

IMPROVING PRIMARY CARE PROVIDERS' KNOWLEDGE AND
INTENT TO RECOMMEND WHOLE FOOD PLANT-BASED
NUTRITION EDUCATION FOR PATIENTS WITH
CARDIOVASCULAR DISEASE

by

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DEDICATION

I would like to dedicate this to, and in memory of to my parents, Dr. Imogene G. Johnson and Dr. James C. Dunn, Sr., who have always given me examples of genuine kindness, caring, motivation, life values and life skills. Thank you, Mom and Dad, for shaping and molding me throughout the years.

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ABSTRACT

Background: Cardiovascular disease has the highest rate of mortality nationally and worldwide. Diet and nutritional practices are factors that have a direct impact on cardiovascular well-being. Whole food plant-based (WFPB) nutrition has been shown to have a significant benefit on the cardiovascular system, in particular repair of the endothelial lining of the blood vessels. In spite of evidenced research, many patients at risk or diagnosed with cardiovascular disease are not provided WFPB nutrition recommendations by primary care providers (PCPs). Although PCPs are often not trained themselves in this area of WFPB nutrition, they have an important role in communicating the benefits of this dietary lifestyle to patients, with the goal of achieving improved patient outcomes.

Objective: The purpose of this project was to assess the knowledge base of PCPs in the area of WFPB nutrition, as well as to provide information and awareness regarding the benefits and relationship of WFPB nutrition to patients at risk or diagnosed with cardiovascular disease.

Methods: This project utilized a non-experimental pretest/posttest design, to compare knowledge base and awareness of PCPs before and after an educational intervention highlighting the benefits and recommendations of WFPB nutrition for individuals at risk or with a diagnosis of CVD. A convenience sample of PCPs from a local medical center were used, where participants' participation was solely voluntary. Pre-test and post-test surveys utilized multiple choice and five-point Likert-scale questions; free text responses were allowed at the end of the post-test. Descriptive statistics were used for data analysis.

Results: A total of 25 PCPs completed both pre- and post-survey for data analysis. All categories of the multiple-choice knowledge assessment questions demonstrated 8% to 24% increments of

improvement. In areas of WFPB knowledge measured with Likert scale categories, the majority showed improvement in these areas.

Conclusion: Improved PCPs knowledge and intent to recommend WFPB nutrition to patients at risk or diagnosed with CVD occurred. At this organization, knowledge, self-rated knowledge and comfortability in recommending WFPB nutrition to patients was achieved. The data from this project will serve as a baseline for future means to assist providers in making WFPB recommendations to improve patient outcomes.

INTRODUCTION

The number one global and national cause of death continues to be cardiovascular disease (CVD), despite efforts to decrease this burden and curb this disease (Salami et al., 2017, Wall et al., 2018). An estimated nearly 400,000 deaths are attributed annually to atherosclerotic cardiovascular disease (ASCVD), the most common form of CVD (Salami et al., 2017). The American Heart Association's 2020 Impact Goals and the Healthy People 2020 Goals are aimed at primary prevention that is prevention of risk factors prior to development of the disease (Allen et al., 2017). It is estimated that over 40% of the population in the United States will be living with CVD by 2030 (Allen et al., 2017). Increasingly, more evidence shows that the dietary intake of primarily plant-based foods, with the minimizing of animal proteins, dairy and oils, plays an integral role of protecting and in many cases healing vascular injury, as related to endothelial lining, the area responsible for plaque build-up and vessel occlusion, resulting in various degrees of the manifestation of cardiovascular disease (Esselstyn, Gendy, Doyle, Golubic, & Roizen, 2014). Perhaps a paradigm shift in focusing on primordial prevention of CVD, as opposed to traditionally treating the risk factors, may enhance the clinical benefit and outcomes for individuals at risk and those already with the diagnosis of CVD (FERENCE, Graham, Tokgozoglul, & Catapano, 2018).

This quality improvement (QI), Doctor of Nursing (DNP) project is aimed at improving the knowledge of primary care providers on whole food plant-based (WFPB) nutrition and resulting in their desire to recommend this nutrition style for patients who are at risk or diagnosed with CVD. These providers are located at a primary care facility in the St. Louis, Missouri metropolitan area. A brief educational intervention on the benefits of (WFPB) nutrition

and benefits of communicating this to patients, in addition to a laminated, printed reminder card for providers to use to facilitate this information to patients, will be provided. A pre- and post-survey will be presented to the providers, to assess their knowledge of WFPB nutrition and the possibility of incorporating this recommendation to their patients with CVD. The data gathered on the effectiveness and satisfaction of this intervention with the providers will be analyzed and used for improvement of care. This paper will describe the background knowledge, purpose, aims, theoretical and process frameworks, synthesis of current evidence, methods used, results of the intervention and a discussion of the results.

Background

Cardiovascular Disease Rates and Comorbid Conditions

Despite past and ongoing medical research, CVD remains the number one cause of death worldwide, as well as being an economic and public health problem in the United States (Bondonno, Croft, & Hodgson, 2015). Hypertension continues to be the leading risk factor for CVD (Jackson, Patterson, MacDonald-Wicks, & McEvoy, 2017). In part, the pathogenesis of CVD is noted in the development of atherosclerosis, heralded by a gradual buildup of cholesterol and the formation of plaque in the coronary arteries (Bondonno, Croft, & Hodgson, 2015). This plaque buildup, directly related to long-term dietary practices, results in excessive amounts of blood cholesterol levels, eventually leading to damage of the epithelial lining of the coronary vessels (Tousoulis, Kampoli, Tentolouris, Papageorgiou, & Stefanadis, 2012). Prior to the plaque formation, the coronary arteries are lined with unadulterated, healthy epithelium, which in its normal state functions to assist in regulating the smooth muscle tone of these vessels (Bondonno, Croft, & Hodgson, 2015). In this healthy state, the epithelial lining produces nitrous oxide, a

soluble gas, which regulates and maintains the tone and integrity of the coronary vasculature (Bondonno, Croft, & Hodgson, 2015). Ongoing conditions such as hypercholesterolemia and hypertension, generate a proliferative inflammatory response, which often includes platelet adhesion and aggregation, factors responsible for acute coronary episodes resulting from plaque rupture (Patel, Chandra, Alexander, Soble, & Williams, 2017). Studies by Esselstyn et al., (2014), have clearly demonstrated benefits of WFPB nutrition. These authors show that dietary changes alone, with WFPB foods, are highly associated with improving, halting and reversing coronary artery disease. In the study, 198 patients were voluntarily counseled on and adhered to whole plant-based nutrition for 3.7 years; 94% reported reduction in symptoms, and 22% experienced reversal of symptoms (Esselstyn, Gendy, Doyle, Golubic & Rozien, 2014). Massera, Zaman, Farren, and Ostfeld, (2015) report a case study validating the use of WFPB diet in profoundly improving multiple measures of patients' cardiovascular picture. These improvements were noted in the measures of plasma lipids, blood pressure and improved vascular function; it was also noted that WFPB nutrition was also associated with reduced mortality. Patients placed on a plant-based, low fat dietary plan were shown to have improved coronary artery percent diameter stenosis measurement as well as decreased angina (Esselstyn, Ellis, Stephen, Medendorp, & Crowe, 1995; Kent et al., 2018). Ornish et al., (1998) and Ornish (1990) observed reversal in coronary artery diameter reduction after one-year adherence to lifestyle changes, which included substantially decreased amounts of dietary fat and cholesterol with a vegetarian diet.

Although interruption in vascular homeostasis results in CAD, WFPB nutrition is shown to interrupt and, in some cases, reverse the atherogenic process, by the positive effects

of polyphenols on endothelial cell function and thus limit platelet adhesion and aggregation which are responsible for acute coronary episodes resulting from plaque rupture (Patel et al., 2017). Studies by Esselstyn (2017), demonstrate restoration of endothelial cells with nitrous oxide production by the implementation of a WFPB nutrition. The repair of the endothelial cell with nitric oxide production, leads to reversal of cardiovascular disease, decrease in morbidity and mortality, and decrease in expenditures to treat these cardiovascular conditions. WFPB nutrition should become one of the main vehicles used to address CVD and help control high blood pressure. Not only is plant-based nutrition positively correlated with improved cardiovascular function but also with reduced incidence, progression and risk factors (Williams & Patel, 2017). In addition, current Medicare expenditures of 58% for CVD would decrease, with a projection of almost 30% savings of the Medicare budget resulting from embracing plant-based and healthier diets (Williams & Patel, 2017).

On a global level, several populations in various parts of the world have been observed and studied, as researches have been intrigued by low incidences of cardiovascular disease among certain international populations. The renowned Cornell China Study has very strong findings that CAD was significantly uncommon and almost non-existent in areas of rural mainland China and Taiwan where animal-based eating lifestyles were minimal or virtually non-existent (Campbell, Parpia, & Chen, 1998). The much studied “blue zones” are geographical locations which have the highest concentrations of centenarians (Mishra, 2009). These populations of centenarians have several basic factors in common, one of which is having a plant-based diet and an extremely low incidence of cardiovascular disease - these areas are

Sardinia, Italy; Loma Linda, California; Nicoya Peninsula in Costa Rica, and Okinawa Island in Japan (Mishra, 2009).

Definition of Terms

Cardiovascular Disease (CVD)

Cardiovascular disease is a generalized term encompassing a variety of heart and blood vessel problems. These diseases include but are not limited to heart failure, heart attack, ischemic stroke and arrhythmia (American Heart Association, 2017).

Coronary Artery Disease (CAD)

Coronary artery disease is a condition resulting in narrowing of coronary arteries due to formation of atherosclerotic plaque, plaque rupture or possible spasm. The result is hypoperfusion of blood to the heart due to the narrowing of the coronary arteries (Sanner, 2017).

Cardiovascular Risk Factors (CVRF)

Cardiovascular risk factors are conditions that increase the likelihood of an individual having cardiovascular disease. Some risk factors cannot be changed such as increasing age, gender (males) and race. Other risk factors can be modified and better controlled, such as certain blood levels, blood pressure, physical inactivity, obesity and diabetes (American Heart Association, 2017).

