the medications before being included in this study. Exclusion from the study included, participants with poorly controlled diabetes mellitus, hyperlipidemia and cardiovascular events within the previous six months, non-descript chronic diseases that might interfere with participation, and BMIs greater than 35kg/m^2. This also excluded many hypertensive patients seen in the outpatient primary care setting.

At the beginning of the study, all participants consumed a control diet low in fruits, vegetables and dairy products for three weeks. The fat content of the control diet was not described but instead it was labeled as typical for the American diet. For the next eight weeks, participants were than randomly assigned to receive either the control diet, a diet rich in fruits and vegetables or a combination diet that included fruits, vegetables and low fat dairy with decreased saturated and total fat. Alcohol consumption, sodium consumption and physical activity were similar for all groups. Further, a variety of food forms (fresh, frozen, canned and dried) were used in the menus and all centers used the same brand of a given food item.

The results of the DASH trial demonstrated that a diet rich in fruits, vegetables and low fat dairy products with reduced saturated and total fat lowered systolic blood pressure by 5.5 mm Hg and diastolic blood pressure by 3.0 mm Hg more than the control diet. In addition, the diet rich in fruits and vegetables lowered blood pressure less than the combination diet. The blood pressure reduction began within two weeks of initiating the diet and maintained for six weeks. The blood pressure reduction was similar in men, women, and minority groups. Furthermore, the decrease in blood pressure seen with the combination diet was similar in magnitude to that observed in the trials of drug monotherapy for mild hypertension. The conclusion of the study was that a diet rich in fruits, vegetables and low fat dairy products resulted in a reduction in participants' blood pressure and the occurrence of blood pressure-related cardiovascular disease.

Moore et al. (1999) expanded on the results of the original DASH trial and continued the multicenter, randomized, controlled feeding study design. The purpose of this study was to determine the effect of the DASH diet on diurnal blood pressure and to determine if participants would accept and comply with ambulatory blood pressure (ABP) monitoring. The definition of ABP monitoring was 24-hour day and night blood pressure monitoring. ABP monitoring provides additional information to casual, office-based measurements because it allows for the examination of the circadian rhythm of blood pressure.

The Moore et al. (1999) study enrolled 459 DASH trial participants in five separate cohorts over a two-year timeframe. Of the original 459 participants, 354 successfully complied with ABP monitoring. These participants were healthy, community-dwelling adults (aged ≥ 22 years; average age 45.1 years) with an average BMI of 28.1 kg/m^2 who were not taking antihypertensive medication. The average systolic blood pressure was less than 160mm Hg and the diastolic blood pressure ranged from 80 to 95 mm Hg. Forty-seven percent (n=166) of the participants were female. Two-thirds of the participants (n=236) were from minority groups and 90% of minority participants were black (n=212). The exclusion criteria were the same as the DASH trial described previously.

After three weeks on a control diet ("typical" American diet), participants were randomly assigned to one of three diets for eight weeks. The three groups included either a continuation of the control diet, a diet rich in fruits and vegetables or a combination diet that included fruits, vegetables and low-fat dairy products. ABP was measured at the end of the control phrase and intervention periods. The fruits and vegetables diet and the combination diet lowered 24-hour blood pressure significantly compared with the control diet ($p < 0.001$ for systolic and diastolic pressures on both diets; control diet -3.2/-1.9 mm Hg; combination diet: -4.6/-2.6). The combination diet lowered blood pressure during both the day and night. Hypertensive participants had a significantly greater response to the combination diet than normotensive participants did (24-hour ABP -10.1/-5.5 vs. -2.3/-1.6 mm Hg respectively).

The results demonstrated that in addition to reducing random-zero sphygmomanometer blood pressure, the combination diet also significantly lowered 24-hour ABP in all participants combined as well as in gender, age, ethnic and blood pressure status subgroups. Further, participants' compliance with ABP monitoring was excellent with one participant who refused to wear the monitor and seven participants who provided incomplete recordings. In addition to the limitations of the DASH trial previously discussed, a limitation of this study was that nonminority subgroups failed to show a significant 24-hour ABP response.

Akita, Sacks, Svetkey, Colin and Kimura (2003), performed an ancillary study to the DASH-Sodium Trial (multicenter, randomized feeding trial). The authors examined the blood pressure-lowering mechanisms of the DASH diet based on the pressure-natriuresis relationship. After a two-week control phase, participants (n=375) were randomly assigned to one of two dietary patterns that included a control diet typical of the average American diet or the DASH diet. Both diets consisted of a 2100kcal diet. Participants consumed their assigned diets for three consecutive 30-day feeding periods during which sodium intake varied among three levels (50, 100 and 150 mmol/day) by a randomly assigned sequence. Participants were self-identified as African-American (n=212) and non-Hispanic white (n=163). In this study, participants were considered hypertensive (n=150) if their untreated baseline blood pressure was greater than or equal to 140/90 mm Hg. There were 213 females and 146 participants were classified as obese (BMI $\geq$ 30kg/m^2 . The only noted exclusion criterion was the use of antihypertensive medications.

The sodium excretion rate and mean arterial pressure (MAP) were measured at the end of each sodium intake level for both the control and the DASH diets and the results were graphed (x-axis MAP & urinary sodium excretion y-axis). The DASH diet steepened the slope of the relationship (29.5 ± 3.4 vs. 64.9 ± 13.1 mmole/day/mm Hg; p=0.0002) without significantly shifting the x-intercept (94.1 ± 0.5 vs. 93.2 ± 0.6 mm Hg, NS). This means that the DASH diet increased the slope of the pressure-natriuretic curve without shifting the curve along the blood pressure axis. This suggested that the DASH diet produced a natriuretic action. Furthermore, it was previously reported that the same effects on the pressure-natriuretic relationship were seen with the use of diuretics. The authors concluded that the DASH diet increased the slope of the pressure-natriuretic curve as if it were a diuretic.

Huggins, Margerison, Worsely and Nowson (2011) conducted a randomized, controlled study on the influence of dietary modifications on the blood pressure response to antihypertensive medication. Due to the similarities between American and British lifestyles, ethnic groups and cultures, the results of this British study are generalizable to United States residents. Since this study included participants who were using antihypertensive medications, it fills the limitation gap of the previous studies.

Huggins et al. (2011) conducted the study with a small sample of 94 participants (n=38 females; n=56 males). The participants were over the age of 25 years (average age was 57.5 years) and the average BMI was 29.6 kg/m^2 . For inclusion in the study, participants' blood pressures had to be ≥ 120/80 mm Hg. This was a study strength because it included pre-hypertensive as well as hypertensive participants. The researchers did not provide a racial breakdown of the participants, which is a weakness of the study. Further, the participants were classified *post hoc*, so the sample size across the groups was not balanced. The exclusion criteria were participants with blood pressure was >160/90mm Hg, had a cardiovascular event in the past six months, were insulin-dependent diabetes, taking Warfarin or Dilantin, and/or ate main meals outside the home more than twice a week. The exclusion criteria also included participants who drank more than 30 alcoholic drinks per week, planning to change their smoking habits or were unwilling to stop taking supplements.

Participants consumed two 4-week dietary protocols in random order (DASH diet and low-sodium high potassium diet) with a control diet before each phase. Participants were grouped based on their antihypertensive drug therapy: no therapy, renin-angiotensin system blockade and other antihypertensive therapy (included 16 subgroups with various medication combinations including calcium channel blockers, diuretics, beta-blockers, and angiotensinconverting enzyme inhibitors). Huggins et al. (2011) objectively assessed dietary compliance by collecting 24-hour urine, which was a strength of the study because it removed the problems associated with remembering the types of foods consumed and the under/over estimating of food consumption. However, blood pressures were self-measured with an automated monitor, which can decrease the validity/reliability of the results. In conclusion, Huggins et al. found that the DASH diet selectively lowered blood pressure in participants who were not on drug therapy and those who used renin-angiotensin blocking agents.

The previous studies by Appel et al. (1997), Moore et al. (1999), Akita et al. (2003) and Higgins et al. (2011), presented evidence supporting the use of the DASH diet to lower blood pressure. The studies utilized large numbers of participants from diverse locations. The populations for these studies included a majority of women and African-Americans, which broadens the results from the typical Caucasian male participant. The food for the studies was controlled by the researchers, which decreased confounding factors in the results. The Higgins et al. study provided additional information because it examined the effects of the DASH diet in pre-hypertensive and hypertensive participants.

Exercise and Blood Pressure

Physical inactivity is a major risk factor for cardiovascular disease, and people who are inactive and physically unfit have a 30% to 50 % greater risk for high blood pressure (Whelton, Chin, Xin & He, 2002). Strong evidence from epidemiological studies supports the inverse relationship between physical activity and cardiovascular and overall mortality in healthy individuals as well as people with documented cardiovascular disease (Kokkinos, 2008).

The Coronary Artery Risk Development in Young Adults (CARDIA) Study by Parker, Schmitz, Jacobs, Dengel and Schriener (2007) examined the relationship between physical activity and incident hypertension in young adults for 15 years of follow-up. The CARDIA Study was a large, multicenter, longitudinal investigation that randomly recruited participants from Alabama, Chicago and Minnesota. Participants were recruited according to age, education, gender, and race. A total of 3,993 African-American and Caucasian men and women aged 18 to 30 years were studied at baseline and at 2, 5, 7 and 15 years. There were 815 Black men, 1101 Black women, 967 White men and 1110 White women. The average BMI was 24.4kg/m^2 and the average years of education was 14.6. Blood pressure and physical activity were measured at each visit. Parker et al. defined hypertension as a blood pressure greater than or equal to 140/90 mm Hg or antihypertensive medication use.

Over the 15-year follow-up period, there were 634 cases of incident hypertension. After an adjustment for age, location, education, family history of hypertension, sex and race, the researchers observed a modest, statistically significant 17% risk reduction of incident hypertension per 300-EU increment in average physical activity, and an 11% risk reduction per 300-EU increase in physical activity among young adults in the CARDIA Study. (Three hundred exercise units (EU) approximate the American College of Sports Medicine's recommendation for the amount of exercise needed to support weight loss.) Therefore, those who were more vs. less physically active experienced a decreased risk for incident hypertension (hazard rate ratio= 0.83; 95% confidence interval = 0.73, 0.93). The authors concluded that physical activity should be examined as a method to prevent incident hypertension in young adults especially as they move into middle age.

The strengths of the CARDIA study included the long follow-up time, the large number of participants including large representation of African-Americans and women, inclusion of young adults and the multicenter location. The weaknesses of the study were the exclusion of Hispanic and Asian participants, and self-reported physical activity data.

Whelton, Chin, Xin and He (2002) conducted a comprehensive meta-analysis of random controlled trials examining the effect of aerobic exercise on blood pressure. Fifty-four random controlled trials (2419 participants) whose intervention and control groups differed only in aerobic exercise were included in the meta-analysis. The selected trials were conducted between 1986 and 2000 and varied in size from eight to 247 participants. All trials were conducted in adults (mean age 21-79 years) and the geographic locations varied widely. The majority of participants ($\geq$ 80%) were white in 23 trials, six trials included Asian participants and four trials included African-American participants. The trials varied in length from three weeks to two years (median duration 12 weeks). The average pretreatment blood pressure varied from 107 to 168 mm Hg for systolic blood pressure (median 126.5 mm Hg) and 61 to 104 mm Hg for diastolic blood pressure (median 77.0 mm Hg). The median baseline BMI was 25.4 kg/m^2 . Antihypertensive medication was administered in four trials in which all or some of the participants were hypertensive.

Whelton et al. (2002) showed that aerobic exercise lowered systolic blood pressure by 3.84 mm Hg and 2.58 mm Hg for diastolic blood pressure. The blood pressure decrease associated with aerobic exercise was consistent in sensitivity analyses that included or excluded subgroups of the clinical trials based on study design. Additionally, the findings suggested that the effects of aerobic exercise on blood pressure may be independent of body weight change. Further, the blood pressure reduction related to aerobic exercise did not significantly differ by subgroup according to the frequency or intensity of exercise

Therefore, Whelton et al. (2002) concluded that aerobic exercise reduced blood pressure in both hypertensive and normotensive persons. Additionally, an increase aerobic activity should be considered an important component of lifestyle modification for the prevention and treatment of hypertension.

The strengths of the Whelton et al. (2002) included the large number of participants that included Asian participants; the multiple geographic locations; the large number of randomized controlled studies analyzed; and the multiple types, frequencies and intensities of aerobic exercise. The weaknesses were the exclusion of nonrandomized studies and studies with multiple interventions; lack of disclosure about study locations; smaller reductions in blood pressure associated with trials lasting longer than six months (could be due to the non-sustainability of regular exercise); and the inability of the researchers to perform a multivariate meta-analysis due to the lack of important co-variables.

Kokkinos et al. (2006) conducted a cross-sectional study that examined the relationship between fitness and 24-hour ambulatory blood pressure in pre-hypertensive men and women. The population for this study consisted of white Greek men and women so the results may not be generalizable to other ethnic groups. However, many areas of the United States include residents with ethnic links to the Mediterranean area. Additionally, this study used ambulatory blood pressure monitoring and included pre-hypertensive participants, which fills the gaps of other exercise studies. Participants were recruited from a cardiology clinic in Athens and Pireaus, Greece. Six hundred and fifty pre-hypertensive men (n=407; mean age 51 years; average BMI= 27.1 kg/m^2) and women (n=243; mean age 54 years; average BMI= 25.7kg/m^2) with no evidence of coronary artery disease participated in the study. Exclusion from the study included participants who were taking cardiac, antihypertensive or other medications that affected blood pressure; participants with chronic diseases, participants who used tobacco within the last year; and alcoholics. Pre-hypertension was defined as resting systolic blood pressure of 120 to 139 mm Hg and a diastolic blood pressure of 80 to 89 mm Hg. Fitness was assessed by the Bruce protocol and categorized as low, moderate or high. Kokkinos et al. examined the relationship between peak exercise time as assessed by a graded exercise test and 24-hour ambulatory blood pressure to determine whether increased fitness was associated with lower blood pressure during a 24-hour period.