Whole Food Plant-Based (WFPB)

Whole food plant-based nutrition consists of plant-based whole foods which provide necessary macronutrients (carbohydrate, proteins, & fats), micronutrients which provide vitamins and minerals, and bioactive substances which provide flavonoids, plant sterols and polyphenols, all of which includes vegetables, fruits, whole grains, nuts, seeds, legumes, herbs and spices

(Hever & Cronise, 2017; Patel et al., 2017). By definition, this style of eating emphasizes green leafy vegetables, fruits; is low in salt, fat, cholesterol, sugar; and minimizes processed foods, oils, added sugars, dairy products and animal protein; processed foods refer to refined carbohydrates such as white flour, white sugar, oils (Hever & Cronise, 2017; Patel et al., 2017).

Provider Recommendations and Patient Education

Why Providers Do Not Recommend Whole Food Plant-Based Eating

Lack of nutrition education and training. Improving population health and curbing the global public health problem of CVD through nutrition practices is critical in achieving and maintaining improved wellness (Al-Muammar, 2012). Healthcare providers are acknowledged by communities, patients and society as a very credible source of medical information and have the ability to be a strong catalyst for implementing healthy lifestyle changes for many individuals (Al-Muammar, 2012). Several studies have shown that there is inadequate practice among primary care providers for nutritional counseling, management and therapy (Al-Muammar, 2012). Although physicians /residents and medical students indicated the importance of nutritional counseling and diet as paramount in health maintenance and disease prevention, Al-Muammar (2012) and Vetter, Herring, Sood, Shah and Kalet (2008) found that providers generally rated themselves as being poor and inadequately prepared to provide nutritional counseling to their patients. A survey conducted in 2010, revealed a decline of nutrition education in medical schools from 35% in 2000 to 25% in 2008, with an average of not quite 20 hours of nutrition education being provided (Kris-Etherson et al., 2014). Nutrition education was emphasized as an essential component of a healthy lifestyle, which is one of the many determinants of health, as defined by Healthy People 2020 (Kushner et al., 2014).

Culture and medical practice. In general, our society has a culture of pre-set and pre-conditioned biases, based on what individuals were taught growing up in the United States. In addition, traditional practice by the medical community is the premise that CVD is a condition, which gradually presents with age and is treated primarily with pharmaceuticals (Lome, 2019). Part of this practice is due to the lack of understanding of evidence-based nutrition research and having this research translated into practice. It is not uncommon for providers who do make concerted efforts to counsel their patients with nutrition education to become frustrated with non-compliance. Approximately 80% of information provided verbally is forgotten immediately; about 50% of what is remembered is misunderstood; roughly 10% is understood correctly-this also results in provider frustration. In addition, financially, time constraints in daily primary care settings make it difficult for providers to spend adequate time with patients on this critical subject of WFPB nutrition (Lome, 2019).

Benefits of Provider Education

The ultimate goal in treating individuals at risk for or with CVD, is to improve nutritional health and wellbeing- not only for these individuals, but for the public at large, both at population and individual levels, with measurable health outcomes (Crowley, Laur, Carter, Jones, & Ray, 2018). As previously mentioned, healthcare providers are highly respected and a reliable source of information and treatment (Al-Muammar, 2012). When providers are presented with valuable, evidence-based research around WFPB nutrition, the goal of improving health and wellness in our society will be a major stimulus and channel by which patients will be afforded more opportunities to embrace improved nutritional practices.

Benefits of Whole Food Plant-Based Lifestyle

Current WFPB Nutrition Recommendations

WFPB nutrition provides maximization of plant foods high in micronutrients, with the necessary macronutrients and bioactive compounds, while minimizing oils, animal foods (to include eggs and dairy products) and processed foods, to promote optimal body functioning (Patel et al., 2017; Tsu, Ismail, Ha, & Bartolotto, 2013; Wright, Wilson, Smith, Duncan, & McHugh, 2017). Macronutrients include proteins, fats and carbohydrates; micronutrients include vitamins and minerals, and bioactive compounds referred to polyphenols, flavonoids and plant sterols (Patel et al., 2017; Satija & Hu, 2018). This form of nutrition provides the advantage of eating to satiation without limitations of food quantities, improvements of chronic illness risk factors, and improvements in quality of life (Tsu, Ismail, Ha, & Bartolotto, 2013; Wright, Wilson, Smith, Duncan, & McHugh, 2017). WFPB nutrition focuses on and emphasizes the highest consumption of whole foods, meaning fruits, vegetables and whole grains, beans, legumes and seeds, while avoiding the ingestion of animal-derived ingredients (meats, eggs, dairy or fish products) (McDougall et al., 2014; Smith, 2018; Tsu, Ismail, Ha, & Bartolotto, 2013). Literature reveals some variation in opinion of plant-based nutrition, with Patel et al., (2017), and the American Heart Association (2017) indicating that it is beneficial to eliminate red meats and limit other animal meats to a couple of times per week. Plant-based nutrition, therefore, is an eating lifestyle where overall dietary intake of animal products, fat, cholesterol, salt, processed foods, oils and added sugars are almost entirely eliminated (Tsu, Ismail, Ha, & Bartolotto, 2013). Smith (2018) also relates that plant-based nutrition focuses on the intention of healthy nutrition, incorporates the highest consumption of whole fruits, vegetables, and whole

grains while staying clear of processed foods and animal products. Plant-based nutrition results in a reduction in risks of chronic illnesses (one being ischemic heart disease) and improvement and reversal in some cases of these chronic conditions (Tsu, Ismail, Ha, & Bartolotto, 2013).

Local Identified Problem

At the local medical center, over the past five years, educational offerings for primary care providers have been in the areas: developing and implementing patient aligned care team (PACT) model across all clinics, team building, process and priorities in primary care, care coordination and management, access to care, meeting strategies, patient centeredness, transition care management, pain management, whole health program training, mindfulness, and opioids. It is identified that there have not been any educational nutritional offerings on whole food plant-based nutrition recommendations for primary care providers to make to patients.

Stakeholders

The key stakeholders in this project are the primary care providers who practice in the clinic areas, the associate chief nurse of primary care clinics, clinic management, the nursing, dietary staff, the evidence-based practice committee; the committee for this QI, DNP project, composed of three graduate-level nursing instructors (one of whose primary role is the associate nurse of the primary care clinics at the Veterans Administration Medical Center, St. Louis, MO), overlooking this QI project, and the at risk or diagnosed CVD patients seen in the clinics. Interestingly, not only does there need to be buy-in from the providers participating in the QI project, but also the healthcare workers supporting the providers practice such as nurses, lab technicians and other multi-disciplinary staff at the clinics. Pharmacists, social workers, dieticians and front-desk workers also need to have buy-in to assist the provider in the continued

use of the practices learned from this QI project. The associate nurse of the primary care clinics along with the evidence-based practice committee oversees the organization and management of the QI process, continuing medical education (CME), and medical staff meetings at the healthcare facility discussed in this proposal. Additionally, the project committee members and the evidence-based practice committee are important since they have provided and continue to provide support and guidance in developing the entire project which includes the intervention and means of data collection described for this project. The support of these stakeholders will be required to reach the overarching purpose of this quality improvement project, which is to educate the providers in the primary care areas on the benefits of WFPB nutrition for patients with risk and incidence of CVD.

Purpose

Aims and Outcomes

The aims of this QI project are to educate primary care providers on the benefits of WFPB nutrition especially for patients at risk or with diagnosed CVD. The expected outcomes of this proposed intervention are improved knowledge of primary care providers on the benefits of WFPB nutrition and a desire of these providers to recommend or “prescribe” WFPB eating lifestyle to patients identified to be at risk for or already diagnosed with CVD. The purpose of this project is two-fold, to: 1) Increase provider knowledge base on whole food plant-based (WFPB) nutrition with evidence-based information; 2) Enhance providers’ intention to educate and “prescribe” WFPB nutrition lifestyle to patients who are at risk or diagnosed with CVD.

Study Question

In a setting of primary care providers, will a 20-minute PowerPoint presentation on whole food plant-based (WFPB) nutrition, improve the knowledge base of the providers and enhance their desire to “prescribe” WFPB recommendations to patients at risk and who already are diagnosed with CVD?

Theoretical and Process Frameworks and Synthesis of Evidence

Social Cognitive Theory (SCT)

Social cognitive theory (SCT), originally developed by Bandura (Rankin et al, 2017), is the theoretical framework which will be used to guide this quality improvement project. Social cognitive theory (SCT) comprises personal, behavioral and environmental factors to bring about an intention that will result in a changed behavior, which is underpinned by perceived benefit or risk of the behavior (Rankin et al, 2017). Additional factors such as social support, goal setting, self-monitoring and feedback are noted to enhance the learning experience taking place within SCT (Rankin et al, 2017).

Model for Improvement (MFI)

The framework guiding the process of this project, is the *model for improvement (MFI)*, a method of process improvement which was originated by the Institute for Healthcare Improvement (IHI) (IHI, 2019). This model of change, used extensively in health care QI projects, is composed of two parts (AHRQ, 2013). The first part incorporates three questions addressing the aims, measures and desired changes of the QI project; the second part consists of the cyclical process known as the Plan-Do-Study-Act (PDSA) cycle (IHI, 2019). The PDSA cycle of the MFI is a process, which will guide the implementation, measurement and

dissemination of change resulting from the QI project (IHI, 2019). This model and tool for a QI project, is a mechanism for maintaining focus and effectiveness while obtaining results.

MFI concepts. The first part of the MFI process establishes the foundation of the project by addressing three crucial areas. Setting the aims of the project, the first concept, underpins the intent of the project to bring about positive change. In setting the aims of the QI project, a specific population needs to be identified as well as a measurable and time-specific aim(s) (IHI, 2019). The second area is establishing measures (IHI, 2019). In this critical area, a determination of improvement is indicated by the results of the measures. It is important that the measures incorporate a strong balance in terms of outcome measures, process measures and balancing measures (IHI, 2019). The third concept in the MFI process is selecting changes - this stage is best achieved by identifying a specific idea for improvement and integrating the knowledge of that specific subject area in a way that will result in improvement (IHI, 2019). The blending of the specific ideas and incorporating the knowledge of these ideas, is imperative before moving the second part of the MFI process, the PDSA cycle (IHI, 2019).

PDSA cycle. The PDSA cycle is composed of four specific steps: *planning, doing, studying* and *acting*, a process used to test the identified change in the third concept, *selecting the change* (IHI, 2019). In the planning stage, the objective for the test is stated, the prediction of the test will be formulated, and a plan to test the change will be established (IHI, 2019). The doing phase of the cycle entails carrying out the test decided on in the planning stage, detailing any unexpected problems and observations, and initializing the analysis of the data (IHI, 2019). In the study stage, the analysis of the data is completed, the results are compared to the initial predictions and the data is summarized as to what has been ascertained from the test (IHI, 2019).