Multiple regression analysis showed that fitness status was inversely associated with ambulatory blood pressure in both sexes. After adjusting for confounders, participants in the lowest fitness category had significantly higher 24-hour, daytime, and nighttime blood pressure than those in the moderate and high fitness categories. Kokkinos et al. (2006) concluded that regularly performed physical activity was essential for pre-hypertensive individuals to achieve lower blood pressures throughout the day. This is important because pre-hypertensive patients have double the risk of developing hypertension than normotensive patients. Therefore, since pre-hypertensive patients are less likely to receive antihypertensive medication or regularly check their blood pressure, physical activity became essential to reduce their blood pressures.

The strengths of the Kokkinos et al. (2006) study were the large study size; the use of 24-hour ambulatory blood pressure monitoring; and the use of pre-hypertensive participants. The weaknesses of the study included the limited geographic location; the lack of ethnic diversity; non-disclosure of the type, intensity and frequency of exercise; the extensive exclusion criteria; and the inability to identify causal relationships due to the cross-sectional study design.

The Parker et al. (2007), Whelton et al. (2002) and Kokkinos et al. (2006) studies examined the relation between exercise and blood pressure. The studies found that physical activity was associated with blood pressure reduction in pre-hypertensive and hypertensive participants. The strengths of these studies included the large sample sizes and the fact that each study evaluated the relationship between physical activity and exercise from a unique perspective. The weaknesses of the studies were the exclusion of certain ethnic groups, the limited descriptions of exercise, and the extensive exclusion criteria that could limit the application of results in the clinical setting.

DASH Diet and Exercise Combined

The previous sections demonstrated that the DASH diet and exercise could each lower blood pressure. This section examines how the combination of the DASH diet and exercise affects blood pressure.

Hypertension is related to abnormalities in autonomic nervous system function namely increased sympathetic output and decreased parasympathetic tone. A study by Edwards, Wilson, Sadja, Ziegler and Mills (2011) examined the effects of the DASH diet and exercise on blood pressure and autonomic nervous system function. Fifty-two sedentary participants (ages 25-60 years) from the San Diego area with blood pressures greater than 120/80 were included in the study. The average pre-intervention BMI was 30.7 Kg/m^2 . Exclusion criteria included a history of a major medical illness (except hypertension), current psychiatric diagnosis (including alcohol or drug use) or psychotropic medication use. Four participants who were using antihypertensive medications were tapered off the medication three weeks prior to initiation of the study. After completion of pre-intervention testing, participants were randomized to one of three groups: exercise only (N=25; men=12), diet and exercise (N=12; men =6) or the control (N=15; men=7). Plasma noradrenaline was measured at rest and participants performed a peak exercise test before and after the intervention. Heart rate recovery (HRR) from exercise was used as an index of parasympathetic tone and plasma noradrenaline was used as an index of sympathetic tone.

After 12 weeks, participants in the exercise only or exercise plus the DASH diet intervention showed improvements in resting blood pressure and fitness (VO_2 peak) compared to the control group. The parasympathetic nervous system showed increased activity while the sympathetic nervous system was not altered. Changes in parasympathetic activity were predictive blood pressure changes even when accounting for changes in fitness or body mass index. Despite results that did not show significant differences between groups, the exercise plus DASH diet groups showed a trend toward greater increases in both VO_2 peak and HRR ($P_s = 0.06$ & 0.8). Further, the exercise group and the exercise plus the DASH diet group (not the control group) showed significant reductions in blood pressure from pre to post intervention. It is believed that the observed blood pressure reduction was due to the potentially differing mechanisms associated with dietary changes and exercise. Therefore, Edwards et al. (2011) concluded that lifestyle interventions reduced blood pressure and altered autonomic tone (indexed by HRR). This study emphasizes the importance of behavioral modifications in hypertension and the association between increased parasympathetic function and blood pressure reduction.

The strengths of the Edwards et al. (2011) study were the wide age range of the participants; the randomized study design; the use of objective measures to study parasympathetic and sympathetic tone; and the inclusion of participants with BMIs ≥ 30 kg/m^2. The weaknesses of the study were no mention of minority groups in the participant demographics; the study was done in a single location; and the definition of sedentary was not noted. Further weaknesses included the unequal distribution of participants to the study groups, the non-specificity of plasma noradrenaline for sympathetic tone, and the small study sample.

Blumenthal et al. (2010) conducted the ENCORE Study, a randomized, controlled trial that examined the effects of the DASH diet alone or in combination with exercise and weight loss on blood pressure. The sample consisted of 144 total participants including Caucasians (n=86), African-Americans (n=56) and Asians (n=2) who were age 35 years or older, with BMIs of 25 to 40 kg/m^2 . The participants were sedentary, did not use antihypertensive medications and had blood pressures of 130-159/85-99mmHg. Blood pressure was measured according to JNC-7 guidelines. Pulse wave velocity, flow-mediated dilation, baroreflex sensitivity and echocardiograms were used to standardize the measures, which add reliability/validity to the results.

Blumenthal et al. (2010) randomized participants to one of three groups: control diet, DASH diet or a reduced calorie DASH diet. Participants remained in their groups for four months and were then assessed. The main outcome was clinic and ambulatory blood pressures, and the secondary outcome included pulse wave velocity, flow-mediated dilation of brachial artery, baroflex sensitivity and left ventricular mass. The results showed that clinic-measured blood pressure was reduced by 16.1/9.9 mm Hg (DASH plus weight management); 11.2/7.5 mm Hg (DASH alone); and 3.4/3.8 mm Hg (control diet) (P<.001). A similar pattern was seen for ambulatory blood pressure (P<.05). Greater improvements were noted for the DASH plus weight management group compared to the DASH alone group for pulse wave velocity, baroreflex sensitivity and left ventricular mass (P<.05).

Blumenthal et al. (2010) concluded that for overweight/obese persons with high blood pressure, the addition of exercise and weight loss to the DASH diet resulted in larger blood pressure reductions, greater improvements in vascular and autonomic function and reduced ventricular mass ($p<.001$; $p<.05$). Generalizability of the results to persons younger than 35 years, BMIs less than $25kg/m^2$ or greater than $40kg/m^2$, blood pressures greater than 159/99mmHg, persons of Asian and Hispanic origin, persons using antihypertensive medications and persons with co-morbid medical conditions could be problematic.

In an 18 month randomized trial, Elmer et al. (2006) compared behavioral interventions involving the DASH diet and exercise vs., advice only on hypertension status, lifestyle changes and blood pressure. The sample consisted of 810 adults (ages 25 years and older; majority Caucasian) who had prehypertension or stage 1 hypertension (120-159/80-95mmHg). Much of the data was collected using self-reporting tools, and the method for blood pressure measurement was not described, which decreased reliability/validity of the results.

Elmer et al. (2006) randomly assigned participants to one of three groups: advice only, an intervention group that targeted established guideline lifestyle recommendations (established), and an intervention group that targeted established recommendations plus addition of the DASH diet (established plus DASH). After 18 months, the results of the study showed that compared with the advice only group, both behavioral interventions had statistically significant reductions in weight, fat consumption and sodium consumption. The established plus DASH diet group had statistically significant increases in fruit, vegetable, dairy and fiber intakes. Relative to the advice only group, the odds ratio for hypertension at 18 months were 0.83 (95% CI, 0.67 to 1.04) for the established group and 0.77 (CI, 0.62 to 0.97) for the established plus DASH diet group. Even though absolute blood pressure reductions were greater for both behavioral intervention groups compared to the advice only group, the differences were not statistically significant. Elmer et al. concluded that over an 18-month course, individuals with prehypertension and stage 1 hypertension could make and sustain multiple lifestyle modifications to control blood pressure and reduce the risk for chronic disease.

The strengths of this study were its large sample size, the randomized controlled design, multiple study locations, use of objective measures such as 24-hour urine and blood samples, and long study duration. The weaknesses of the study were the predominantly Caucasian sample, the non-disclosed locations of various study centers, the category “other ethnicities” was not described, and diet was self-reported.

It is difficult to generalize these results to populations younger than 25 years old, ethnicities other than African-Americans or Caucasians, patients using antihypertensive medications, patients with BMIs outside the range of the study (BMI less than 18.5 kg/m^2 or greater than 45kg/m^2), and patients with past cardiovascular conditions.

Rigsby (2011) conducted a church-based quasi-experimental study to examine the effectiveness of healthy lifestyle modifications (education, exercise and healthy eating) on the blood pressure control of African American adults in a rural southwestern Alabama. The objectives of the study were: 1) to increase awareness of hypertension and its associated risks and the benefits of a healthy diet and exercise in 60% of participants; 2) to improve blood pressure control among 30% of the participants; 3) to increase physical activity among 40% of participants; 4) to increase the consumption of fruits and vegetables among 40% of participants and 5) to reduce body weight among 20% of participants. Despite the small African-American sample size and the limited location, this study provided insight into the effects of dietary modifications and exercise initiation on rural, southern residents.

The study sample consisted of 36 participants, which included seven male and 29 female participants. Eleven participants used tobacco and 18 participants used alcohol. All 36 participants had a family history of heart disease and/or hypertension. The majority of the data was gathered by self-reporting which decreased the reliability/validity of the results.

The 36 participants attended weekly 30-minute interactive educational sessions and 30-minute physical activity sessions. Initial and final BMI measurements were recorded. Participants completed health assessments: pre and post questionnaires, daily logs of blood pressure measurements, and dietary consumption and physical activity sessions.

At the conclusion of the 12-week project, all the participants met the objectives of the study. Rigsby found that participants had adopted healthy lifestyle modifications that led to improved blood pressure control. The strengths of the study were the inclusion of participants who used alcohol and tobacco, the community location, the large age range of the participants and the rural location. The weaknesses of the study were the small sample size, missing data, loss of 24 participants and the lack of a definition for hypertension,

The studies by Edwards et al. (2011), Blumenthal et al. (2010), Elmer et al. (2006) and Rigsby (2011) examined the relationship between the combination of the DASH diet and exercise and blood pressure. The studies concluded that the combination of the DASH diet and exercise was associated with blood pressure reduction and the reduced risk of developing cardiovascular disease. There was improvement in autonomic nervous system function, and reduced ventricular mass when the DASH diet and exercise were followed. The strengths of the studies were the inclusion of participants with various age ranges, BMIs and blood pressure classifications. The weaknesses of the studies included underrepresentation of the Asian population as well as imbalances in the representation of African-Americans and women. Some of the studies had small sample sizes and undisclosed locations, which decreased the generalizability of the results. Finally, many of the studies used self-reported data values, which can influence the validity and reliability of the results.

Synthesis/Conclusion

After reviewing eleven articles that range in design from a meta-analysis to randomized clinical trials, to a cross-sectional study and a quasi-experimental study, it is evident that the addition of the DASH diet and exercise to the lifestyles of pre-hypertensive/hypertensive adults is associated with a decrease in blood pressure as well as a reduced risk of future cardiovascular disease. Four randomized clinical trials examined the effects of the DASH diet on blood pressure. The DASH diet clinical trial of Appel et al. (1997) showed that a diet rich in fruits, vegetables, low fat dairy products and decreased saturated fat lowered systolic blood pressure by 5.5 mm Hg and diastolic blood pressure by 3.0 mm Hg as compared to the control (typical American diet). Moore et al. (1999) showed that in addition to reducing random-zero sphygmomanometer blood pressure, 24-hour ambulatory blood pressure decreased. Additionally, Akita et al. (2003) showed that the consumption of the DASH diet produced a natriuretic effect that mimicked the effect of diuretic use. The study by Huggin et al. (2011) included participants who were using antihypertensive medications, which filled the gap of the previous DASH trials that excluded participants on antihypertensive medication. Huggins et al. found that the DASH diet, in addition to lowering the blood pressure of participants who were not on antihypertensive therapy, also selectively lowered the blood pressure of participants who were using renin-angiotensin blocking agents.

The three DASH diet trials of Appel et al. (1997), Moore et al. (1999) and Akita et al. (2003) had the strengths of large study populations, diverse sample participants and multicenter locations. The weaknesses of the DASH trials were that the locations of the centers were not disclosed, there was no mention of Asian and Hispanic participants, and there were no participants younger than 22 years old.

Three studies that included a randomized longitudinal study by Parker et al. (2007), a meta-analysis Whelton et al. (2002) and a cross-sectional study by Kokkinos et al. (2006), examined the effect of exercise on blood pressure. The CARDIA Study by Parker et al. (2007) demonstrated that young adults who were more physically active decreased their risk for incident hypertension. Additionally, the meta-analysis by Whelton , Chin, Xin and He (2002) showed that aerobic exercise lowered systolic blood pressure by 3.84 mm Hg and diastolic blood pressure by 2.58 mm Hg. This reduction occurred in both hypertensive and normotensive persons. The cross-sectional study by Kokkinos et al. (2006) found that regular physical activity was essential for pre-hypertensive individuals to lower blood pressure.

The strengths of the Parker et al. (2007), Whelton et al. (2002) and Kokkinos et al. (2002) studies were the large sample size and the diverse locations. The CARDIA study and the meta-analysis included African-Americans. The CARDIA study had a 15-year follow-up time and was therefore able to associate exercise with incident hypertension. The weaknesses of the CARDIA study were the exclusion of Hispanic and Asian participants, exclusion of participants with baseline hypertension and self-reporting of physical activity. The meta-analysis did not disclose the study locations, it did not include studies lasting longer than six months and a multivariate meta-regression was not done due to missing covariables. The Kokkinos et al. study exclusively included Greek participants and the study was conducted in Greece so the results have limited generalizability; however, the results are applicable to areas of the United States that include residents of Mediterranean origin. The Kokkinos et al. study was also important because it demonstrated the necessity of exercise in pre-hypertensive patient populations.

Finally, three randomized clinical trials by Edwards et al. (2011), Blumenthal et al. (2010) and Elmer et al. (2006) and one quasi-experimental study by Rigsby (2011) examined how the combination of the DASH diet and exercise affected blood pressure. When the DASH diet was combined with exercise, further blood pressure reductions were realized. Edwards et al. (2011) found that dietary changes and exercise reduced blood pressure by potentially different mechanisms. Blumenthal et al. (2010) found that the addition of the DASH diet and exercise to the treatment plan of overweight/obese persons with high blood pressure was associated with greater blood pressure reductions, greater improvements in vascular and autonomic function and reduced ventricular mass. Elmer et al. (2006) concluded that participants who received behavioral interventions that included the DASH diet and exercise had less hypertension, more weight loss and better sodium and fat intake compared to those receiving advice only. Rigsby et al. (2011) found that 12 week interactive education and physical activity sessions improved blood pressure control in Southern, rural African-Americans with hypertension.

The strengths of the Edwards et al. (2011) study were the inclusion of participants of various ages and large BMIs as well as the use of objective measures. The strengths of the Blumenthal et al. (2010) study were the inclusion of minorities, the four-month duration, the use of objective measures for key variables and the inclusion of participants with large BMIs. Additionally, the strengths of the Elmer et al. (2006) study were the large sample size and the diverse study locations. Finally, the strengths of the Rigsby (2011) study were the rural location, the African-American study population, and the inclusion of participants who used alcohol and tobacco. The weaknesses of the studies were the exclusion or limited participation of Hispanic and Asian participants, the restricted age ranges and BMIs of participants, and the limited or non-disclosed study locations.

The results of this literature review have far-reaching implications for clinical practice and public health. This is especially true for rural areas of the United States. Rural populations experience a disproportionate burden of a number of chronic conditions including hypertension (Lutiyya, Chang, & Lipsky, 2012). Rural populations across the United States have an increased likelihood of developing hypertension and diabetes, which are significant risk factors for cardiovascular disease (Bale, 2010). Lutiyya et al. found that less than one in four rural adults consume five or more servings of fruits and vegetables per day. Further, rural residents smoke more, exercise less and are more likely to be obese than suburban residents (Hartley, 2004). When rural areas are divided into regions, the research shows that the South has higher rates of poverty, adult smoking, physical inactivity and death due to ischemic heart disease (Hartley, 2004). These regional differences reinforce the need to customize the evidence presented in this literature review to specific populations. Additionally, given the difficulty associated with lifestyle changes, education and support are key factors that are necessary for the successful transition to a healthy lifestyle.

Underserved rural populations have limited access to health care due to geography, income, education and acculturation (Bale, 2010). Effective healthcare delivery is crucial to prevent and treat hypertension in this population. Since primary care providers are in a position to provide patients with the necessary resources to begin the DASH diet and a regular aerobic exercise routine, each patient visit should be considered an opportunity to support rural residents in their overall treatment. Tools such as motivational assessments, nutritional assessments, food diaries, pedometers and follow-up encounters should be used to assure that each patient (especially in high need rural areas) is successful in adoption of the DASH diet and implementation of an aerobic exercise routine.

Theoretical Framework

The Transtheoretical Model of Behavior Change (TTM) will be the theoretical framework for this project. The main constructs of the TTM include Stages of Change, The Process of Change, Self-Efficacy and Decisional Balance. The Stages of Change include (Prochaska, 2008):

precontemplation -person will not change in the next six months

contemplation -the person intends to take action in the next six months

preparation-the person intends on taking action in the next month

action-the person has made changes to his/her life

maintenance -the person works to prevent relapses

termination-the person has zero temptation and 100% self-efficacy

A person proceeds through the stages of change from precontemplation to termination; however, relapses are possible and a person can enter or leave the stages at various points. The process of change is used to move through the stages, and self-efficacy usually increases as one progresses through the stages of change. Decisional balance is the weighing of the perceived pros/cons of behavior change (pros increase with movement though stages) (Cheung et al., 2006).

Project Description, Implementation and Monitoring

The project design follows the format according to the University of Massachusetts Amherst School of Nursing 2012-2013 Graduate Student Handbook.

Population Description and Organizational Analysis of the Project Site

The Blue Ridge Medical Group has several offices in Surry County North Carolina, located in the Blue Ridge Mountains. The practice consists of six offices for the purpose of this project, only the Mount Airy office will be used. The practice specializes in Family Medicine, Pediatrics, Internal Medicine, Geriatrics, Palliative Care, Cardiology and Sleep Medicine.

The Mount Airy office draws patients from the 10,388 residents of Surry County. The median age of this population is 45.8 years old. The county obesity rate is 27.5%; the low-income preschool obesity rate is 15.0% and the adult diabetes rate is 10.7%. The racial breakdown is 81.7% Caucasian, 8.1% African-American, 6.7% Hispanic and 1.4% Asian. The median household income is $27,804 and only 20.2% of the population have a Bachelor's Degree or higher. Due to the recent economic downturn, this community suffers from job losses, resulting in a reduction and/or loss of both income and health benefits along with an increase in stress.

The participants and/or population for this project will consist of medical practice patients 19 years old and older with blood pressures ≥120/80mmHg who are currently under medical treatment. The majority of patients are caucasian males and females of European descent with high school being the highest level of education for the majority of this population.

Stakeholder Support and Letter of Agreement

Several stakeholders may benefit from the implementation of this project.
The key stakeholders for the project are the providers and staff at the Mount Airy office due to their direct involvement with implementation of the project. The project participants are also key stakeholders because the purpose of the project may have a direct benefit for them. The Blue Ridge Medical Group expressed interest in initiating a lifestyle education program for patients with hypertension and diabetes; this project could serve as a pilot project for implementing a long-term educational program into the practice. The final stakeholders are the practice administrators since data from this project could result in the development of additional

programs for the remaining five medical offices. The Blue Ridge Medical Group has approved implementation of this capstone project in the Mount Airy office. Please refer to Appendix E to view a copy of the Letter of Agreement.

Resources, Constraints, Facilitators and Barriers to Implementation of the Project

The majority of the resources required for this project will come from the primary care office. In addition to the assistance of the office staff and the FNP mentor, this project will require the use of sphygmomanometers, computers, electronic medical records (EMR), telephones, and fax machines. This DNP candidate will provide additional supplies such as educational materials, stethoscopes and data analysis software.

Using the Blue Ridge Cardiology electronic medical record system (EMR) to recruit participants for this project will be a valuable resource. This recruitment method was selected because patient information is easily accessed and regularly updated. Information concerning project participants will be maintained through this record keeping system. EMR data from clinical practice have implications for a broad array of research, including understanding practice patterns, assessing outcomes, and evaluating quality indicators as well as developing effective quality-improvement interventions (Dean et al., 2009). Additionally, the office has both automated and manual blood pressure monitors with cuffs of various sizes. The Mount Airy office staff consists of two FNPs, two medical assistants and one LPN. There are also two receptionists, an assistant office manager and an office manager. A physician is also available for advice and guidance.

Implementation of this project will be facilitated by the strong relationship that developed between the DNP candidate, the FNP mentor, the patients, and the staff/providers of the primary care site. The FNP mentor will have a critical role in the project's implementation by assisting with participant selection, data recording and serving as an information resource. The staff physician has shown his support of this project by reviewing the project method and making suggestions that were incorporated into the project design. The office staff agreed to assist with identifying patients who meet the project criteria, and they will assist with procedures necessary for the 8-week follow up. Finally, office administration has agreed to grant access to patient records and office resources.

Patient noncompliance, patients lost to follow-up, and inappropriate blood pressure measurement are some of the barriers to implementation. Diligent follow up is required to be sure that participants follow the project protocol. Encouraging staff to assist with the project might be another barrier as this project may be viewed as additional work that is not a required component of their job description. This is a busy medical practice and the staff is usually overwhelmed with work. Standardizing blood pressure measurement protocol is another problem. It will be difficult for everyone to take blood pressure according to JNC-7 guidelines. In addition, data entry errors into the EMR could occur. Finally, the DNP candidate has limited financial resources that can used to provide incentives to participate in the project.

Protocol and Plan

Project design and feasibility. This performance improvement project will utilize pre-test, post-test quantitative methods. The pre-test data will be collected from participants before implementation of the DASH diet and exercise. Once patients consent to participating in the project, they will receive a pedometer and record the number of steps taken each day for three days, they will also maintain a three-day aerobic exercise journal; a two-day food diary and record two days of home blood pressure readings (Please see Appendix A). Participants will bring this pre-implementation data to the first office visit. Pre-implementation blood pressure readings will be taken at the initial office visit and a list of current medications with doses and frequencies will be recorded (Appendix B). Post-test data collection will occur after the implementation of the DASH diet and exercise at each monthly office visit. During the scheduled office visits, the home data collection will be reviewed and office blood pressure measurements will be recorded. Inferences concerning the effects of the DASH diet and exercise on blood pressure will be made by examining the difference in the pretest and posttest results. Limitation to the design does not allow definitive causal inferences to be drawn, but it allows for the answering of the question, "What is the effect of the DASH diet and exercise on the blood pressures of prehypertensive/hypertensive rural adult patients?"

Since hypertension is highly prevalent in this area, a sample of 10 participants is expected. This sample size estimate is based on the number of patients in the electronic medical record (EMR) with a diagnosis of prehypertension or hypertension (Stage 1 or 2). The sample for this project will be a convenience sample of adults' ages 19 years old or older with a diagnosis of prehypertension/hypertension. Participants currently using diet and exercise as method to treat their elevated blood pressure will be excluded.

Plan for implementation/evaluation. This quality improvement project will utilize the Plan-Do-Study-Act (PDSA) model. The PDSA model is recommended by the Agency for Healthcare Research and Quality (AHRQ) and it is used by many healthcare organizations (Speroff & O'Conner, 2004). The "Plan" for this project is to add the DASH diet and exercise to the medical treatment plan of adults with blood pressures >120/80mmHg. The "Do" for this project will begin by teaching patients about the DASH diet, exercise, blood pressure measurement and the method to record information into logs/diaries. Patients will keep a log of their home blood pressures, food/ exercise diaries and pedometer readings (see Appendix A).

Following the initial office visit, patients will have subsequent scheduled in-office follow up appointments. At each office visit, a blood pressure measurement will be attained according to JNC-7 guidelines and patient logs and diaries will be reviewed (See Appendix B). The initial teaching session will be in person, conducted by the DNP candidate and last approximately 45 minutes to an hour. Pamphlets will outline the information covered in the initial visit so participants can review the information in the future (Please see Appendix D). The DNP candidate will conduct weekly telephone follow-up calls to answer questions, provide motivation and correct misunderstandings. The "Study" will be a comparison of sample patients' baseline blood pressures measurements, diet and exercise information (taken at the initial visit) to their blood pressures measurements, diet and exercise information after the addition of the DASH diet and exercise to the treatment plan (over the 8-week course). Data analysis including charts and graphs will be used to evaluate the effects of the DASH diet and exercise on blood pressure readings. Finally, the "Act" will include a comparison of project data results to the predetermined measureable outcomes. If changes are required, the PDSA cycle will be repeated.

The DNP candidate and the FNP mentor will collect data for this study. The data will be entered into the computer via the EMR. Blood pressure will be measured three times in the office setting as part of standard visit practice (the initial baseline measurement plus two follow up measurements) (Please see Appendix B). The office blood pressure measurements will be compared to patients' at home log measurements to estimate the reliability/validity of the blood pressure measurements.

Goals and objectives. According to the JNC-7 (2004), most people with hypertension will reach the diastolic blood pressure (DBP) goal once the systolic blood pressure (SBP) goal is achieved. Therefore, the primary focus of treatment should be on attaining the SBP goal. The

JNC-7 reports that adoption of the DASH diet can decrease SBP 8-14mmHg and physical exercise can decrease SBP 4-9mmHg. Therefore, the combination of the DASH diet and exercise has the potential to decrease SBP 12-23mmHg. The goal for this project is to see an 8-10-mm Hg decrease in systolic blood pressure (SBP) after the addition of the DASH diet and exercise to the treatment plan of rural pre-hypertensive/hypertensive adults (ages 19 years and older) over the 8 week course of the project. Based on these findings, it is expected that at least 30% of project participants (n=3) will reach this goal. As a result of this project, a change in the participants' diet will include a 20% increase in the consumption of fruits, vegetables and low fat dairy, along with a 50% decrease in the consumption of fast food, processed food and saturated fat. The expected outcome for exercise is that participants will take 500 steps/day three day a week for two weeks progressing to 2500 steps three days a week by six weeks and 5000 steps three days a week by eight weeks.

Cost and plan to obtain resources. The source of revenue for this project will come from the DNP candidate as well as the clinical site at which the project is being implemented. The DNP candidate will provide the revenue for pamphlet development, pedometers and data analysis. The clinical site will cover the cost associated with staffing, use of phones, faxes, sphygmomanometer and maintenance of the EMR.

Estimated Project Budget

Cost of paper for pamphlets	$10.00
Cost of printing for pamphlets	$50.00 for 15 pamphlets
Rental of SPSS Software	$60.00
Total student time for patient teaching	23 hours
Medical Assistant cost	15 hours X $10/hour=$150
Data analysis by DNP candidate	10 hours
Pamphlet development by DNP candidate	10 hours
DNP candidate's time for participant follow-up	27 hours
Miscellaneous expenses (phone, faxes, pedometers etc)	$200 for three months

IRB approval and ethics considerations. This project does not require IRB approval. This is a quality improvement project aimed at improving the health of patients at a specific primary care outpatient site. There are no significant risks associated with this intervention. Potential participants will be informed about the project and its associated benefits/risks, and they will then be asked to volunteer. Data collection will not involve information that could identify study subjects. A coding system (that does not involve personal information) will be used to organize data.