The final stage of the PDSA cycle, the action phase, allows for refinement of the change based upon test results from earlier stages of the cycle (IHI, 2019). All of these concepts are reflected in Figure 1.

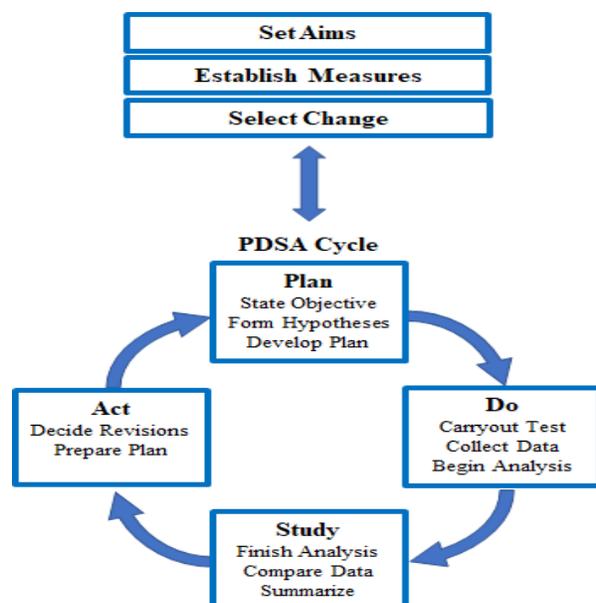


FIGURE 1. The concepts of the MFI process, with specific steps of the two stages and the PDSA process (IHI, 2019).

MFI Concepts in this QI Project

As this framework indicates, the first part of this MFI will help guide this QI project in forming the aims and establishing measures of this specific QI project and its intervention (AHRQ, 2013). Considering the first concept of the MFI, the aims of the project will be addressed by the question “What are you trying to accomplish?” (IHI, 2019). This project will evaluate the effectiveness of a 20-minute educational intervention on WFPB nutrition with the goal of improving the knowledge of providers on the cardiovascular benefits of this form of nutrition, with the intent of having providers make these recommendations to their patients with this diagnosis or who are deemed at risk. In establishing measures, the question of “How will we

know that a change is an improvement?” is addressed (IHI, 2019). For this project, improvement will be noted as positive if the providers addressed show an increased knowledge of WFPB nutrition recommendations, respond with some level of satisfaction to the educational presentation and if there is some level of increased self-reporting intention to recommend WFPB nutrition on the post-test vs the pre-test results. The third concept focuses on the question, “What changes can we make to that will result in improvement? In this QI project, the desired outcome is that the 20-minute presentation on WFPB nutrition will increase the intention of primary care providers to recommend this form of nutrition to patients with cardiovascular disease and to those at risk.

The second part of the MFI, which focuses on the PDSA cycle, will be the basis for the implementation and refinement of this QI project (IHI, 2019). The use of each of these parts of the PDSA cycle is further discussed. However, for the purposes of this project, only one cycle of the PDSA will be implemented. Step 1 - Plan: this concept of the cycle involves stating the objective, making estimations about the plan and determining a plan to implement (IHI, 2019). For this project, a 20-minute slide presentation was delivered to a group of primary care providers on WFPB nutrition recommendations for patients with cardiovascular disease or with cardiovascular risk factors. This presentation was given at a medical providers’ monthly staff meeting along with a pre-test and post-test survey, to evaluate the effectiveness of the presentation. Step 2 - Do: this step of the PDSA cycle was the actual 20-minute presentation of WFPB nutrition to the primary care providers. The pre- and post-test surveys were given, collected and initial data analysis began, as indicated (IHI, 2019). Step 3 - Study: After the data was collected (as noted in step 2), complete analysis was conducted, and the findings were

summarized (IHI, 2019). Descriptive statistical analysis was utilized to summarize the findings from this QI project. Subsequent sections of this paper, the methods section as well as the results and discussion sections will further specify and elaborate on the information gained in this section of the cycle. Step 4 - Act: This is the final step in the PDSA cycle, in which the intervention is fine-tuned to maximize further success. In this project there will only be one cycle of the PDSA. However, this cycle will be the catalyst for a second PDSA cycle and a subsequent QI project. In further sections of this paper, full results will be discussed to include project limitations.

In summary, the MFI is one of the most widely used processes in QI projects known to be widely used in QI projects (AHRQ, 2013). The concepts of this process are well substantiated in the literature and fit the use in this project as well.

Synthesis of Evidence

A comprehensive and extensive appraisal of peer reviewed and scientific literature related to CVD and benefits of WFPB eating lifestyle was conducted using a total of six literature searches, through a combination of the online medical databases that were utilized to conduct searches including Cumulative Index to Nursing and Allied Health Literature (CINAHL), and Medline (PubMed). Each of these searches was refined; only results with available full text and pertaining to this QI project were selected (Appendix D). The literature search also included peer-reviewed literature regarding medical providers and their training in nutrition and specifically in WFPB recommendations to patients with diagnosed CVD and those at risk. In addition, evidence-based written information was obtained from booklets, brochures

and educational material compiled by organizations and health care systems who have embraced and experienced the benefit of transitioning to a whole food, plant-based lifestyle.

Various terms and phrases were used in different combinations to conduct the searches, such as whole food plant-based, cardiovascular disease, hypertension, plant-based, diets, eating practices, medical training, physician training and nutrition. The search was restricted to articles in English, and inclusion of criteria was at five years, as well as at 10-year interval. Additional research journal articles (which reported studies more than 10 years ago) were utilized, due to the relevance and uniqueness of the studies as they related to plant-based nutrition. These were significant evidence-based studies, which addressed CVD in conjunction with plant-based nutrition. Terms ‘plant-based diets’ and ‘cardiovascular disease’ provided 30 results, and a total of 15 articles selected; ‘whole-food plant-based nutrition’ and ‘heart disease’ or cardiovascular disease’ with a five-year filter provided 148 results, 10 of which were selected, eliminating results which included chronic illnesses other than CVD or that were specific to other populations such as pediatrics. The author’s name ‘Esselstyn’ was searched providing four results, all of which were used, and the terms ‘nutrition’ and ‘medical education’ were used providing over 67 results, four of these articles were utilized (Appendix D).

Plant-Based Nutrition and CAD

Although the term *plant-based nutrition* in the literature lends itself, in some cases, to refer to varying degrees of consumption of animal foods (Khaleova, Levin, & Barnard, 2017; Satja & Hu, 2018), true WFPB nutrition refers to nutrition practices found to primarily focus on whole grains, fruits, vegetables, seeds, nuts, omega-3 fatty acids, non-starch vegetables and significantly limiting animal products, virtually no dairy products, refined foods or added fats

such as oils (Herver & Cronise, 2017; Smith, 2018; Tsu, Ismail, Ha, & Bartolotto, 2013). Nutrition practices which incorporate high levels of cholesterol, animal-based foods, oils, processed foods and sugars have been highly associated with damage to vascular endothelium, ultimately resulting in CVD (Esselstyn, 2017; Kahleova, Levin, & Barnard, 2017; Patel et al., 2017; Tsu, Ismail, Ha, & Bartolotto, 2013). On the opposite end of the spectrum, whole food plant-based nutrition, in randomized controlled trials has shown impressive results. In a cohort study using the Nurses' Health Study (NHS), 73,710 women from 1984-2012; NHS2, 92,329 women, 1991-2013, and the health professional follow-up study (HPFS), 43,259 men, 1986-2012, Satija et al. (2017) observed the associations of plant-based diet indices with coronary heart disease (CHD) incidence. Data pertaining to dietary intake was collected using a semi-quantitative food frequency questionnaire every 2-4 years (Satija et al., 2017). Results in this study showed that participants who had the healthier version of the plant-based foods not only had enhanced health outcomes but lower risk of CHD. In the BROAD study, Wright, Wilson, Smith, Duncan, and McHugh, (2017), randomized 65 participants from a single primary care practice where the individuals in the intervention group were placed on a WFPB program for a period of 12 months (Wright, Wilson, Smith, Duncan, & McHugh, 2017). After six and 12 months, individuals in the intervention group were noted to have a greater reduction in their BMI, cholesterol, decreased total medication use and improved quality of life (Wright, Wilson, Smith, Duncan, & McHugh, 2017). Other randomized studies have shown the use of WFPB nutrition resulted in arresting and in some cases reversing CAD (Esselstyn, Ellis, Medendorp, & Crowe, 1995; Esselstyn, Gendy, Doyle, Golubic, & Roizen, 2014; Ornish et al. 1990; Ornish et al., 1998). Interventions of WFPB nutrition in case reports and in short-term cohort studies have

demonstrated to provide relief of angina without additional cardiovascular procedures or medications (Massera, Zaman, Farren, & Ostfeld, 2015). Weight loss and a decrease in blood pressure, blood sugar and blood lipids have also resulted from use of WFPB nutrition (McDougall et al., 2014).

Provider Preparedness

Shifting to the other crucial element of this project, is addressing what was found in the literature regarding nutritional training for medical providers and their level of confidence for presenting these recommendations to patients. Reviews by Kris-Etherson et al., (2014) and Kushner et al., (2014) substantiate the historically minimal integration of nutrition training into medical school curriculum and summarize the urgent need to better equip health care providers to provide nutrition education to patients using best practices. In several studies, physician providers self-reported minimal nutrition recommendations were provided to patients. Vetter, Herring, Sood, Shah, and Kalet (2008) found that only 14% of 114 medical residents surveyed, deemed themselves adequately trained to offer nutritional recommendations to patients. Some 266 physicians participated in research by Al-Muammar (2011) in which only 7.9% self-reported that they were practicing all aspects of nutritional counseling and management with their patients. Krause and Williams (2017) conducted a pilot study with a convenience sample of 106 residents, fellows, attending physicians and students in a university setting, to assess their knowledge of plant-based nutrition. The research concluded that although several participants were aware of positive health benefits of plant-based diets, fewer were able to identify details of this form of nutrition (Krause & Williams, 2017). It was concluded that plant-based nutrition

education is essential, as it is recommended that physicians consider educating patients on plant-based nutrition (Krause & Williams, 2017).