Timeline Work Plan

Task	Sept 2012	Oct 2012	Nov. 2012	Dec. 2012	Jan 2013	Feb 2013	March 2013	April 2013	May 2013
Project Development & Comp Exam	X								
Committee Approval			X						
Prep for implementation			X	X	X				
Implementation						X	X	X	
Data analysis & final report								X	X

Conclusion

Hypertension is a growing problem in the U.S. The costs associated with hypertension include the costs associated with decreasing and maintaining blood pressure, the costs associated with the treatment of related complications and the cost associated with the loss productivity and quality of life. In relation to the costs of medical treatment, pharmacotherapy, hospitalization and loss of productivity/quality of life, the cost of initiating and maintaining a diet and exercise is minimal. The combination of the DASH diet and exercise can further decrease blood pressure leading to the decreased need for medication and the prevention of complications. This equates to financial savings as well as preserved productivity and quality of life. These benefits are especially important for rural patients with limited access to healthcare, finances and medical benefits.

Evaluation

Methods

Project design modification. The data collection process was revised from the proposed pre-test/post-test design to a qualitative design due to loss of participants and missing data. Data collection will occur via unstructured interviews, participants' self-recorded diaries and telephone follow-ups. The qualitative method allows data to be collected as it occurs.

Recruitment

Consisted of a four-week process that began with the EMR. The DNP-c and the FNP mentor searched the EMR for patients 19 years old and older with a diagnosis of pre-hypertension or hypertension. Each potential participant's medical record was evaluated for lifestyle habits and medication use. Patients who were currently participating in a diet and exercise program were excluded from the recruitment list. A list of 20 potential project participants was initially generated and these patients were asked about their desire to participate either by telephone or during a scheduled office visit. Twelve patients from the list agreed to participate. The remaining eight patients both directly refused to participate in the initial request or they considered participation and then declined later.

From the list of twelve participants, two participants decided that they did not have the commitment and time to change their lifestyle and they subsequently refused to participate. The participants (n=10) made an appointment to visit the office and begin the project. All ten participants signed the consent form and were provided instructions on maintaining food, exercise/pedometer and blood pressure diaries. These participants were given a pedometer to record their steps and a notebook to record their data. Three of the ten participants did not show up for their second scheduled appointment. The DNP-c called each participant three times over the course of a week. Messages were left on voice mails but these participants did not return calls or return for a visit. Seven participants followed-up with the first scheduled visit and these participants were included in the project.

Patient Characteristics

The sample consisted of adults' between the ages 24-78 years old (six female and one male). All the participants are nonsmokers with diagnoses of pre-hypertension or hypertension as documented in the EMR. Three participants were not taking any prescribed antihypertensive medications while the remaining four participants were taking one or more antihypertensive drugs. There was also a husband and wife couple among the participants. The educational level of the participants ranged from high school through graduate school. Please see Appendix F – for demographic information.

Methods

All the participants met with the DNP candidate in the Blue Ridge Office for an initial visit. Five participants met with the DNP candidate individually while the husband and wife team scheduled their appointment together. During the initial interview, project details were reviewed and consent forms were signed (Please see Appendix C). Participants received a notebook with written directions about how to create a two-day food diary, three-day exercise and pedometer diary and a three-day blood pressure diary. Participants were to collect this data before their second scheduled visit. The purpose of this initial data collection was to provide a picture of participants' current diet and exercise habits and how these habits were associated with ambulatory blood pressure.

In addition to the data collection instructions, the Sportline two function (distance and steps) pedometers were calibrated for each participant's stride. The pedometers were tested for placement, accuracy and ease of use. At the conclusion of the sessions, blood pressure measurements were collected (see Appendices G, H, I), questions were answered and second appointments were scheduled for the following week.

At the second scheduled office visit, participants individually met with the DNP candidate to review diaries. All participants were educated about the DASH diet, reading food labels and aerobic exercise and handouts were provided for future reference (See appendix D). Participants were asked to demonstrate their understanding of reading food labels by analyzing a sample food for serving size, total calories, saturated fat and sodium and the participants were advised to look at the sodium content of all labeled foods. The projected goal for each participant was that no food selections should contain more than 5% of their total daily sodium serving. Finally, participants were encouraged to add additional aerobic exercise into their daily routine such walking, swimming, elliptical machines etc. At the conclusion of the visit, a weekly telephone follow-up schedule was formulated.

Results

Office visit #2. Participants #1(male) and #2 (female) met as a team to review their diaries. Both participants did not have any fruit and minimal vegetables (lettuce on a sandwich) in their food diaries. It was noted that large amounts of sodium were from both canned and packaged foods. Both participants were receiving more than 1000 steps/day without any additional aerobic exercise (Please see Appendix I). The participants acknowledged that they did not know how to monitor the sodium content of food nor were they aware of how little plant-based nutrition they were receiving.

Participant #3 (female) had type 2 diabetes mellitus and consumed almost no fruits and vegetables. The diet contained large amounts of sodium and saturated fat from canned soups and processed meats. Participant #3 was advised to choose lower glycemic fruits and to monitor the serving size of consumed fruits. In addition to the diagnoses, it was noted that the participant's level of activity consisted of less than 1000 steps/day (300-500 steps/day on average).

Participant #4 (female) was consuming a diet rich in fast food and processed food. The majority of the diet consisted of cheese products, soda, and salty snacks. The only plant-based nutrition was the consumption of six strawberries over the course of two days. The participant had a 1,600 step pedometer reading plus three 10-20 minutes walking sessions.

Participant #5's (female) diet consisted of instant potatoes, instant macaroni and cheese, processed baked goods and processed meat. The participant did prepare dinner at home but many of recipes included the use of canned cream soup. Fluids included coffee, water or 1% milk; however, 10 ounces of orange juice was the only plant-based nutrition found over the course of two days. Participant #5's pedometer readings were less than 300 steps/day for three days. Participant #5 thought that the pedometer was not working correctly so she bought a new pedometer; however, the new pedometer showed readings that were also less than 300 steps/day. No additional exercise was performed.

Participant #6's (female) diet consisted of meals and snacks on the run. As a working mother with three boys under 10 years old, participant #6 did not have the time to prepare meals. The participant's diet consisted of take-out food, packaged snacks and diet sodas; however, there was some plant-based nutrition in the diet by way of small salads or lettuce/tomato added to premade sandwiches. Participant #6 did receive more than a 1000 steps/day (averaging 2000-3000 steps/day) but did not include any additional aerobic exercise.

Participant #7's (female) diet consisted of meats and baked goods with no plant-based nutrition. She had many dietary restrictions due to her diverticulosis and anticoagulation therapy; however, after extensive education, a modified DASH diet was formulated that allowed for the addition of some fruits, vegetables and nuts. Participant # 7 feared fruits and vegetables that contained seeds because gastroenterology cautioned the participant that consuming these foods could lead to diverticulitis, but the participant agreed to start adding fruits such as apples, bananas, and pears. The participant was required to monitor her leafy green vegetables; however, lettuce was not a problem so small salads were added to this participant's diet. Further, education included creating salads with a small lettuce base and the addition of beans, carrots, and celery. Participant #7 received less than a 1000 steps/day (average was 450-550 steps/day) with no additional aerobic exercise. Due to bilateral knee arthritis, participant #7 will consider adding swimming to her exercise regimen.

Please see appendix H for participants' average ambulatory blood pressure readings. Participants were asked to record three home blood pressure measurements before each scheduled office visit, and the average of each participant's readings were charted. In clinical practice, the average of multiple blood pressure readings is frequently used to assess patients' cardiovascular status. Participant # 3 did not record her home blood pressure readings, and participant # 4 only recorded readings for two days. Please see Appendix F for a table of participant compliance.

Following the second office visit, weekly telephone follow- up appointments were scheduled for each participant. Each participant selected a time and day for the DNP candidate to call and discuss progress. During the telephone follow-ups, dietary and exercise changes were reviewed and reinforced, questions were answered and problems were discussed. After three to four follow-up calls, a third office visit was scheduled.

First set of telephone follow-ups. Participants # 1 and 2 received three telephone calls before the third office visit. Over the course of three weeks, salads with low sodium salad dressing were added to lunches and dinners. Any canned vegetables consumed during meals were rinsed before use; low fat/low sodium macaroni and cheese was chosen over the regular brand; and reduce sodium/sugar peanut butter was substituted for the high sodium brand. Snacks included non-fat Greek yogurt with granola, a handful of raw almonds, or fruits and vegetables such as carrots, clementines, bananas, apples or grapes. Breakfast included oatmeal bars when time was short. All meats were cooked at home with no added sodium and leftovers were used for sandwiches or future dinners. Baked potatoes were consumed without sour cream or butter. When stir-fry was prepared, low sodium soy sauce and brown rice were used in addition to vegetables. Fluids included unsweetened tea or tea sweetened with Splenda, coffee, water and an occasional diet soda. Overall, participants #1 and 2 reported that they increased their consumption of plant-based nutrition by 25% since starting the project.

Participant #1 increased the amount of walking at work but did include any additional aerobic exercise to the exercise regimen. There was a day at work where 15,000 steps were completed by the end of the day. Participant #2 had days were 7,000 steps were completed. Further, an hour of Zumba or 1.5 hours of Pilates along with recreational walking were added to the weekly exercise regimen. Both participants felt good and thought that they lost weight. The participants were very motivated to continue the program.

Participant #3 received three calls before the third office visit. Due to a previously scheduled office visit, participant #3 received a phone call and the third office visit in the same week. Over the course of the first follow-up week, participant #3 added a small amount of fruits and vegetables to lunch and dinner. Non-fat Greek yogurt with added fruit was included as a snack, but the participant was advised to monitor the sugar content of the yogurt due to diabetes. Food labels were inspected for the sodium content before food items were purchased. Participant #3 added a small amount of walking to the exercise regimen, and a blood pressure cuff was purchased at the flea market. Participant #3 stated that the blood pressure decreased from an initial reading of 162/80 mm Hg to 152/80 mm Hg.

During the second follow-up week, participant #3 did not make any significant changes to the diet or exercise plan. The participant decreased walking due to the weather, and dietary changes were not reported. Participant #3 stated that the amount of sodium in the diet had decreased. During the third phone conversation, participant #3 mentioned that the project was too much to manage, and a gym membership would suffice to control blood pressure. The participant would consider the options and make a decision about remaining in the project by the third office visit.

Participant #4 had four follow-ups before the scheduled office visit. Over the course of four weeks, participant #4 continued to consume fast food and salty snacks but a modification to the diet included some fruit to her diet in the form of few strawberries or a fruit cup as a side to a meal. Mountain Dew (soda) was replaced with water and whole milk was replaced with 1% milk. This participant purchased a home treadmill and approximately 20 minutes/day, five days/week was dedicated to walking.

Participant #5 had four follow-ups before the third scheduled office visit. Snacks consisted of fruit, 2% fat free cheese and nuts. Food labels were read and low sodium selections were made. No additional salt was added to prepared food. Egg Beaters was substituted for whole eggs and oatmeal was consumed for breakfast. Participant # 5 admitted to having a lapse when she went to MacDonald's for dinner; however, a Happy Meal without French fries was substituted for a full adult meal and a salad was consumed prior in the day for lunch..

Participant #5 dramatically increased the amount of physical activity by joining the local gym to use the walking track. Since March 4, participant #5 has been walking on the track four days/week after work and she calibrated her pedometer to her laps for better accuracy. Participant #5 was proud of her achievements and was highly motivated to continue the project.

Participant #6 had four follow-ups before the third scheduled office visit. A few small salads and fruit servings were added to the diet, while frozen dinners were eliminated. Diet soda was limited to one/day and water was increased. Skim milk replaced whole milk and whole-wheat pasta replaced processed pasta. The amount of physical activity and steps remained stable as compared to the first exercise diary.

Participant #7 had three follow-ups before the third scheduled office visit. One telephone follow-up missed due to illness. The participant's husband has chronic back problems, and his healthcare needs prevented participant #7 from making the expected dietary changes. However, fruits and vegetables were added to lunches and food labels were monitored before making purchases. Most snacks were reduced or eliminated from the diet and flat wheat bread was substituted for white bread. There was no change in physical activity; therefore, participant #7 received few daily steps. Water aerobics and swimming classes continued to be considered as additions to the exercise regimen. Overall, participant # 7 needed further motivation to make the necessary lifestyle changes for the project.

Office visit #3. Please see Appendices G and H for blood pressure readings. Participants #1 and #2 met with the DNP candidate individually on two separate days. Participant #1 added fruits and vegetables to breakfast, lunch and dinner. Snacks consisted of almonds, granola and yogurt. No additional salt was added to foods, and canned vegetables were rinsed before use. Grains were consumed in the form of whole- wheat bread and honey wheat pretzels. Beverage selections consisted of diet soda, water, coffee and 2% milk. Participant #1's average three-day pedometer reading increased by 896 steps since the last office visit; however, no additional aerobic exercise was added to the regimen. The average ambulatory systolic blood pressure remained stable at 117 mm Hg while the diastolic blood pressure decreased by 9 mm Hg as compared to the first set of diaries. The in-office systolic and diastolic blood pressures decreased by 5 mm Hg and 6 mm Hg respectively as compared to the initial reading. Participant # 1 stated that he felt good and he thought he lost weight. The participant will consider using a Bowflex to achieve additional aerobic exercise. Participant #1 was very motivated to continue the diet and exercise plan.

Participant #2 added fruits and vegetables to lunch, dinner and snacks. Snacks consisted of almonds, fruit or nonfat Greek yogurt. Beverages included decaffeinated coffee, caffeine free diet soda, unsweetened tea and water. No additional salt was added to food and low salt versions of preferred foods were selected. Grains were consumed in the form of whole wheat bread, oatmeal bars and honey wheat pretzels. The number of steps remained stable as compared to the readings at the second visit, but additional walking, yoga and Zumba were incorporated. The average ambulatory systolic and diastolic blood pressures decreased by 12 mm Hg and 8 mm Hg respectively s compared to the first set of diaries. The in-office systolic and diastolic blood pressures decreased by 12 mm Hg and 2 mm Hg respectively as compared to the initial reading. Participant #2 felt good and was motivated to continue with the project.