METHODS

Design

The design of this quality improvement (QI) project is a non-experimental pre-test/post-test design, utilizing a convenience sample of primary care providers at a local facility in the metro St. Louis, MO area. This convenience group was used to assess the effectiveness and satisfaction of an approximate 20-minute educational intervention. The goal of the educational intervention was to improve provider knowledge and intent on “prescribing” /recommending WFPB nutrition lifestyle to patients who are either at risk for or already diagnosed with CVD. The use of this design and sampling method for this project was selected based on convenience of the population of primary care providers, and their interaction with a large population of patients with CVD diagnosis and risk factors, which will allow for data from this project to be obtained directly from the providers. The pre-test (Appendix A) and post-test (Appendix B) were used to collect quantitative data, to assess provider knowledge of WFPB nutrition, intention of making these recommendations to patients and satisfaction of the presentation. The post-test had an additional area for free texting, allowing the providers to make any suggestions for continued improvement. As the project director, I assigned conditions of the quality improvement, by defining the population, the elements to be utilized based upon the background information gathered, theoretical framework, evidence-based practices reviewed in the literature. Presentation of educational information included a PowerPoint presentation, and a laminated handout for quick reference when talking to patients, that participants were able to keep. This design is based

on the realization that adult learning involves visual, auditory, reading/writing, and kinesthetic (VARK) learning, to obtain optimal results in receiving and retaining information (Sanchez, 2018).

Setting

This project took place within the primary care provider monthly meeting, which is held once each month, at the local medical center. The primary care providers see patients in one of the seven primary care clinics. The primary care clinics serve veterans who reside in the greater St. Louis and metropolitan east areas. There are approximately 70 providers across all the clinics - approximately 50 physicians, 16 advance practice nurses and five physician assistants (PAs). The population served is military veterans, spanning an age range of 18 years to 104 years of age. Although the exact demographics are not known, this population is diverse in ethnicity, and includes many individuals with diagnosed or at risk for CVD. Interest has been shown by members of the Whole Health Integrative program at the Veteran's Medical Center, as well as by the Associate Chief Nurse of primary care clinics, and Department of Organizational Development and Leadership. The intervention was implemented at a primary care provider staff meeting in the summer of 2019, where all primary care providers were invited to attend. The Associate Chief Nurse of primary care clinics, Whole Health dietician and Department of Organizational Development and Leadership provided support of this project.

Participants

All providers working in the outpatient clinics associated with this facility were invited to participate in this project. Participation was solely voluntary. There are approximately 50 providers, which include physicians, advance practice nurses and physician assistants, all of

whom provide primary care services at these sites. Inclusion criteria was providers currently practicing at one of the primary care clinics sites. The goal target sample was 30% of the total primary care providers at the facility. Not all providers were available to attend the meeting on the day of the presentation and allowance was given for those who declined to participate.

Currently, as reported by the Associate Chief Nurse of the primary care clinics and the registered dietician who oversees the whole health component of the primary care clinics, there was buy in with regards to introducing benefits of WFPB nutrition lifestyle as it aligns with the facility's current quality improvement and whole health goals.

Data Collection

A quantitative pre- and post-test survey tool (Appendix A & B) was used for the primary data collection process for this quality improvement project and administered pre- and post- the educational presentation. The tool used was a modification of a Likert tool utilized by Krause and Williams (2017), in a study surveying medical providers in relation to their understanding of plant-based nutrition. This survey assessed specific aspects of the QI project to include satisfaction with the presentation topics, with the presentation's layout/flow, with the survey design, with the time length of the presentation. In addition, the pre-test included questions inquiring about knowledge of WFPB nutrition particularly regarding CVD. The pre- and the post-test survey also inquired about the providers' comfort level in recommending a WFPB eating lifestyle to a patient. The post-test included a free text box to allow participating providers to make suggestions. The pre- and post-tests were administered without any input from any individual in supervisory staff role in relationship to the providers.

The survey was tested prior to the beginning of the project to ensure content and face validity appropriateness. Content validity ensures that the questionnaire has adequate ability to cover relevant topics related to the concept to be measured (Trakman, Forsyth, Hoye, & Belski, 2017), in this case the knowledge of the benefits of whole plant-based foods as related to CVD. Face validity measures and ensures the items of a questionnaire are an adequate reflection of the concept to be measured (Trakman, Forsyth, Hoye, & Belski, 2017).

Data Collection Process

This project took place on a mutually agreed upon date and time between this author and the facility coordinators, for the providers' medical staff meeting. One month and again one week prior to the medical staff meeting, registered dieticians (RDs) at each of the clinic locations were contacted to inform of the project and to review the process of distributing the hard copy of the pre- and post-tests before and after the presentation and the collection process of the pre- and post-tests. At the beginning of the presentation, an explanation of the quality improvement project was given, as well as an invitation to the providers to participate in the survey collection, by the DNP student completing this quality improvement project. A disclaimer was attached to each pre-test distributed (Appendix C), and the disclaimer was verbally summarized. All surveys were secured in a manila envelope and handed directly to the DNP student after the presentation. Data from the surveys were entered into Qualtrics at a later date and the hard copies then shredded and destroyed. There was no identifying data collected.

Data Analysis

Data was collected and analyzed using descriptive statistics. Likert scale results and survey question results were collected, tabulated and reported, presenting information obtained.

A comparison of pre-test with comparison of post-test results, on knowledge of whole plant-based foods and lifestyle, to include health benefits were obtained and reported. Histograms were utilized, and conclusions, inferences and recommendations were made as a result. An executive summary report was presented to the facility as well as other stakeholders.

Ethical Considerations

Ethical considerations must be taken into consideration. The population studied in this QI project were not an at-risk population, nevertheless, respect, autonomy, beneficence and justice were all addressed. Respect was implemented by ensuring that autonomy was maximized by offering all participating providers a disclosure form allowing them to understand the project and to voluntarily participate. Due to participation being voluntary, participants had the option of withdrawing at any time without penalty. Respect was further maintained by collecting non-identifying, demographic information to maintain participant privacy and identity. It was also important to consider the ethical principle of beneficence. The benefits of a brief educational intervention far outweigh any risks. No identifiable information was collected, and data was kept protected. Finally, the principle of justice was also considered and maintained in this project by having an unbiased sample selection of participants. All primary care providers were invited to participate. In addition, the sample selected benefited from the intervention given in the QI project. Lastly, site approval and University of Arizona (UA) Institutional Review Board (IRB) review was obtained before implementing this project (Appendix F).

RESULTS

Participants

Thirty-three primary care providers attended the monthly primary care providers' staff meeting. The exact breakdown of roles is uncertain since not all providers participated in completing the pre- and post-tests. Of those who participated, 16 were physicians, six were advanced practice nurses and three were physician assistants. Fourteen of the participants indicated they have been in practice for greater than 15 years, three indicated they have been in practice for 11-15 years, one for 6-10 years and seven indicated that they have been in practice for 1-5 years. None of the participants were in practice for less than 1 year. Graphic illustrations of these results can be seen in Figure 2 and Figure 3.

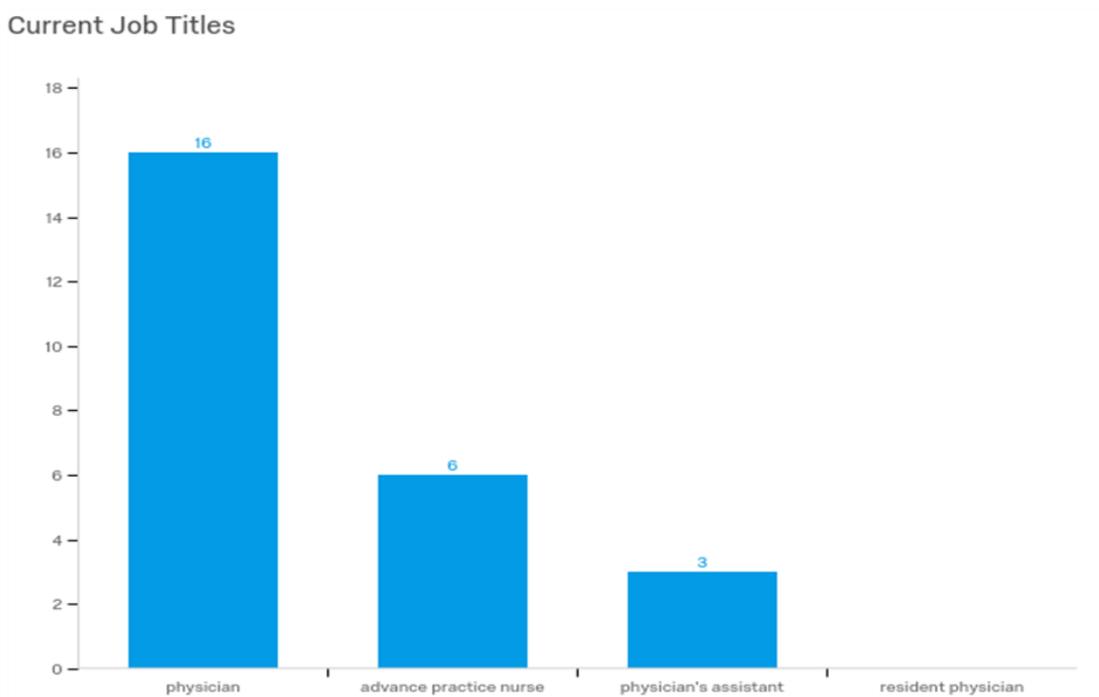


FIGURE 2. Job title of participants.

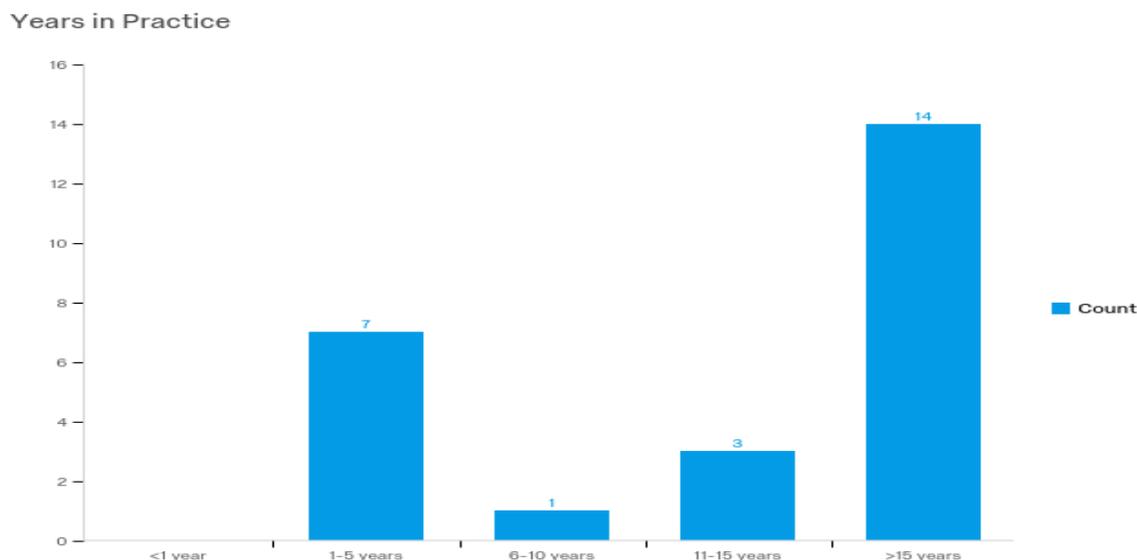


FIGURE 3. Years in practice.