Participant #3 did not maintain logs as instructed. A small amount of plant-based nutrition was added to the diet, but high sodium snack foods and fast food were not eliminated. The day before office visit #3, participant #3 consumed an entire bag of salty chips. The ambulatory blood pressure that day was 160/70 mm Hg. The in-office blood pressure reading was 180/92 mm Hg, which represented a systolic increase of 38 mm Hg and a diastolic increase of 12 mm Hg as compared to the initial reading. No change was made in aerobic activity as compared to the second office visit. Participant #3 was not motivated to change lifestyle habits despite the risk factors, and she may elect to dropout from the project.

Participant #4 occasionally added a small side of fruit to a meal; however, most meals consisted of fast food or processed food. No whole grains or nuts were added to the diet. Beverages consisted of 1% or 2% milk, protein shakes, water and occasional sugary processed shakes. No snacks were consumed between meals; however, high sodium foods such as chips, nachos and pepperoni pizza were consumed with meals. Participant #4's average pedometer reading increased by 400 steps compared to the first diary. The average ambulatory systolic blood pressure increased 4 mm Hg and the diastolic blood pressure decreased by 7 mm Hg as compared to the first diary. The in-office systolic and diastolic blood pressures decreased by 8 mm Hg and 7 mm Hg respectively as compared to the initial reading. Participant #4 desired to make lifestyle changes but stress and a busy work schedule interfered with goals.

Participant #5 added plant-based nutrition to all meals including snacks. Whole grains were consumed in the form of wheat bread, brown rice and multigrain crackers. Beverages consisted of orange juice, coffee, water, and 1% milk. Sodium was not added to foods, and lower fat/cholesterol selections such as reduced fat cheese, nonfat Greek yogurt and Egg Beaters were substituted for full fat versions along with salmon that was also added to the diet. Since joining the gym, participant #5's average pedometer reading increased by 4,268 steps when compared to the first diary. The participant walked after work four days per week. The average ambulatory systolic and diastolic blood pressures increased by 1 mm Hg and 6 mm Hg respectively when compared to the readings in the first diary. The in-office systolic blood pressures increased by 10 mm Hg and the diastolic blood pressure remained stable at 80 mm Hg as compared to the initial reading. Participant # 5 had been suffering from an upper respiratory tract infection at the time of these readings. Participant #5 was motivated to continue with the lifestyle changes and was looking forward to continuing with the project.

Participant # 6 added plant-based nutrition to all meals and snacks. Whole grains were consumed in the form of whole wheat bread and pasta. Beverages consisted of skim milk, diet soda and water. Sunflower seeds were added into the diet as a snack. No additional sodium was added to food. Participant #6's average pedometer reading increased by 573 steps as compared to the first diary. The average ambulatory systolic and diastolic blood pressures decreased by 1 mm Hg and 14 mm Hg respectively as compared to the first diary. The in-office systolic blood pressure increased by 10 mm Hg and the diastolic blood pressure decreased by 10 mm Hg as compared to the initial reading. Participant #6 had an upper respiratory tract infection during the in-office blood pressure measurement.

Participant #7 occasionally added a small amount of plant-based nutrition to a snack or a meal. Whole grains were not consumed, and a modest amount of saturated fat/cholesterol was consumed through eggs and mayonnaise. Beverages included water, coffee and orange juice. A modest amount of sodium was consumed in the form of chips, sausages, and sauces. The average pedometer reading decreased by 75 steps as compared to the first diary. The average ambulatory systolic and diastolic blood pressures both decreased by 16 mm Hg as compared to the first diary. The in-office systolic blood pressure decreased by 25 mm Hg and the diastolic blood pressure decreased by 12 mm Hg as compared to the initial reading. Participant #6 realized that further lifestyle changes were needed and she was motivated to continue with the project.

The second set of telephone follow-ups. Participant #1 and #2s' motivation began to waiver during the first week following office visit #3, but these participants continued with the diet and exercise program. The participants were concerned about the sustainability of these lifestyle changes after completion of the project. The participants were reminded about the benefits of the DASH diet and exercise and resources were provided for recipes and food items. Over the course of the second telephone follow up, the participants took a trip to Whole Foods and Trader Joe's which renewed interest and sparked motivation. The participants bought healthier versions of favorite foods. For example, apple chips and lentil chips were substituted for potato chips. Both participants began to walk more following office visit #3 and the home blood pressure reading s continued to improve.

During the week following office visit #3, participant #3 continued to consume high sodium foods; however, oatmeal, self-canned green beans, hummus and strawberries were added to the diet. Additionally, no salt crackers were substituted for saltines. Participant #3 joined the local gym, and sedentary TV viewing was decreased while activity was slightly increased. However, during the subsequent telephone follow-up, participant #3 admitted to another episode of binge eating. The participant made a trip to Pizza Hut where pizza, pizza sticks and additional undisclosed foods were consumed. Following this trip, the home blood pressure reading was 150/80 mm Hg.

During participant #3's final telephone follow-up, the participant stated that it was difficult to eat fruits and vegetables. The only plant-based nutrition received over the course of a week was the artichoke and spinach in hummus. Further, the participant admitted to consuming a bag of salty popcorn; after which, the ambulatory blood pressure reading was 150/75.

Participant #4 did not make any significant changes following office visit #3. She continued to consume fast food and processed food while trying to add some plant-based nutrition into the diet. Additionally, the participant continued to walk on the treadmill with the goal of increasing both the duration and frequency of the walking.

Participant #5 continued to consume walnuts, almonds, Egg Beaters and salads as part of her dietary regimen. The participant began to experiment with new recipes such as stir-fry with asparagus, broccoli and water chestnuts. Sandwiches consisting of turkey breast were substituted for ham sandwiches. Participant #5 continued to add laps to walks at the gym for a total of 28 laps. The participant stated that since the start of the project, mood has improved, energy has increased and old clothes were fitting.

Participant # 6 continued with the previous dietary and exercise changes. During a recent visit to the doctor, a decrease in blood pressure and weight were noted. The participant felt good and was motivated to continue with the diet and exercise program.

Participant #7 added fruits such as pineapple, oranges and apples to the diet each day. By reading food labels, the participant decreased sodium consumption and removed high sodium foods, such as Raman Noodles, from the diet. Participant # 7 did not improvement the exercise regimen. Due the stress involved with caring for a husband and adult son, the participant decided to postpone purchasing a gym membership. During a subsequent follow-up, the participant was encouraged to take time for self-care, relaxation and stress reduction.

Office visit #4, the final visit. Participant #1 and #2 were compliant with the diet and exercise recommendations and were able to sustain the changes over the duration of the project. Plant-based nutrition was added to each meal and to most snacks. Total daily sodium consumption decreased by approximately 50%-75% as compared to the initial food diary. Food selections were made based on the nutritional information provided during the project, and the amount of plant-based nutrition in the diet increased by 75% while the amount of fast food, processed food and saturated fat decreased by 50% as compared to the pre-DASH food diaries. The addition of lean meats, nonfat or low fat dairy and the elimination of most processed foods led to an approximate 25% reduction in dietary saturated fat as compared to the first set of food diaries. Participant #1's average pedometer reading increased by 471 steps as compared to the initial diaries but decreased by 425 steps as compared to the second set of diaries; however, additional aerobic activity was included in the exercise regimen through gardening and yard work. Overall, participant #1 increased aerobic activity by approximately 25%. Further, the average ambulatory systolic and diastolic blood pressures decreased by 13 mm Hg and 3mm Hg respectively as compared to the third office visit, and they decreased by 13 mm Hg and 12 mm Hg respectively as compared to the pre-DASH/exercise readings. The office blood systolic blood pressure reading remained stable as compared to the Pre-DASH/exercise reading, but increased by 5 mm Hg as compared to the first post-DASH/exercise reading. The office diastolic readings remained stable at 80 mm Hg. Participant #1 did not begin using the Bowflex machine, but the participant is contemplating its use in the near future. The participant concluded the final visit motivated to continue the achieved lifestyle change.

Participant # 2 had one pedometer reading of 8500 steps: however, biking was added to the exercise regimen and the participant walked over two miles/day. Overall, participant #2's steps varied over the course of the project but new forms of exercise were consistently added to the exercise regimen, which led to an approximate 50% increase in aerobic activity at the conclusion of the project. Further, the average ambulatory systolic blood pressure remained the same at 115mm Hg as compared to the pre-DASH reading but it increased by 12 mm Hg as compared to the first post-DASH reading. The average ambulatory diastolic blood pressure deceased by 4 mm Hg when compared to the pre-DASH reading, but increased by 4 mm Hg when compared to the first post-DASH reading. The systolic office blood pressure reading decreased by 20 mm Hg and 8 mm Hg when compared to the pre-DASH and post-DASH readings respectively. The diastolic office blood pressure reading decreased by 10 mm Hg and 8 mm Hg when compared to the pre-DASH and post-DASH readings respectively. Participant #2 remained motivated to continue the lifestyle changes following the conclusion of the project.

Participant #3 remained in the project until it concluded but there was minimal compliance with the recommended diet and exercise changes. The participant attended each scheduled office visit and was available for each weekly telephone follow up but none of the required diaries were maintained. Participant #3 added a very small amount of fruit and hummus to the diet, but binges of salty snack foods as well as fast foods led to increases in blood pressure. Overall, the participant's estimated sodium level, saturated fat, and amount of fast food/processed food remained elevated. The participant did join the local gym, but has not made a visit; however, participant #3 did recently engage in a few hours of gardening. The systolic office blood pressure reading increased by 6 mm Hg as compared to the pre-DASH reading, but it decreased by 32 mm Hg as compared to the first post-DASH reading. The office diastolic blood pressure remained the same as compared to the pre-DASH reading but it decreased by 12 mm Hg when compared to the first post-DASH reading. Participant #3 understood the need for dietary changes and the addition of physical activity but was unable to take action to achieve goals. This participant hopes to begin exercise and weight loss classes at the gym by the end of April.

Participant #4 was partially compliant with the DASH diet and fully compliant with exercise. The participant continued to eat fast food and processed food; however, small amounts of plant-based nutrition were added to at least one or two meals/day. This led to a 5% total increase in dietary plant-based nutrition as compared to the pre-DASH diet. However, dietary saturated fat remained elevated due to the consumption of fast food, chips, whole milk and

French fries. Participant #4's daily sodium intake decreased by approximately 10% as compared to the start of the project, but the total estimated dietary sodium remained elevated. The participant did purchase a treadmill during the course of the project; therefore, daily walks of a mile or more were added to the exercise regimen. Overall, exercise was increased by approximately 25% as compared to the start of the project. The average ambulatory systolic blood pressure reading decreased by 5 mm Hg when compared to the pre-DASH reading and it decreased by 9 mm Hg as compared to the first post DASH reading. The average ambulatory diastolic blood pressure increased by 2 mm Hg when compared to the pre-DASH reading and it increased by 9 mm Hg as compared to the first post DASH reading. The office systolic blood pressure reading decreased by 20 mm Hg and 8 mm Hg as compared to the pre-DASH and first post DASH readings respectively. The office diastolic blood pressure readings decreased by 10 mm Hg and 8 mm Hg as compared to the pre-DASH and first post DASH readings respectively. The participant was concerned about maintaining the lifestyle improvements due to the daily stress of being a single mother with a stressful job; however, the importance of improved health and the modeling of healthy habits was a motivator for continued interest.

Participant #5 put much effort into making the recommended diet and exercise changes. The participant added plant-based nutrition (in the form of oatmeal, nuts, whole-grains, fruits and vegetables) to every meal and to most snacks. Dairy selections included 1% milk and yogurt while meat selections included turkey breast. Fish was also added to the diet. Overall, at the conclusion of the project, participant #4 increased the dietary plant-based nutrition by 50%, decreased dietary sodium by 50%, and decreased dietary saturated fat and processed foods by 25% as compared to the pre-DASH diet.

Participant #5's average pedometer readings increased by 4,478 steps and 210 steps as compared to the pre-project and first post-DASH readings respectively. This participant joined the local gym and walked at least three to four days/week. The participant aimed to increase the number of laps completed each week. Further, participant #5's ambulatory systolic blood pressure readings increased by 8 mm Hg and 7 mm Hg as compared to the pre-DASH and first post DASH readings respectively. The ambulatory diastolic blood pressure readings decreased by 1 mm Hg and 7 mm Hg as compared to the pre-DASH and post-DASH readings respectively. The office systolic blood pressure reading decreased by 10 mm Hg and 20 mm Hg as compared to the pre-DASH and first post DASH readings respectively. The office diastolic blood pressure reading decreased by 10 mm Hg when compared to both the pre-DASH and first post DASH readings. Participant # 5 did so well that one antihypertensive medication was removed from her treatment plan. This participant was highly motivated to continue with the lifestyle changes and looked forward to making further improvements to both the diet and exercise regimens.

Participant #6 continued to add plant-based nutrition in the form of fruits, vegetables and seeds to all meals and most snacks. Dietary dairy products included skim milk and yogurt and total dietary saturated fat remained low. Total dietary plant-based nutrition increased by approximately 10%, total sodium decreased an estimated 5%, and saturated fat and processed food remained the same as compared to the pre-DASH diet. Due to a foot injury, participant #6 decreased aerobic exercise. The participant had one pedometer reading that was decreased by 22 steps and 595 steps as compared to the pre-DASH and first post DASH readings respectively. The average ambulatory systolic blood pressure reading decreased by 8 mm Hg and 7 mm Hg as compared to the pre-DASH and the first post-DASH readings respectively. The average ambulatory diastolic blood pressure reading decreased by 10 mm Hg and increased by 5 mm Hg as compared to the pre-DASH and first post-DASH readings. The office systolic blood pressure reading decreased by 7 mm Hg and 12 mm Hg as compared to the pre-DASH and first post-DASH readings. The office diastolic blood pressure reading decreased by 10 mm Hg and remained the same as compared to the pre-DASH and first post-DASH readings respectively. The participant remained motivated to continue the diet and exercise plan following the conclusion of the project.

Participant #7 added a very small amount of plant-based nutrition to the diet as compared to the pre-DASH diet. The participant added vegetables to dinner and fruit as a snack, which led to an estimated 5% increase in plant-based nutrition as compared to the pre-DASH diet. Total dietary saturated fat remained elevated as eggs, mayonnaise and slaw remained in the diet. Total dietary sodium decreased by 10% as the participant became accustomed to reading food labels and no longer bought Raman noodles and other processed foods. Unfortunately, participant #7 did not join the gym and begin a swimming class as discussed. Time constraints and stress prevented additional exercise. Therefore, the average pedometer readings decreased by 150 steps and 75 steps as compared to the pre-DASH and first post-DASH readings respectively. The average systolic ambulatory blood pressure reading decreased by 2 mm Hg and increased by14 mm Hg as compared to the pre-DASH and first post-DASH readings. The average diastolic ambulatory blood pressure decreased by 10 mm Hg and increased by 6 mm Hg as compared to the pre-DASH and first post-DASH readings respectively. The office systolic blood pressure reading decreased by 5 mm Hg and increased by 20 mm Hg as compared to the pre-DASH and first post-DASH readings respectively. The office diastolic blood pressure reading decreased by 2 mm Hg and increased by 10 mm Hg as compared to the pre-DASH and first post-DASH readings respectively. The participant's blood pressure readings were consistently high during the project and the participant was advised that antihypertensive medication was needed. Participant #5 did not want to begin medication so the participant decided to work diligently on the necessary lifestyle modifications before the next scheduled medical office visit in May. If the blood pressure remains elevated at that visit, the participant will begin using an antihypertensive medication.

Discussion and Conclusion

Hypertension is a growing problem in the United States especially in rural areas where access to care and resources are limited. According to the research, lifestyle modifications such as the adoption of the DASH diet and initiation of an aerobic exercise routine have the potential to reduce blood pressure. This project demonstrated the challenges and benefits associated with the use of these lifestyle modifications as a method to control blood pressure in a rural, southeastern population. At the conclusion of this project, 86% (n=6) of the participants increased the amount of plant-based nutrition in the diet with 43% (n=3) meeting the project goal of a 20% or more increase. All participants were able to read food labels to monitor sodium, and 86% (n=6) of participants decreased total dietary sodium consumption by 10% or more. Further, 57% (n=4) of participants concluded the project with an increase in aerobic physical activity. The original project goal was a gradual increase in the number of steps over the course of 8 weeks with the target of 5,000 steps at week 8. Furthermore, 29% (n=2) of the participants reached this goal; however, it is important to note these participants were performing at this level before the start of the project. One participant was close to this goal at 4,701 steps. Forty-three percent of participants (n=3) reached the project goal of an 8-10mm Hg decrease in systolic blood pressure (using office blood pressure measurements) which surpassed the initial project estimate of 30%. Additionally, 43% (n=3) of participants met the project goal of a 50% decrease in dietary saturated fat, processed food and fast food. Please see Appendices J and K.

The strengths of this project included the diverse age range of the participants. The ages of the participants spanned from 24 years old to 78 years old. An additional strength was the inclusion of participants with various morbidities, which represented the real world clinical environment. A final strength of the project was the inclusion of participants with a wide range of blood pressures and variable medical treatment plans. Participants' blood pressures ranged from pre-hypertensive to hypertensive with some participants using multiple antihypertensive medications and others using no medications. The diversity of patient characteristics and medical histories provided the opportunity to monitor the effects of lifestyle changes on various patient populations within the clinical environment.

The limitations included small sample size, limited gender variation (female, 86% n=6); limited geographic location, non-compliance of some participants, misinterpreted directions, missing data and the short implementation time. Motivation played an important role in adherence to both the diet and exercise recommendations. Age, educational level, co-morbidities and support (friends, family or spouse) seemed to play a role in participants' level of motivation. Participants who were highly motivated were more likely to follow project recommendations, adhere to directions and display greater self-efficacy than participants who had lower levels of motivation. Furthermore, motivation appeared to decrease over time, so the weekly telephone follow-ups became important for maintaining participants' interest and goals.

Self-recorded diaries and self-measured ambulatory blood pressure measurements were further limitations of the project. The self-recording and measurement of project information can lead to variable data reliability and validity; however, office blood pressure measurements were used to counterbalance this problem. Overall, the gathering of diverse data in the form of foods consumed, exercise and steps completed and blood pressure readings provided a comprehensive picture of how participants' lifestyles changed over time and how these changes effected blood pressure.

Implications

The results of this pilot project lay the groundwork for future projects concerning the effects of lifestyle changes on blood pressure. Future work should include multiple rural locations, larger sample sizes and longer follow-up periods. The results attained from this project demonstrate that the addition of the DASH diet and exercise to the medical treatment plan of pre-hypertensive and hypertensive patients has the ability to decrease blood pressure when motivation and follow-up are provided. One suggestion that may improve results and possibly reach noncompliant patients is to combine one-on-one patient time with group sessions. Personal patient time allows for customized plans and open discussion while group sessions allow for additional support and patient interaction.

Additionally, this project elucidates the importance of patient education in the primary care setting. This point is especially true in rural areas where access to resources is limited. In many rural areas, the only resource for medical and wellness information is the patient's primary care provider. Therefore, it is important that providers utilize patient encounters to convey necessary educational information and materials.

This project demonstrated that it is possible to educate patients and assist them in taking control of their blood pressure and health. Wellness and lifestyle changes should not be limited to primary care interventions, but they should extend to community and states efforts. Further projects that focus on the importance of lifestyle changes and health can bring this topic to the public forum with the hope of making large- scale changes.

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Appendix A

The food diary will provide a listing of the typical foods and beverages a participant consumes in a 24-hour period. Participants' pre-test food diary (prior to initiation of the DASH diet) will be compared to his/her post-test food diary (following the initial teaching visit until the conclusion of the project 8 weeks later). The patient will record all food and liquids consumed for two days/month for 8 weeks (total of two entries pre-test and four entries post-test). It is preferable to have one weekday entry and one weekend entry per month. The food diary will be used to monitor dietary changes.

The exercise diary will consist of the type of aerobic, duration and frequency of daily exercise as well as pedometer readings. A pre-test two-day aerobic exercise diary will be compared to the post-test exercise diary. Following the initial teaching session, participants will record all formal aerobic exercise sessions and three days/week of pedometer readings. Exercise for this project is defined regular aerobic activity such as brisk walking for at least 30 minutes/day most days of the week (U.S.DH & HS, 2004)

Self-monitoring of blood pressure at home is an approach to assess differences between office and out-of-office blood pressure (U.S.DH & HS, 2004). Participants will maintain a log that includes the date, blood pressure reading and time of reading. Participants will bring their sphygmomanometer to the initial visit so an evaluation of correct use can be made. If patients do not own a sphygmomanometer, they can measure their blood pressure at least three times a week at the drug store and record their results.

Appendix B

Accurate Measurement of In Office Blood Pressure (U.S.DH & HS, 2004):

Accurate blood pressure measurement in the office setting is dependent upon a regularly inspected and validated sphygmomanometer, trained operators and properly prepared and positioned patients. The auscultatory method of blood pressure measurement will be used. The patient will be seated quietly in a chair for at least 5 minutes. The feet will be on the floor and the arm supported at heart level. Caffeine, exercise and smoking will be avoided for at least 30 minutes prior to measurement. The cuff bladder will encircle at least 80% of the arm. At least two measurements will be made and the average recorded. Palpated radial pulse obliteration pressure will be used to estimate the SBP and the cuff will be inflated 20-30mmHg above this level. The cuff deflation rate will be 2mmHg/sec. SBP is the point at which the first of two or more Korotkoff sounds are heard and the disappearance of Korotkoff sound is used to define DBP.

Appendix C

Consent Form for Participation in a Quality Improvement Project
University of Massachusetts Amherst

DNP-c's: Marian Michel DNP-C
Project Title: The Blood Pressure Effect of the Addition of the DASH Diet and Exercise to the Treatment Plan of Both Pre-hypertensive and Hypertensive Rural Adults

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1. WHAT IS THIS FORM?

This form is called a Consent Form. It will give you information about the project so you can make an informed decision about participation in this project.

2. WHO IS ELIGIBLE TO PARTICIPATE?

This project will include adults' ages 19 years old and older with blood pressures greater than 120/80

3. WHAT IS THE PURPOSE OF THIS STUDY?

The purpose of this project is to see if the addition of the DASH diet and exercise to your medical treatment plan can further decrease your blood pressure

4. WHERE WILL THE STUDY TAKE PLACE AND HOW LONG WILL IT LAST?

This project will be conducted at Blue Ridge Cardiology and Internal Medicine in Mount Airy, North Carolina. The project will last eight weeks and involve three office visits and eight telephone interviews.

5. WHAT WILL I BE ASKED TO DO?

If you agree to take part in this project, you will be asked to keep three 2-day food diaries, three 3-day exercise and pedometer diaries and three 3-day home blood pressure logs.

6. WHAT ARE MY BENEFITS OF BEING IN THIS STUDY?

Participants of this study may benefit from a decrease in their blood pressure, adoption of healthy lifestyle changes, and increased knowledge concerning blood pressure management and cardiovascular health.

7. WHAT ARE MY RISKS OF BEING IN THIS STUDY?

We believe there are no known risks associated with this project; however, a possible inconvenience may be the time it takes to complete the project

8. HOW WILL MY PERSONAL INFORMATION BE PROTECTED?

The primary investigator will keep all project records, including any codes to your data, in a secure location at Blue Ridge Cardiology and Internal Medicine in Mount Airy. Project records will be labeled with a code. A master key that links names and codes will be maintained in a separate and secure location. The master key will be destroyed 2 months after the close of the study. All electronic files containing identifiable information will be password protected. Any computer hosting such files will also have password protection to prevent access by unauthorized users. Only the members of the project staff will have access to the passwords. At the conclusion of this project, the primary investigator may publish her findings. Information will be presented in summary format and you will not be identified in any publications or presentations.

9. WHAT IF I HAVE QUESTIONS?

We will be happy to answer any question you have about this project. If you have further questions about this project or if you have a project-related problem, you may contact Marian Michel or Vivian Seal at (336) 648-8200

10. CAN I STOP BEING IN THE STUDY?

You do not have to be in this project if you do not want to. If you agree to participant in the project, but later change your mind, you may drop out at any time. There are no penalties or consequences of any kind if you decide that you do not want to participate.

12. SUBJECT STATEMENT OF VOLUNTARY CONSENT

When signing this form I am agreeing to voluntarily participate in this project. I have had a chance to read this consent form, and it was explained to me in a language, which I use and understand. I have had the opportunity to ask questions and have received satisfactory answers. I understand that I can withdraw at any time. A copy of this signed Informed Consent Form has been given to me.

______________________	____________________	__________
Participant Signature:	Print Name:	Date:

By signing below I indicate that the participant has read and, to the best of my knowledge, understands the details contained in this document and has been given a copy.

______________________	____________________	__________
Signature of Person Obtaining Consent	Print Name:	Date:

Appendix D

The Handouts

What DASH Can Do for You

The DASH Diet can help lower your blood pressure and cholesterol levels, which is good for your heart. In fact, DASH stands for Dietary Approaches to Stop Hypertension, or high blood pressure. Even if you don't have high blood pressure, the DASH Diet is worth a look. It may help you lose weight because it's a healthier way of eating. You won't feel deprived. You'll have lots of vegetables, fruits, and low-fat dairy products while cutting back on fats, cholesterol, and sweets.

Cut the Salt

Too much salt causes fluids to build up in your body. This puts extra pressure on your heart. On DASH, you’ll lower your sodium to either 2,300 or 1,500 milligrams a day, depending on your health, age, race, and any medical conditions. Here are some ways to cut back:

Choose low- or no-sodium foods and condiments.
Watch foods that are cured, smoked, or pickled.
Limit processed foods. They're often high in sodium.

Get Your Grains

Eating whole grains like whole wheat breads, brown rice, whole grain cereals, oatmeal, whole-wheat pasta, and unsalted pretzels or popcorn is a good way to get fiber. Fiber helps lower your cholesterol and also keeps you feeling full longer. For a diet of 2,000 calories per day: Eat six to eight servings a day. One serving is a slice of bread, 1 ounce of dry cereal, or ½ cup of cooked whole-wheat pasta, rice, or oatmeal (about the size of half a baseball).

Load Your Plate With Vegetables

Vegetables give you fiber, vitamins, and minerals. They don't have a lot of calories or fat -- a good recipe for controlling blood pressure. Have four to five servings of vegetables a day. That's 1/2 cup of cooked or raw vegetables, 1 cup of raw leafy vegetables, or 1/2 cup of vegetable juice for each serving. Iffy about veggies? Start by adding a salad at lunch and dinner.

Don't Forget Fruit

Fruits offer lots of fiber and vitamins that are good for your heart. Many also have potassium and magnesium, which lower blood pressure. Have four to five servings of fruit every day. One serving is a medium apple or orange, or 1/2 cup of frozen, fresh, or canned fruit. One-half cup of fruit juice or 1/4 cup of dried fruit also counts as a serving. Try adding bananas or berries to your breakfast cereal or have fruit for dessert.

Have Some Yogurt

Low- and no-fat dairy foods are good sources of calcium and protein, which can help maintain a healthy blood pressure. Try to get two to three servings of dairy every day. Choose skim or 1% milk, buttermilk, and low- or no-fat cheeses and yogurt. Frozen low-fat yogurt is OK, too. One serving equals 1 cup of yogurt or milk, or 1 1/2 ounces of cheese -- about the size of three dice.

Go for Lean Meats and Fish

You can still eat meat. Just make sure it's lean. Meats are good sources of protein and magnesium. Skinless chicken and fish are also on the menu. Limit your servings to six or fewer a day. A serving is 1 ounce of cooked meat, fish, or poultry, or one egg. A good rule is to have no more than 3 ounces of meat at a meal -- the size of an iPhone. Limit egg yolks to no more than four in a week.