Pre-Test

The 25 participants answered all questions on the pre-test. There were 19 questions on the pre-test; two multiple choice which assessed non-identifiable demographics, four multiple choice questions assessed definition of WFPB nutrition, one multiple choice question to assess time to educate a patient on WFPB nutrition, and one self-evaluation question on adopting a plant-based diet. The remainder of the pre-test questions were self-rated on a five-point Likert scale with '1' being a more positive value and '5' being more negative value. Participants were asked to rate their knowledge WFPB guidelines on obtaining sufficient protein, avoidance of processed foods, avoidance of dairy, inclusion of animal products, oil, eggs, complex carbohydrates, encouragement of nuts, legumes, dark green leafy vegetables, possibility of plant-based nutrition treating cardiovascular disease, animal proteins and quality protein sources, the safety of a plant-based diet in health promotion, and the use of plant-based diets to reverse some degree of cardiovascular disease.

Among the 25 participants, 92 % (n=23) answered correctly for the description of a WFPB diet. 36% (n=9) participants indicated it would take five minutes to educate a patient on WFPB nutrition and 64% (n=16) indicated it would take 50 minutes. Some 60% (n=15) of the participants said they would recommend a WFPB diet to their patients and 40% (n=10) indicated that maybe they would make this recommendation. And 44% (n=11) of participants stated they would consider adopting a WFPB diet themselves and 56% (n=14) stated they would for only a short time. Self-rated knowledge on WFPB guidelines and information related to sufficient protein, processed foods, use of dairy, animal foods, oil, eggs, complex carbohydrates, nuts and legumes, dark green leafy vegetables; WFPB diets in regards to treating/preventing chronic diseases ,particularly heart disease, animal proteins being quality proteins, plant-based diets being safe and health promoting and long term use of plant-based diet being able to reverse some degree of cardiovascular disease were measured on a five-point Likert scale, with '1' being a more negative value and '5' being more positive. See Table 1 for multiple-choice pre-test and post-test comparative results. See Table 2 for Likert scale pre-test results.

Post-Test

Like the pre-test, all questions were answered on the post-test by 25 of the participants. The same four multiple choice questions on the pre-test assessing knowledge - definition of WFPB nutrition, time to educate a patient on WFPB nutrition and self-evaluation of adopting a plant-based diet were on the post-test. The remainder of the post-test questions were identical to the pre-test questions of self-rated knowledge of WFPB guidelines on obtaining sufficient protein, avoidance of processed foods, avoidance of dairy, inclusion of animal products, oil, eggs, complex carbohydrates, encouragement of nuts, legumes, dark green leafy vegetables,

possibility of plant-based nutrition treating cardiovascular disease, animal proteins and quality protein sources, the safety of a plant-based diet in health promotion, and the use of plant-based diets to reverse some degree of cardiovascular disease, on a five-point Likert scale with '1' being a more positive value and '5' being more negative.

Among the 25 participants, 100% (n=25) answered correctly for the description of a WFPB diet. Some 60% (n=15) participants indicated it would take five minutes to educate a patient on WFPB nutrition and 40% (n=10) indicated it would take 50-minutes. And 76% (n=19) participants said they would recommend a WFPB diet to their patients and 24% (n=6) indicated that maybe they would make this recommendation. Also, 64% (n=16) of participants stated they would consider adopting a WFPB diet themselves and 36% (n=9) stated they would for only a short time.

All 25 participants completed self-rated knowledge on WFPB guidelines and information related to sufficient protein, processed foods, use of dairy, animal foods, oil, eggs, complex carbohydrates, nuts and legumes, dark green leafy vegetables; WFPB diets in regards to treating/preventing chronic diseases, particularly heart disease, animal proteins being quality proteins, plant-based diets being safe and health promoting and long term use of plant-based diet being able to reverse some degree of cardiovascular disease were measured on a five-point Likert scale with '1' being a more positive value and '5' being more negative (Table 3). Questions 20 and 21 evaluated self-acquired knowledge from the presentation and comfortability in recommending WFPB nutrition to patients. Satisfaction of the educational intervention was measured through questions 22-23 of the post-test, including satisfaction with content and length

of the presentation and whether or not the intervention was useful in improving knowledge.

These questions also used a five-point Likert scale.

Free Text Responses

As part of the post-test, there was area to allow for free text responses. Six participants gave a free text response. The responses were as follows: “Patients on limited income can’t do this, expensive,” “Please provide recipes,” “I have been encouraging PB diet for years,” “Has a plant-based diet to treat many chronic diseases been evaluated by the FDA?” Some of the statements overstated relationships as casual, “I wonder if the stats on Norway was skewed- older men were killed thus did not die of heart diseases. How was this factored in?”

Comparison

To complete the data analysis of this QI project, a comparison of the pre-test and post-test outcome measurements was performed. Questions 20 and 21 evaluated self-acquired knowledge from the presentation and comfortability in recommending WFPB nutrition to patients. There were no comparative measurements for these questions.

TABLE 1. *Pre-test and post-test multiple choice question comparisons.*

	Pretest	Posttest	Percent of Improvement
Definition of WFPB nutrition	92%	100%	8%
Time to educate a patient	36%	60%	24%
Would you make recommendation of WFPB nutrition to patients?	60%	76%	16%
Would you consider adopting a WFPB diet for yourself?	40%	64%	24%

TABLE 2. *Likert scale results – pre-test.*

(n=25 for all questions)	Strongly Agree (%)	Agree (%)	Not Sure (%)	Disagree (%)	Strongly Disagree (%)
You cannot get enough protein on a plant-based diet.	4	16	4	60	16
Processed foods are to be avoided in a plant-based diet.	16	80	4	0	0
Dairy is encouraged on a plant-based diet	4	24	40	32	0
Animal foods are limited or excluded from plant-based nutrition.	8	76	0	16	0
Oil is encouraged in a plant-based diet.	4	56	8	32	0
Eggs are limited or excluded from a plant-based diet.	0	32	40	24	4
Complex carbohydrates are discouraged in a plant-based diet.	8	36	12	28	16
Nuts and legumes are high in protein and are encouraged on a plant-based diet.	48	48	0	4	0
Dark, green, leafy vegetables, fruits, vegetables, nuts, seeds and cocoa are high in nitric oxide.	28	32	20	16	4
A plant-based diet can prevent and treat many chronic diseases, particularly CVD.	20	52	20	4	4
Animal proteins are the only quality protein sources.	4	0	8	60	28
A plant-based diet is safe and health promoting diet.	16	72	0	8	4
Longer-term use of a plant-based diet in some cases reverse some degree of CVD.	16	72	8	0	4

TABLE 3. *Likert scale results – post-test.*

(n=25 for all questions)	Strongly Agree (%)	Agree (%)	Not Sure (%)	Disagree (%)	Strongly Disagree (%)
You cannot get enough protein on a plant-based diet.	8	12	0	52	28
Processed foods are to be avoided in a plant-based diet.	40	48	0	8	4
Dairy is encouraged on a plant-based diet	4	24	16	44	12
Animal foods are limited or excluded from plant-based nutrition.	28	60	4	8	0
Oil is encouraged in a plant-based diet.	0	20	16	52	12
Eggs are limited or excluded from a plant-based diet.	24	60	8	8	0
Complex carbohydrates are discouraged in a plant-based diet.	16	36	4	28	16
Nuts and legumes are high in protein and are encouraged on a plant-based diet.	48	48	4	0	0
Dark, green, leafy vegetables, fruits, vegetables, nuts, seeds and cocoa are high in nitric oxide.	48	36	8	8	0

TABLE 3 – *Continued*

(n=25 for all questions)	Strongly Agree (%)	Agree (%)	Not Sure (%)	Disagree (%)	Strongly Disagree (%)
A plant-based diet can prevent and treat many chronic diseases, particularly CVD.	36	48	8	8	0
Animal proteins are the only quality protein sources.	8	12	8	36	36
A plant-based diet is safe and health promoting diet.	40	48	8	4	0
Longer-term use of a plant-based diet in some cases reverse some degree of CVD.	36	48	16	0	0

DISCUSSION

As previously stated, the purpose of this QI project was to improve the primary care provider knowledge on WFPB nutrition and increase their desire to recommend this nutrition style for patients who are at risk or diagnosed with CVD. An educational PowerPoint presentation on an overview of WFPB nutrition and benefits for individuals at risk or diagnosed CVD, along with providing a teaching card with visual aids was presented to 33 providers during the monthly primary care provider meeting. Some 25 of the participants filled out a pre-test and post-test, and the results of these surveys and the QI project are discussed below.

Participants and Variables

Participants

Physicians, physician assistants and nurse practitioners were all represented in this QI project. Out of the 25 participants, 16 were physicians (n=16), six were advance practice nurses (n=6), and three were physician assistants (n=3). Out of the 25 providers, 14 had been practicing for more than 15 years, three had been in practice for 11-15 years, one had been in practice for 6-10 years, and seven had been in practice for 1-5 years. There were no participants who had been in practice for less than one year. The varied professional roles and varied years of practice

demonstrates that the sample used in this project not only had a strong base of clinical knowledge but also many years of clinical experience. These aspects add diversity to the project's sample.

Knowledge

Knowledge regarding the definition of a WFPB diet, time to educate a patient, multiple specific aspects of WFPB nutrition were assessed on the pre-test and post-test. After the educational presentation, there was an 8% increase in identifying the correct definition of WFPB nutrition. The time determined to educate a patient had 24% increase. There was a 16% increase in the intent to recommend a WFPB diet to patients, and a 24% increase in the area of self-consideration of using a WFPB diet. The 13 additional questions addressing specific aspects of WFPB nutrition were evaluated on the pre-test and the post-test. The overall mean score for these questions as an aggregate improved from 3.68 to 44.96, representing an 11.23% increase in the overall knowledge of WFPB nutrition.

It is impressive that areas of improvement between the pre-test and the post-test were noted in the description of WFPB nutrition, time to educate a patient, self-consideration of a WFPB diet, obtaining sufficient protein on a WFPB diet, intake of dairy, minimizing animal foods, intake of oil, intake of eggs, increase intake of foods high in nitric oxide and using plant-based diets for treating chronic illness and CVD. The areas addressing avoiding processed foods, knowledge of animal proteins, longer use of WFPB nutrition for disease improvement were noted to show declined results on the post-test. The three areas addressing use of complex carbohydrates, using nuts and legumes and of a plant-based diet being safe and healthy remained the same percentage of answers on both the pre-test and the post-tests.

On the pretest, 92% of participants accurately described the correct definition of WFPB nutrition as compared to 100% on the post-test. 36% of participants indicated it would take five minutes to educate a patient on WFPB nutrition on the pre-test, as compared to 60% on the post-test; similarly, 60% of participants compared to 76% participants on the pre- and post-test indicated that they would recommend a plant-based diet to current or future patients, and 40% of participants indicated they would consider adopting a plant based diet for themselves on the pre-test as compared to 64% of participants on the post-test (Table 1).

The actual outcome measures for the five-point Likert scale are listed below. Each percentage represents the total number of combined values of either '4' and '5,' or '1' and '2,' for the pre-test and post-test respectively: obtaining sufficient protein on a WFPB diet - 76%, 80%; avoidance of processed foods - 98%, 88%; intake of dairy - 32%, 56%; intake of animal products - 84%, 88%; intake of oil - 32%, 64%; intake of eggs - 32%, 84%; intake of complex carbohydrates - 44%, 44%; protein content of nuts and legumes - 96%, 96%; recognizing foods high in nitric oxide - 60%, 84%; use of plant-based diets for treating chronic illness and CVD - 72%, 84%; quality protein sources - 88%, 72% (it was desirable to see a decrease in this result); plant-based diets are safe and health promoting - 88%, 88%; long-term use of a plant-based diet to reverse some degree of CVD - 88%, 84% (Table 4).

TABLE 4. *Likert scale pre-test and post-test percentage outcome measures.*

Criteria	Pre-test	Post-test	Percent of Change
Obtaining sufficient protein on a WFPB diet	76%	80%	4%
Avoidance of processed foods	98%	88%	-10%
Intake of dairy	32%	56%	34%
Intake of animal products	84%	88%	4%
Intake of oil	32%	64%	32%
Intake of eggs	32%	84%	52%
Intake of complex carbohydrates	44%	44%	0%
Protein content of nuts and legumes	96%	96%	0%
Recognizing foods high in nitric oxide	64%	84%	20%

TABLE 4 – *Continued*

Criteria	Pre-test	Post-test	Percent of Change
Use of plant-based diets for treating chronic illness and CVD	72%	84%	12%
Quality protein sources	88%	72%	-16%
Plant-based diets are safe and health promoting	88%	88%	0%
Long-term use of a plant-based diet to reverse some degree of CVD	88%	84%	-4%

This demonstrates overall effectiveness in the presentation of increasing the knowledge of primary care providers and intent to recommend WFPB nutrition for patients at risk or diagnosed with cardiovascular disease. In the areas where there was no change and a decrease in rating on the post-test as compared to the pre-test, it is possible that there was either unclear or insufficient information presented during the presentation, or that the participants simply did not agree. There were specific slides in the presentation, which addressed avoiding processed foods and complex carbohydrates, knowledge of animal proteins, and longer use of WFPB nutrition for CVD improvement. Evidence-based research in the form of randomized control trial studies was presented during the presentation, which demonstrated how plant-based diets have been used safely to treat chronic illness and CVD, where improved health outcomes resulted.

Increased Knowledge

A series of post-test questions included a self-rating of knowledge of WFPB nutrition, ranging from a novice to an expert. No participants indicated a novice rating. Two participants (8%) gave themselves a rating of ‘limited knowledge,’ 22 (88%) participants gave themselves a ‘moderate amount of knowledge’ rating and one participant gave them self an ‘expert’ rating. This question was not given on the pre-test; therefore, it was not possible to compare a prior rating.

Comfortability

It was very impressive that 21 (84%) of participants indicated that after the presentation they were either ‘somewhat comfortable,’ or ‘extremely comfortable,’ in recommending WFPB nutrition to patients at risk or diagnosed with CVD. One (4%) participant indicated ‘very uncomfortable, two participants (8%) indicated ‘somewhat comfortable,’ and one (4%) participant indicated ‘neither comfortable nor uncomfortable.’

Satisfaction

Participants were asked to rate their satisfaction of the presentation, considering the contents and information as well as length of the presentation. Some 21 (84%) of participants were either ‘extremely satisfied’ or ‘somewhat satisfied.’ Two (8%) participants were ‘neither satisfied for dissatisfied’ and two (8%) participants were ‘somewhat dissatisfied. No participants indicated being ‘extremely dissatisfied.’

Usefulness of Presentation

Lastly, participants were asked to rate how useful the presentation was in improving their knowledge of WFPB nutrition particularly for individuals at risk of CVD or those already with this diagnosis. A combined 48% (12) of the participants indicated that the presentation was either ‘extremely useful’ or ‘very useful.’ And 44% (11) participants indicated that the presentation was moderately useful, 4% (one) indicated that it was slightly useful and one (4%) indicated that it was ‘not at all useful.’

Free Text Responses

Six free text messages were received in the “Additional Comment” section of the post-test. The comments were “Patients on limited incomes can’t do this, expensive,” “Please provide

recipes,” “I have been encouraging PB diet for years,” “Has a plant-based diet to treat many chronic diseases been evaluated by the FDA?” Some of the statements overstated relationships as casual and “I wonder if the stats on Norway was skewed - older men were killed thus did not die of heart diseases. How was this factored in?”

Comparison with Current Literature

The results of this QI project correlate well with findings in current literature, which indicates that often medical providers are not well informed of the benefits of WFPB nutrition as it relates to CVD, but education in this area is beneficial in providing information in ways that it will intimately be useful in educating patients. Similar to studies noted in the background and synthesis of evidence in this paper (Krause & Williams, 2017; Patel, Chandra, Alexander, Soble, & Williams, 2017), this QI project demonstrated that at brief educational presentation was overall beneficial and successful in improving actual and self-rated knowledge relating to WFPB nutrition to CVD.

Many specific aspects of WFPB nutrition specifically relating to CVD, which was addressed in this QI project are found to be strongly present in the current literature. Appleby et al., (1999) demonstrated positive correlations with significance, between the intake of animal products such as eggs and animal fats, as well as cheese, and mortality from ischemic heart disease. In a study by Petterson et al., (2012), results were significant where systolic and diastolic blood pressures were shown to be significantly lower in vegans and vegetarians as compared to omnivores. In addition, Tsu et al., (2013), shows the benefit of plant-based diets on heart disease and blood pressure, with possibility of minimizing the number of medications needed to manage various chronic illnesses. There is minimal research showing the providers

have been properly educated and informed so that they are able to convey these concepts to patients and other staff. Addressing issues, for example, such as time to educate patients on WFPB nutrition, how nitric oxide is obtained from foods, repair of endothelium from diet and specific food choices were not strongly documented in the literature. This QI project therefore assisted to fill in some of these gaps in presenting useful information regarding educating providers on benefits of WFPB nutrition to patients with CVD.

Strengths and Limitations

This QI project had several strengths. The project was presented at a monthly provider staff meeting, at which the primary care providers had an obligation to attend. This allowed providers to participate in the project without having to take additional time away from their daily schedules. The presentation was also at time that was convenient to the providers, thereby increasing their interest to listen to the presentation. The pre- and post-tests were given as hard copies and collected at the time of the presentation, thereby possibly increasing the number of participants, as opposed to requesting an electronic completion.

The sample size was small as well as being a convenience sample. The sample was from a single institution and voluntary, which could bias the results as the participants could individually have been motivated by interest and/or knowledge in nutrition. The presentation was given in person, however several of the participants were involved virtually. It was reported that some providers at remote sites did not attend the meeting. This presentation was also given in the month of July, when many providers are on vacation. Implications for further research include a larger sample size of a more diverse group of providers. Additional research would possibly gain insight into why some providers chose not to attend the monthly meeting. The focus of this

project was to address WFPB nutrition as it relates to CVD. Assessing the providers' knowledge of WFPB nutrition as it relates to other chronic conditions would also be advantageous to patients.

Conclusion

Overall, important findings in this QI project are that providers found the information presented useful, over 80% were not only satisfied with the information presented but also stated they were comfortable recommending WFPB nutrition to their patients at risk or diagnosed with CVD. Finding from this QI project also showed that minimal time is required to instruct patients on the benefits of WFPB nutrition. Recommendations for an additional cycle of PDSA could possibly include: 1) offer presentation to providers in other specialty outpatient areas, 2) conduct a retrospective study by reviewing charts for documentation of instruction of WFPB nutrition for patients with at risk or diagnosed CVD. There would be greater buy in if the registered nurses in the outpatient care areas were also instructed to partner with the providers to reinforce WFPB nutrition to patients. It needs to be mentioned that the teaching tool designed for this QI project was requested by the outpatient clinics, to be duplicated in mass, and was subsequently distributed to all of the outpatient clinics for patient instruction. Current literature shows that providers as a whole, are not given adequate training in order to better address nutritional benefits as relates to chronic disease (Kris-Etherton et al., 2014). Nutrition education is recommended to be standard in provider educational programs of especially in the light of the prevalence of chronic disease and the mortality of heart disease (Kushner et al., 2014).

APPENDIX A:
PRE-TEST

Pre-Test

1. What most accurately describes your current job title?
 - a. physician
 - b. advance practice nurse
 - c. physician's assistant
 - d. resident physician

2. How many years have you been practicing as a healthcare provider?
 - a. <1 year
 - b. 1-5 years
 - c. 6-10 years
 - d. 11-15 years
 - e. >15 years

3. Which of the following best describes a plant-based diet?
 - a. Primarily eats fruits, vegetables, whole grains, beans, nuts and seeds, with limited amounts of animal food products
 - b. Do not eat any meat (including red/white meat, fish), but DO eat other animal products (including dairy and eggs)
 - c. Eat all animal products
 - d. Do not eat red/white meat, but DO eat fish

4. How long do you expect it would take to educate a patient on a plant-based diet?
 - a. 5 minutes
 - b. 15 minutes
 - c. 30 minutes
 - d. 50 minutes
 - e. Other (please specify) _____

5. Would you recommend a plant-based diet to your current or future patients?
 - a. Yes
 - b. No
 - c. Maybe

6. Would you ever consider adopting a plant-based diet?
 - a. Yes
 - b. No
 - c. Maybe

For the following questions, please select the number (1-5) which most closely describes your position.