Add Nuts and Legumes

Nuts, legumes, and seeds are rich in magnesium, protein, and fiber. Walnuts are full of omega-3 fatty acids, which may help lower your risk of heart disease. Enjoy as many as five servings of these foods each week. That’s 1/3 cup of nuts, 2 tablespoons of seeds, or a 1/2 cup of cooked dried beans or peas in each serving. Grab a handful of seeds or nuts as a snack. Or add beans to your salads or soups.

Cut Back on Fats and Oils

Eating too many fats can cause high cholesterol and heart disease. With DASH, you’ll limit fats and oils to two to three servings a day. A serving is 1 teaspoon of margarine or vegetable oil, 1 tablespoon of mayonnaise, or 2 tablespoons of low-fat salad dressing. When cooking, use vegetable oils like olive or canola instead of butter.

Watch the Sweets

You don't have to skip all sweets. But you should try to have five or fewer servings a week. That's 1 tablespoon of sugar or jam, 1 cup of lemonade, or 1/2 cup of sorbet at a time. Choose sweets that are low in fat, such as gelatin, hard candy, or maple syrup. Instead of high-fat desserts, try having fresh fruit over low-fat ice cream.

Get Enough Potassium

Potassium is another important part of the DASH diet. Getting enough of this mineral may help lower your blood pressure. It's best to get potassium from food instead of supplements. Aim for 4,700 milligrams (mg) a day. Try these potassium-rich foods:

Potato: 926 mg
Sweet potato: 540 mg
Banana: 420 mg
Avocado (1/2): 345 mg

Cooked spinach (1/2 cup): 290 mg

Getting Started on DASH

DASH isn't hard to follow, but you'll have to make some changes. Start by keeping a food diary for a few days and see how your diet stacks up. Then start making changes. You'll aim for around 2,000 calories a day. It may vary some depending on your body and how active you are. Ask your doctor for advice.

WebMD (2012). Slideshow: DASH diet for heart health. Retrieved from

http://www.webmd.com/cholesterol-management/high-cholesterol-12/slideshow-dash-diet

diabetes care

WHAT CAN YOU LEARN FROM food labels?

By Johanna Burani, MS, RD, CDE

Our body needs many kinds of foods to keep it strong and healthy every day. Do you know what your body gets from the foods you eat? How can you find out? The front of the food package may look very nice, but is that food good for you? To find out, look on the side or the back of the package, where you will see a Nutrition Facts label. There is a lot you can learn from the information there. Here is a guide to what you should look for.

1 Serving size. This number will be at the top of the label. It tells you what your body gets if you eat that amount of food. For example, if you buy a can of tomato soup you may see that the serving size is 1 cup. All of the numbers found on the label are for 1 cup of the soup. Let's say there are 100 calories in 1 cup of tomato soup. But what if you eat two cups? There will be 200 calories in 2 cups of tomato soup.

2 Servings per container. This number is right below the serving size. It tells you how many portions are inside the package. For example, there may be one, two or maybe more servings per container. This helps you decide how much of the food to eat.

3 Calories, total fat, cholesterol, sodium, potassium, total carbohydrates, protein, vitamin A, vitamin C, calcium and iron. If you eat one serving of the food, your body will get the exact amounts listed. This information is important if you want to control your blood glucose, lose weight or eat less fat or sodium. If you have a choice of two kinds of tomato soup, you may prefer to pick the one that has less sodium or sugar, or more iron or vitamin A.

4 The list of ingredients. This tells you the foods and chemicals that are inside the item. The order in which they are listed is important, too. The item found in the largest amount is listed first. The last food is in the smallest amount. Natural, unrefined foods have a very short list. For example, old fashioned oats has just one ingredient: 100% natural rolled oats. Natural peanut butter with no salt added only contains peanuts. These foods are very good for your body. Refined foods have a long list of ingredients with names that are hard to say. These foods may give your body many calories and very little that is good for your health.

The best way to read a food label is to:

1. Look for a short list of ingredients.
2. Know your serving size (portion).
3. Pick the package with less fat, cholesterol, sugar and sodium.
4. Pick the package with more fiber, vitamins A and C, calcium and iron.

be informed

The more you read food labels, the easier it will be for you to make the best food choices.

Exercise: Starting an Exercise Program

Exercise is very important for good health. Your healthcare provider may tell you that you need to get more exercise. To do this, you will need to get into the habit of exercising so that it becomes part of your normal daily or weekly routine. The best exercise for you is one that you enjoy and that you will do on a regular basis. If you start a jogging program, but hate to jog, you are not likely to keep it up. Find an activity you enjoy, perhaps basketball, soccer, dance, or hiking. Try to involve family members or friends. Join a team or an exercise class and make it fun.

You can get exercise at many times of the day. For example, take the stairs instead of an elevator, park far away in a parking lot and walk briskly to the store, or walk during your lunch break. The benefits are lifelong - so have fun and stick to it!

What is aerobic exercise?

An aerobic exercise is any activity that makes your muscles use oxygen. When you are doing an aerobic exercise, your heart has to work harder to get more oxygen to your muscles. This makes your heart stronger. Endurance exercises such as biking, jogging, walking, swimming, or basketball are considered aerobic.

Aerobic exercise:

- Decreases your blood pressure, which reduces your risk for having a heart attack or stroke.
- Decreases your resting heart rate, which puts less stress on your heart.
- Increases the levels of HDL (the good cholesterol in your blood).
- Increases your cardiac output, which means your heart pumps more blood with each heartbeat.
- Decreases your resting respiratory rate, which means your lungs don't work as hard when you are at rest.
- Increases blood flow to your lungs, which helps you to get more oxygen.
- Burns calories, which can help you lose weight.

What is anaerobic exercise?

Anaerobic exercise is high intensity, strenuous activity such as weight lifting or sprinting. It is done to build strength, improve speed, and lose body fat.

You have the opportunity to do this kind exercise often during the day. Carrying groceries or sprinting to catch a bus are considered anaerobic exercise.

Interval training is a great anaerobic exercise. An interval can be done with many types of exercise (for example, running, biking, swimming, or weight lifting). An interval is done by increasing your pace for a short period of time (for example, between 10 to 60 seconds) then having a slow recovery period that is at least 3 times as long as the interval. To interval train, you simply repeat these bursts of exercise during the course of your workout. For example, you run for 30 seconds, then walk for 2 minutes, run for 30 seconds, walk for 2 minutes and so on.

One benefit from anaerobic exercise is that it may raise your metabolic rate for nearly 18 hours after the activity is finished. This means you may burn calories at a faster rate well after the exercise is completed. This can help you lose weight. In contrast, aerobic exercise only raises your metabolic rate for 2 hours.

How often and how long should I exercise?

There are three ways to measure your exercise: frequency, duration, and intensity.

- **Frequency:** This is how often you exercise. Try to get aerobic exercise at least 3 times a week. Doing too much aerobic exercise can lead to overtraining and overuse injuries. Do anaerobic exercise 2 or 3 times a week.
- **Duration:** This is how long you exercise. The goal is to have each exercise workout last 30 to 60 minutes. You may need to work up to this gradually.
- **Intensity:** This is how hard you are working when you exercise. While you are doing aerobic exercise, you should keep your heart rate up. To make sure you are benefiting from your exercise, you need to check your heart rate (pulse) during your workout. You need to set a target heart rate for yourself so that you can make sure you are exercising hard enough to help your heart, yet easy enough so you can complete the exercise safely. The goal for aerobic exercise is to maintain your target heart rate during your exercise for at least 20 minutes. You can also use your target heart rate to check your progress over time. For anaerobic exercise, use a heart rate monitor during your rest intervals to monitor recovery. You will do a sprint, rest, then do another sprint once your heart rate enters your recovery zone.

After a few weeks of training, you can continue improving your level of fitness by increasing the frequency, duration, or intensity of your exercise.

How do I calculate my target heart rate?

To figure out your target heart rate, you first need to figure out your maximum heart rate (MHR). Your maximum heart rate is calculated by subtracting your age from 220.

220 - Age = MHR

For example, if you are 40 years old, your MHR would be 180 beats per minute.

220 - 40 (years old) = 180 beats per minute

Next, figure out your target heart rate. Your target heart rate is based on a percentage of your MHR For aerobic activity, try to keep your heart rate between 50% and 85% of your MHR. For example, if you are 40 years old your target heart rate range should be 90 to 153 beats per minute.

180 (MHR) X 0.5 (50%) = 90 beats per minute

180 (MHR) X 0.85 (85%) = 153 beats per minute

During exercise, check your pulse from time to time to see if you are within your target heart rate range. Do this by finding your pulse on the thumb side of your wrist or on your neck beside your Adam's apple. Use a clock or watch with a secondhand to count the number of heartbeats in 10 seconds. Multiply that number by 6 to get the number of heartbeats per minute. Some exercise machines will measure your heart rate when you put your hands on special sensors. You can also buy a heart rate monitor that you wear.

For aerobic exercise, if your heart rate is too fast (over your 85% mark) then slow down. If your heart rate is below your 50% mark then you need to pick up your pace.

What about warming up and cooling down?

You should include warm-up and cool-down exercises before and after exercise. Muscles that have not been used are cool. Doing calisthenics and dynamic stretching or walking slowly for 5 to 10 minutes before beginning your workout warms your muscles, making them more flexible and less prone to injury.

Right after exercise, allow your heart rate to return slowly to normal. Walking slowly, for example, will let you cool down and let your heart and breathing to return to normal levels. You should also stretch the muscles you used during your exercise. Devote a total of 5 to 10 minutes to cooling down.

References

DeLee and Drez's Orthopaedic Sports Medicine, 3rd Edition. Jesse C. DeLee, MD, David Drez, Jr., MD and Mark D. Miller, MD. Elsevier. 2009

"Target Heart Rates." American Heart Association. Web. 20 July 2010. <http://www.americanheart.org/presenter.jhtml?identifier=4736.>.

From Merck Medicus

Appendix E

UNIVERSITY OF MASSACHUSETTS AMHERST School of Nursing
Skinner Hall
651 North Pleasant Street
Amherst, MA 01003-9304 413-687-2626

Fall, 2010

To Whom It May Concern:

I am the Director of the DNP Program at the University of Massachusetts, Amherst, School of Nursing. I am writing this letter on behalf of Marian Michel, your student preceptee. Your student is in the final year of the DNP program, is a DNP Candidate, and is planning to complete the final requirement for the Degree, a Capstone Scholarly Project, in your facility. Your student will be designing, implementing, and evaluating the effect of translating a programmatic intervention into your practice or setting. As these projects are considered performance improvement or program evaluation projects and not research studies, the University does not require Institutional Review Board permission for this student to actualize the project as outlined by the student. I am using this letter as a "Key Stakeholder" commitment letter for the student to use in the Capstone Scholarly Project Proposal. A Graduate faculty member of the School of Nursing will, also, be working directly with your student as Chair of the Capstone Scholarly Project.

Thank you in advance for allowing this student to actualize the Capstone Project in your facility. If you have any questions, please call me at 413-687-2624 or email jdemart@nursing.umass.edu.

Key Stakeholder Signature: ____________ **Date:** 1/3/13

Student Signature: ____________ **Date:** 1/2/13

Sincerely,

Jean E. DeMartinis

Jean E. DeMartinis, PhD, FNP-BC
Associate Professor
Director DNP Program

Appendix F

Sample Characteristics

Item	N=7	%
Gender:		
Male	1	14%
Female	6	86%
Highest Level of Education:		
High School	2	29%
Associate Degree	4	57%
Graduate Degree	1	14%
Antihypertensive Medications:		
0	3	43%
1 or more	4	57%
Pre-hypertensive	5	71%
Hypertensive	2	29%

Participants' Maintenance of Food Diaries, Exercise Diaries and BP Diaries

Participants	Maintained Food Diary	Maintained Exercise Diary	Maintained BP Diaries	Use of Pedometer	Expected Outcomes (improved)
#1	X	X	X	X	X
#2	X	X	X	X	X
#3					
#4	X	X	X		X
#5	X	X	X	X	X
#6	X	X	X	X	X
#7	X	X	X	X	

Participant #2 missed 3 pedometer readings but additional exercise was recorded

Participant #3 did not follow the diary protocol. She would verbally discuss her progress but she did not write results in the notebook

Participant #4 missed 3 pedometer readings but walking was recorded in miles

Participant #5 was missing 2 pedometer readings but physical activity was recorded. One blood pressure reading was missing from the first set of diaries.