7. You cannot get enough protein on a plant-based diet
 1 Strongly Agree 2 Agree 3 Not Sure 4 Disagree 5 Strongly Disagree
8. Processed foods are avoided in a plant-based diet
 1 Strongly Agree 2 Agree 3 Not Sure 4 Disagree 5 Strongly Disagree
9. Dairy is encouraged in a plant-based diet
 1 Strongly Agree 2 Agree 3 Not Sure 4 Disagree 5 Strongly Disagree
10. Animal foods are limited or excluded from plant-based nutrition
 1 Strongly Agree 2 Agree 3 Not Sure 4 Disagree 5 Strongly Disagree
11. Oil is encouraged in a plant-based diet
 1 Strongly Agree 2 Agree 3 Not Sure 4 Disagree 5 Strongly Disagree
12. Eggs are limited or excluded from a plant-based diet
 1 Strongly Agree 2 Agree 3 Not Sure 4 Disagree 5 Strongly Disagree
13. Complex carbohydrates are discouraged in a plant-based
 1 Strongly Agree 2 Agree 3 Not Sure 4 Disagree 5 Strongly Disagree
14. Nuts and legumes are high in protein and are encouraged on a plant-based diet
 1 Strongly Agree 2 Agree 3 Not Sure 4 Disagree 5 Strongly Disagree
15. Dark green leafy vegetables, fruits, vegetables, nuts, seeds and cocoa are high in nitric oxide
 1 Strongly Agree 2 Agree 3 Not Sure 4 Disagree 5 Strongly Disagree
16. A plant-based diet can prevent and treat many chronic diseases, particularly CVD
 1 Strongly Agree 2 Agree 3 Not Sure 4 Disagree 5 Strongly Disagree

17. Animal proteins are the only quality protein sources

1	2	3	4	5
Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree

18. A plant-based diet is a safe and health promoting diet

1	2	3	4	5
Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree

19. Longer term use of a plant-based diet can in some cases reverse some degree of cardiovascular disease

1	2	3	4	5
Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree

APPENDIX B:
POST-TEST

Post-Test

1. Which of the following best describes a vegan diet?
 - a. Primarily eats fruits, vegetables, whole grains, beans, nuts and seeds, with limited amounts of animal food products
 - b. Do not eat any meat (including red/white meat, fish), but DO eat other animal products (including dairy and eggs)
 - c. Eat all animal products
 - d. Do not eat red/white meat, but DO eat fish

2. How long do you expect it would take to educate a patient on a plant-based diet?
 - a. 5 minutes
 - b. 15 minutes
 - c. 30 minutes
 - d. 50 minutes
 - e. Other (please specify) _____

3. Would you recommend a plant-based diet to your current or future patients?
 - a. Yes
 - b. No
 - c. Maybe

4. Would you ever consider adopting a plant-based diet?
 - a. Yes
 - b. No
 - d. Maybe

For the following questions, please select the number (1-5) which most closely describes your position.

5. You cannot get enough protein on a plant-based diet

1	2	3	4	5
Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree

6. Processed foods are avoided in a plant-based diet

1	2	3	4	5
Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree

7. Dairy is encouraged in a plant-based diet

1	2	3	4	5
Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree

8. Animal foods are limited or excluded from plant-based nutrition

1	2	3	4	5
Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree

9. Oil is encouraged in a plant-based diet

1	2	3	4	5
Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree

10. Eggs are limited or excluded from a plant-based diet

1	2	3	4	5
Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree

11. Complex carbohydrates are discouraged in a plant-based

1	2	3	4	5
Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree

12. Nuts and legumes are high in protein and are encouraged on a plant-based diet

1	2	3	4	5
Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree

13. Dark green leafy vegetables, fruits, vegetables, nuts, seeds and cocoa are high in nitric oxide

1	2	3	4	5
Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree

14. A plant-based diet can prevent and treat many chronic diseases, particularly CVD

1	2	3	4	5
Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree

15. Animal proteins are the only quality protein sources

1	2	3	4	5
Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree

16. A plant-based diet is a safe and health promoting diet

1	2	3	4	5
Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree

17. Longer term use of a plant-based diet can in some cases reverse some degree of cardiovascular disease

1	2	3	4	5
Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree

18. Following this presentation, how would you rate your knowledge on WFPB nutrition?

1	2	3	4	5
Novice		Some Experience		Expert

19. How comfortable are you prescribing WFPB nutrition to patients at risk or with diagnosed CVD?

1	2	3	4	5
Very Uncomfortable		Neutral		Very Comfortable

20. Following this presentation, how do you feel about the need to prescribe/recommend WFPB nutrition for individuals at risk or with diagnosed CVD?

1	2	3	4	5
Very Poorly		Neutral		Very Strongly

21. Is prescribing WFPB nutrition for individuals at risk or with diagnosed CVD?

1	2	3	4	5
Absolutely Not		It's Possible		Absolutely

22. How satisfied were you with the contents, information and length of the presentation?

1	2	3	4	5
Very Unsatisfied		Neutral		Very Satisfied

23. How satisfied were you with the Power Point layout and how it was presented?

1	2	3	4	5
Very Unsatisfied		Neutral		Very Satisfied

24. Do you agree or disagree with the following statement: "This presentation was useful in improving my knowledge on WFPB nutrition for individuals at risk or with diagnosed CVD prescription?"

1	2	3	4	5
Strongly Disagree		Neutral		Strongly Agree

Comments/Suggestions:

APPENDIX C:
DISCLOSURE FORM

DISCLOSURE FORM

Project Title: IMPROVING PRIMARY CARE PROVIDERS' KNOWLEDGE AND INTENT TO RECOMMEND WHOLE FOOD PLANT-BASED NUTRITION EDUCATION FOR PATIENTS WITH CARDIOVASCULAR DISEASE

You are being invited to participate in an educational quality improvement study being conducted by Gina Gardner, a Doctor of Nursing Practice student enrolled at the University of Arizona. Please read the information below to better understand the potential risks and how your responses will be utilized. Should you choose to participate your responses and personal information will be anonymous. Your participation in the study is voluntary and if you choose not to participate there will be no penalty or loss of benefit you may normally have. There are no costs or compensation for participants in this study.

The purpose of the study is to evaluate and improve the knowledge of primary care providers regarding Whole food plant-based nutrition for patients at risk and with diagnosed cardiovascular disease. With the knowledge gained from this study, providers' knowledge can be increased to recommend this form of nutrition to appropriate patients, as part of their treatment plan.

The project includes a survey with 19 questions for the pretest and 21 questions for the posttest and will take approximately 5 minutes to complete for each of the pre and posttests. There will also be a 15 to 20-minute presentation after taking the pre-test and prior to taking the post test. Participation is voluntary, and consent is implied by your participation. You may refuse or discontinue your participation at any time without penalty. If you decide to withdraw at any time prior to submitting the survey, your answers will not be recorded.

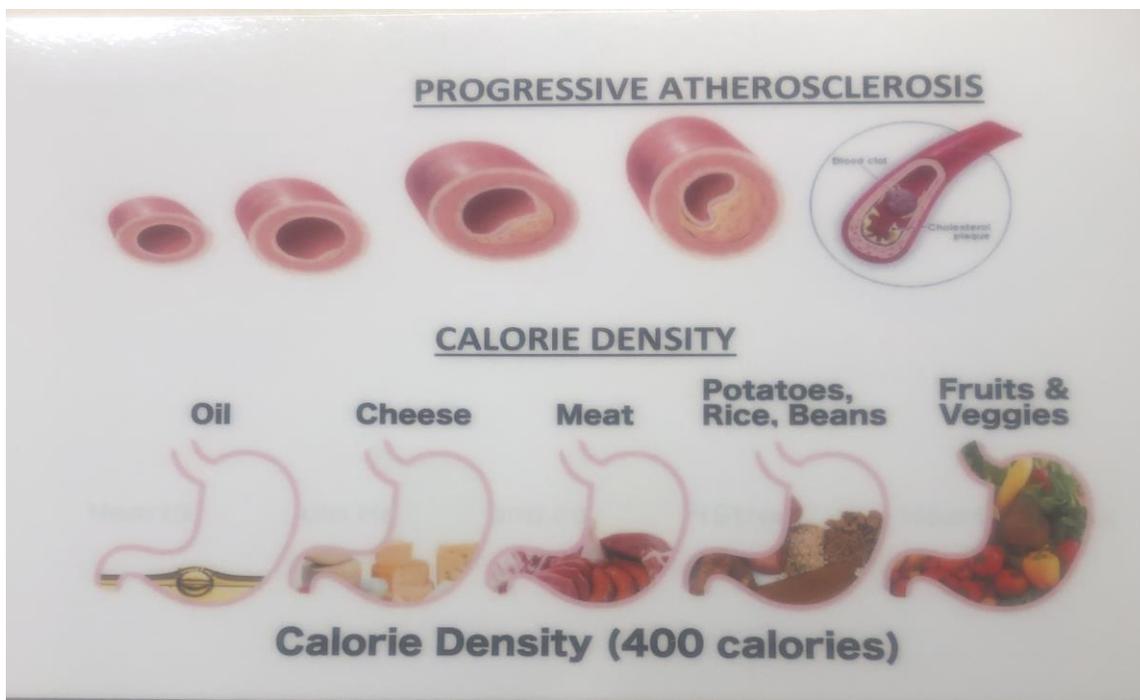
All responses will be kept confidential and analyzed in group form so that no personal information or responses are revealed. Only the PI and the advising committee will have access to the survey responses.

You may contact the Principal Investigator to tell her about a concern or complaint about this quality improvement project. Gina Gardner can be reached at (314) 583-4661. You may also contact the Principal Investigator's advisor, Lori Martin-Plank PhD, FNP-BC, NP-C, GNP-BC, FAANP at lorimartinplank@email.arizona.edu.

By beginning the survey, you acknowledge that you have read this information and agree to participate in this research survey, with the knowledge that you are free to withdraw your participation at any time without penalty.