Participant #6 missed 3 pedometer readings. Two readings were missed due to a foot injury

Appendix G

Initial Office Blood Pressure Readings

Participant #	Blood Pressure Reading (mm of Hg)
1	120/80
2	130/80
3	142/80
4	128/87
5	120/80
6	125/90
7	155/90

Office Visit #3 Blood Pressure Measurements Post DASH/ Exercise Teaching

Participant	Date	BP (mm Hg)
1	3/25	115/80
2	3/27	118/78
3	3/20	180/92
4	3/27	120/80
5	3/21	130/80
6	3/27	130/80
7	3/28	130/78

Office Visit #4 Blood Pressure Measurements Post DASH/Exercise Teaching

Participant	Date	BP (mm Hg)
1	4/15	120/80
2	4/17	110/70
3	4/17	148/80
4	4/11	100/70
5	4/8	110/70
6	4/11	118/80
7	4/11	150/88

Appendix H

Participants' Average Ambulatory Blood Pressure Pre DASH/Exercise Teaching

Participant	Dated	Average BP(mm Hg)
1	2/24, 2/26, 2/28	117/83
2	2/24, 2/26, 2/28	115/75
3	incomplete	incomplete
4	Dates not recorded	124/79
5	2/14, 2/16, 2/18	107/66
6	2/20, 2/21, 2/22	130/89
7	2/25, 2/28, 3/3	145/89

Participants' First Set of Average Ambulatory Blood Pressure Post DASH/Exercise Teaching

Participant	Dates	Average BP (mm Hg)
1	3/20, 3/22, 3/24	117/74
2	3/17, 3/20, 3/24	103/67
3	incomplete	incomplete
4	Dates not recorded	128/72
5	3/17, 3/18, 3/20	108/72
6	3/2, 3/9, 3/15	129/75
7	3/18, 3/20, 3/21	129/73

Participants' Second Set of Average Ambulatory Blood Pressure Post DASH/Exercise Teaching

Participant	Dates	Average BP (mm Hg)
1	4/7, 4/8, 4/9	104/71
2	4/9, 4/10, 4/16	115/71
3	incomplete	incomplete
4	Dates not recorded	119/81
5	4/2, 4/3, 4/7	115/65
6	No dates recorded	122/80
7	4/3, 4/11, 4/12	143/79

Appendix I

Pre-DASH/Exercise Pedometer Readings

Participant	Dates	Average Reading (# of steps)
1	2/21, 2/26, 3/2	9730
2	2/22, 2/24. 2/28	9034
3	incomplete	incomplete
4	No dates recorded	1600
5	No dates recorded	223
6	No dates recorded	3236
7	No dates recorded	500

Participant #3 did not record exercise
Participant #4 was missed two pedometer readings, but additional walking was recorded
Participant #5 was missed the third pedometer reading
Participant#6 missed the third pedometer reading

First Set of Post-DASH/Exercise Pedometer Readings

Participant	Dates	Average Reading (# of steps)
1	3/7, 3/12, 3/19	10,626
2	3/9,3/21	7750
3	incomplete	incomplete
4	No dates recorded	2000
5	No dates recorded	4491
6	No dates recorded	3809
7	No dates recorded	425

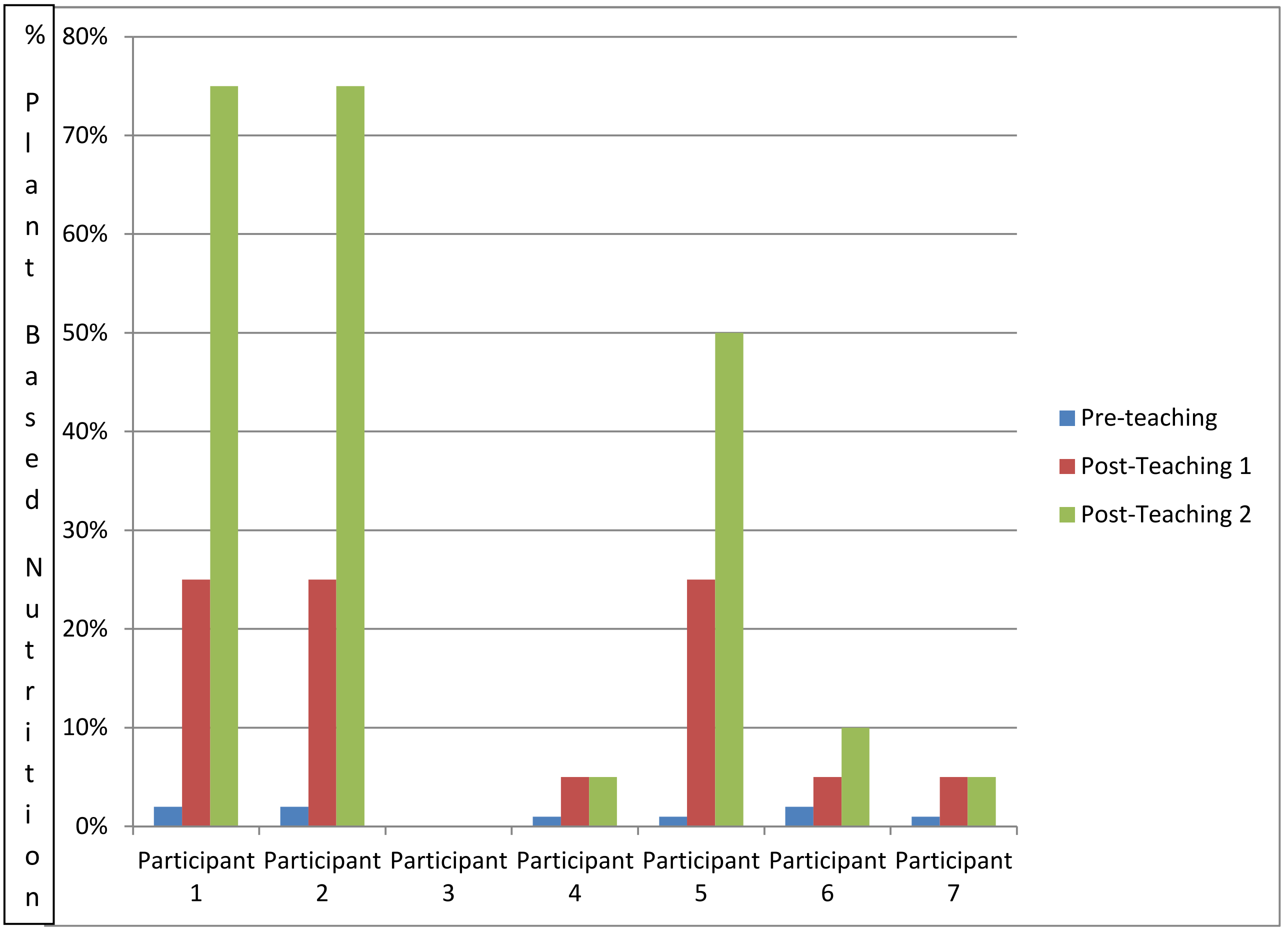
Participant # 2 missed the third pedometer reading but had additional exercise
Participant #3 did not record exercise
Participant # 5 missed the third pedometer reading

Second Set of Post-DASH/Exercise Pedometer Readings

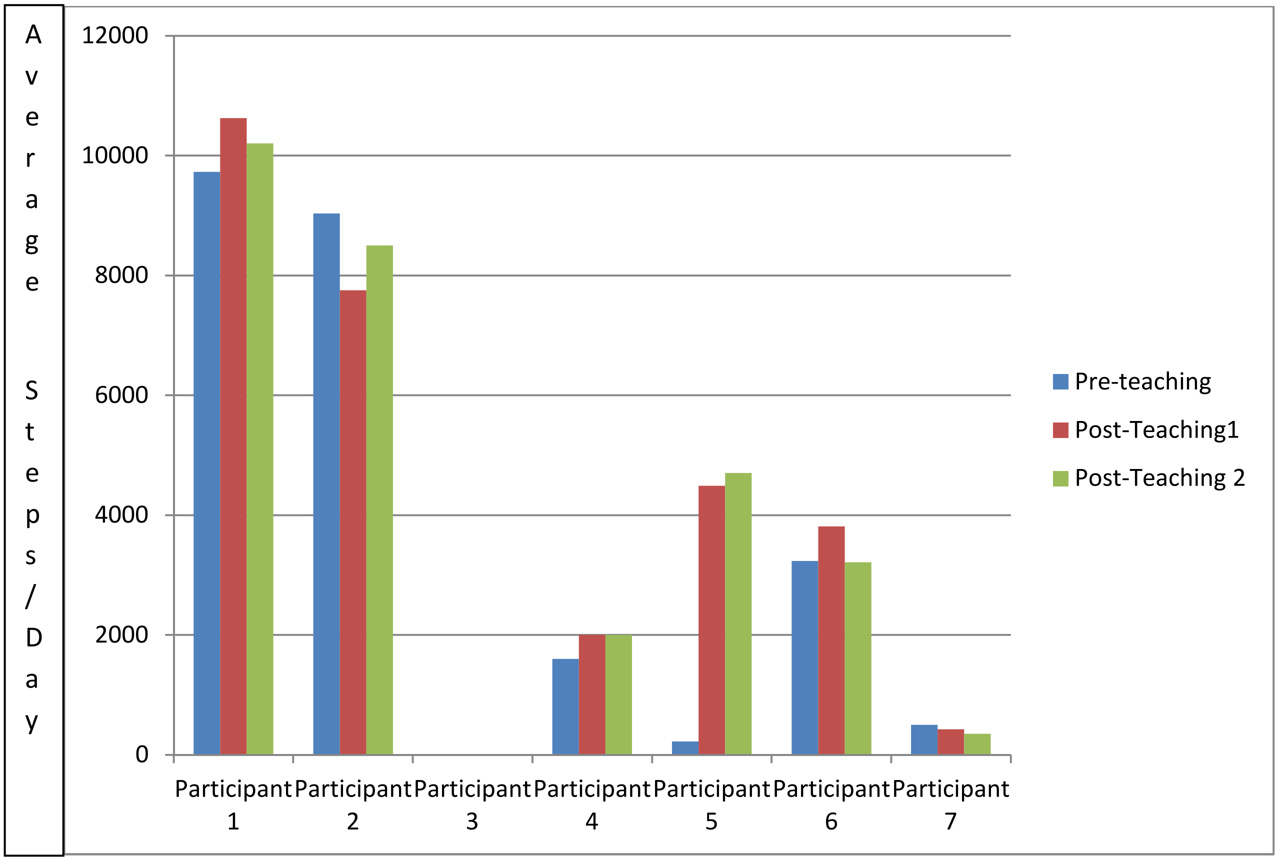
Participant	Dates	Average Reading (# of steps)
1	No dates recorded	10,201
2	4/2	8500
3	incomplete	incomplete
4	No dates recorded	2000
5	4/2, 4/3. 4/5	4701
6	No dates recorded	3214
7	No dates	350

Participant #1 received additional exercise through gardening
Participant #2 had one pedometer reading plus bike riding and additional recorded miles
Participant #3 did not record exercise
Participant #4 had one pedometer reading, the additional readings were in miles
Participant#6 had one pedometer reading due to a foot injury

Appendix J

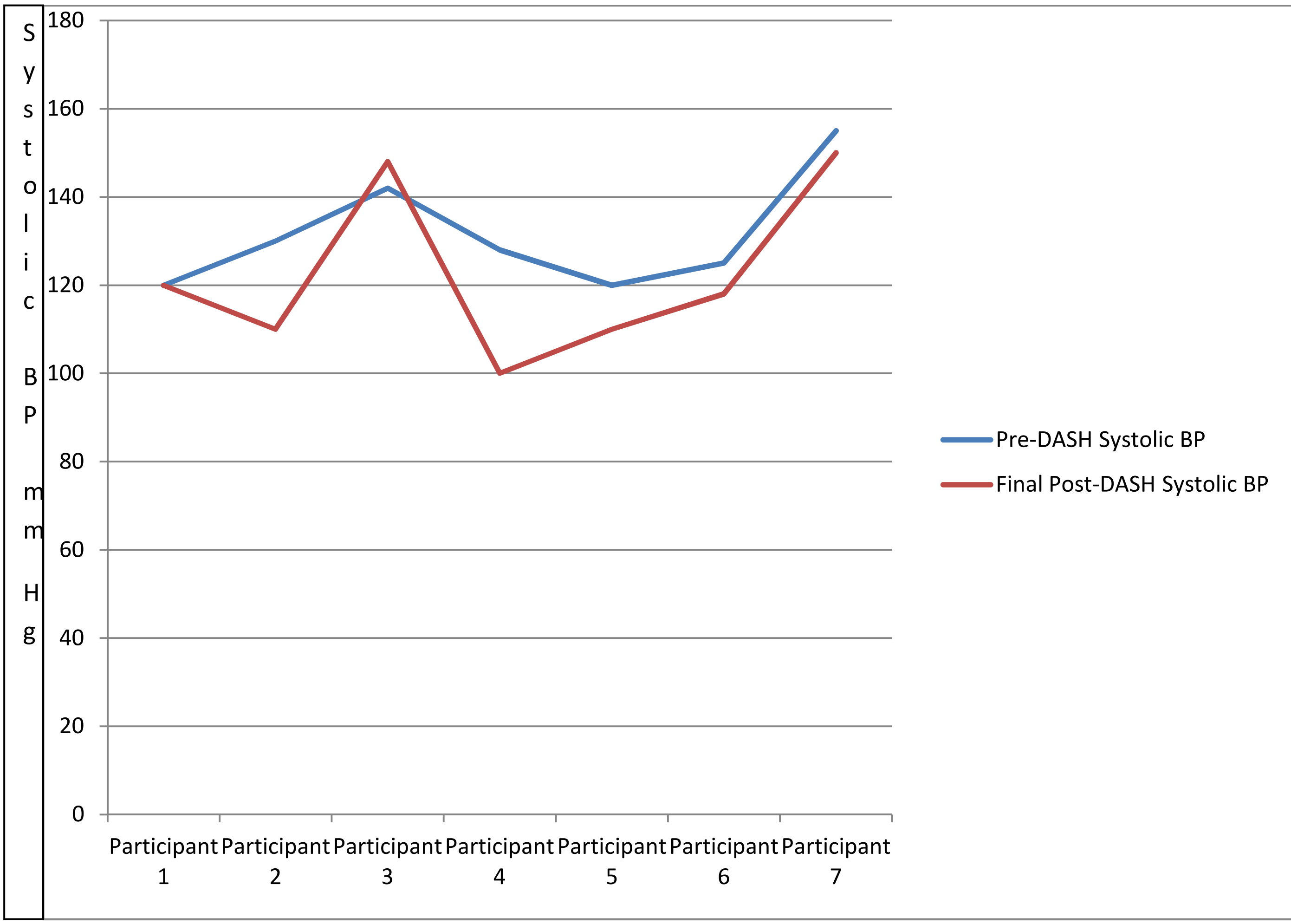


The dietary percent of plant-based nutrition for each participant's diet pre/post DASH teaching



Comparison of the pre/post-teaching steps/day averaged for each participant

Appendix K



Comparison of participants' in-office pre-DASH/exercise systolic blood pressures and final post-DASH systolic blood pressures