APPENDIX D:
EDUCATIONAL CARD GIVEN TO PROVIDERS

Front of Card



Back of Card

100% WHOLE FOOD PLANT-BASED

Food Item	Protein	Calories
4 oz Beef	24 grams	320
4 oz Black Beans	24 Grams	120

RESOURCES

- "Forks Over Knives" DVD or on Netflix
- STL Plant Centered Living, <https://www.stlpcl.org>
- Webster Groves WFPB Support Group
- Contact Becky Burley @ 314-322-9262
- NutritionFacts.org, <https://nutritionfacts.org>
- Heartstrong.com, <https://www.heartstrong.org>
- Become Certified in plant-based nutrition
- American College of Lifestyle Medicine, <https://www.lifestylemedicine.org/>
- Physicians Committee for Responsible Medicine, <https://www.pcrm.org/>
- Dr. Esselstyn's Prevent & Reverse Heart Disease Program, www.dresselstyn.com

APPENDIX E:
SYNTHESIS OF EVIDENCE RESULTS

Evidence Appraisal Table

Reference	Research Question/ Objective	Study Design and Intervention	Sample and Setting	Methods for Data Collection and Data Analysis	Findings
Allen, N. B., Zhao, L., Lei L., Daviglius, M., Kiang L., Fries, J., ... Lloyd-Jones, D. M. (2017). Favorable cardiovascular health, compression of morbidity, and healthcare costs: Forty-year follow-up of the CHA Study (Chicago Heart Association Detection Project in Industry). <i>Circulation</i> , 135(18), 1693–1701. https://doi-org.ezproxy3.library.arizona.edu/10.1161/CIRCULATIONAHA.116.026252	To determine if favorable cardiovascular health is associated with longer, healthier lives or if favorable cardiovascular health only extends life at the cost of increasing morbidity and health care costs	Design: longitudinal prospective study Intervention: -cohort was followed for >40 years; final cohort for analysis included 25,804 individuals who were ≥65yrs of age by 2010, representing of all CHA participants	Sample: 39,522 men and women, 10-74 yrs. and employed in the Chicago area; Setting: City of Chicago, personal contact, National Death index data and linked Medicare files	Data was collected on demographic, medical history and medical treatment by questionnaire; measurement of height, weight, heart rate, casual blood pressure and ECG; also, collection of blood for measurement of serum total cholesterol and plasma glucose	Middle aged individuals with favorable cardiovascular health 5.6% of participants had favorable levels of all major cardiovascular risk factors at baseline, 19.0% had ≥1 elevated but no high levels; 40.3% had 1 high level and 35.1% had ≥ 2 high cardiovascular risk factors
Al-Muammar, M. (2012). Predictors of physicians' practices related to nutritional counseling and management in Riyadh City. <i>Alexandria Journal of Medicine</i> , 48(1), 67-74.	To investigate physicians' practices concerning nutritional counseling and management practice (NC&M) and to explore some determinants that predict such practices	Design: cross-sectional descriptive study Intervention: Investigation of physicians' practices concerning NC&M and explore determinants that predict these practices	Sample: N=266 Setting: 7 departments related to NC&M from 5 large hospitals	For a 4-month period, physicians were chosen from 7 departments related to NC&M from 5 large hospitals, to voluntarily participate in completing the survey which included questions related to- demographics, years of experience, training/sources, attitudes towards, beliefs, and practices of NC&M	Of 266 respondents, 7.9% reported they practiced all aspects of NC&M to include assessment, therapy and education for patients; 41% practiced only 1 of these aspects and 28% reported they did not practice any at all; 72% had poor nutritional knowledge
Bondonno, C., Croft, K., & Hodgson, J. (2015). Dietary nitrate, nitric oxide and cardiovascular health. <i>Critical Reviews in Food Science and Nutrition</i> , 56(12), 2036-2052, DOI: 10.1080/10408398.2013.811212	Objective to present an overview of nitric oxide (NO) & role in cardiovascular health; detail the observed vascular benefits of dietary nitrate intake through effects on NO status; discuss possible toxic effects of nitrate	Design: Review Intervention: NA	Sample: NA Setting: NA	Data collected from over 120 referenced articles	NO is critical in cardiovascular health; diets rich in vegetables provide cardioprotective effects resulting in improvements in BP, endothelial function, ischemia reperfusion injury, arterial stiffness, platelet function and exercise performance

Reference	Research Question/ Objective	Study Design and Intervention	Sample and Setting	Methods for Data Collection and Data Analysis	Findings
Campbell, T. C., Parpia, B., & Chen, J. (1998). Diet, lifestyle and the etiology of coronary artery disease: the Cornell China Study. <i>American Journal of Cardiology</i> , 82(10B): 18T-21T.	Investigate diet, lifestyle and disease mortality in populations in rural mainland China and Taiwan	Design: Non-experimental, longitudinal observational design Intervention: Collection of detailed dietary data, blood, urine and food samples	Sample: N=6500; 50 individuals were observed from each of 130 villages Setting: Rural China and Taiwan;	Blood, urine, food samples were collected from 50 adults in each of 130 villages in rural mainland China and analyzed for nutritional and toxic chemical factors	Fat intake in rural China was less than 50% of fat intake in the United States; animal protein intake was 10% of that in the United States; mean serum cholesterol level was 127mg/dL in rural China and 203mg/dL for adult in the United States;
Crowley, J. J., Laur, C., Carter, H.D., Jones, G., & Ray, S. (2018). Perspectives from the Third International Summit on Medical Nutrition Education and Research. <i>Frontiers in Public Health</i> , 6, 93.	Objective to build stronger evidence base to turn in to policy and practice, regarding whole system food, nutrition and health.	Design: Review Intervention: NA	Sample: NA Setting: NA	Data collected and presented at Third International Summit on Medical Nutrition Education and Research	Ultimate goal to improve population and individual health with measurable outcomes; focus of summit to impact policy for the full food system and implement behavioral changes for the public
Esselstyn, C. (2017). A plant-based diet and coronary artery disease: a mandate for effective therapy. <i>Journal of Geriatric Cardiology</i> , 14(3), 317-320.	Will WFPBN in severely ill patients with CAD halt or reverse CVD?	Design: Cohort study Intervention: Use of WFPBN in CAD patients	Sample: 18 Setting: Cardiologist's office setting	Volunteer participation to engage in WFPBN; follow up measurements via angiograms	17 of patients who adhered to WFPBN sustained no additional cardiac events over 12 yr. period of study; 1 patient returned to SAD after 6 years and required bypass surgery; analysis by observation in f/u out-pt visits
Esselstyn, C. B., Ellis, S. G., Medendorp, S. V., and Crowe, T. D. (1995). A strategy to arrest and reverse coronary artery disease: a 5-year longitudinal study of a single physician's practice	Measure coronary artery disease progression in patients and observe effectiveness of assisting patients achieve and maintain serum cholesterol levels below 150mg/dL	Design: longitudinal Intervention: Use of plant-based nutrition, <10% calories from fat; promotion of diet adherence through education and physician involvement vis support groups; individualized cholesterol lowering medication	Sample: n=22; volunteer, non-diabetic, non-hypertensive and non-smokers, ages 43-67yr; participants considered not to have immediately life-threatening coronary artery disease or who had declined or were not considered candidates for intervention by	-Data collected and measured was the coronary angiography and quantified with the percent diameter stenosis and minimal lumen diameter methods; serum cholesterol was measured biweekly for 5 years and monthly thereafter; participants' - results noted by arterial patency, change in individual lesions and overall change in disease status of each patient -cholesterol was analyzed by values at baseline, onset of medication and f/u; cholesterol data was averaged to provide a single value for each participant for the entire study period	- of 11 of the participants who remained in the study, all had decreased cholesterol levels from a mean baseline of 246mg/dL to below 150mg/dL -of 25 lesions, 11 regressed and 14 remained stable -results showed that in all 11 remaining participants, disease was clinically arrested with no new infarctions - after 10 years, 6 participants continued the diet with no further coronary events, and 5 resumed their pre-study diet with 10 reported 10 coronary artery events

Reference	Research Question/ Objective	Study Design and Intervention	Sample and Setting	Methods for Data Collection and Data Analysis	Findings
			their cardiologists Setting: Single physician's office practice; voluntary		
Esselstyn, C., Gendy, G., Doyle, J., Golubic, M., & Roizen, M. (2014). A way to reverse CAD? <i>The Journal of Family Practice</i> , 63(7), 356-364b.	This is a follow-up study of a larger patient population, after showing in a smaller population that plant-based nutrition achieved coronary artery disease (CAD) arrest and reversal; goal was to define the degree of adherence and outcomes of patient volunteers who received counseling to converted to plant-based nutrition	Design: Cohort study Intervention: Counseling to patients who desired to transition to whole food plant-based nutrition	Sample: 198 Setting: Out-patient clinic	Initial face to face contact, follow-up by phone to gather data; if participant was deceased, then data gathered from surviving spouse if possible; Criteria given to follow for adherence was examined	-Out of 177 adherent patients, 112 reported initial angina and 104 (93%) of these pts reported improved symptoms during follow-up -improved radiographic or stress testing in 39 (22%) of adherent CAD patients -27 pts with CAD were able to avoid PCI or CABG -avg wt. loss was 18.7 lbs.
Ference, B., Graham, I., Tokgozogl, L., and Catapano, A. L. (2018). Impact of lipids on cardiovascular health: JACC Health Promotion Series. <i>Journal of the American College of Cardiology</i> , 72(10), 1141-1156	Objective is to engage health care providers to assist individuals in achieving ideal cardiovascular health and enhance substantial prevention of cardiovascular disease; shift focus from treating disease to prevention of disease	Design: Review Intervention: NA	Sample: NA Setting: Health promotion series	55 references used	Main goal in maintaining optimal lipid levels is to keep circulating LDL levels low, therefore minimizing possibility of particles adhering to arterial wall and developing atherosclerotic plaques
Hever, J. and Cronise, R. J., (2017). Plant-based nutrition for healthcare professionals: implementing diet as a primary modality in the prevention and treatment of chronic disease. <i>Journal of Geriatric Cardiology</i> , 14(5): 355-368.	Demonstrate advantages for plant-based diets, being related to decreasing ischemic heart disease, hypertension, weight management and other chronic conditions	Design: Review Intervention: NA	Sample: NA Setting:	196 references used	Plant-based diets rich in vegetables, fruits, whole grains, legumes, nuts, seeds herbs and spices show a much lower risk of cardiovascular disease.
Jackson, J., Patterson, A., MacDonald-Wicks, L., & McEvoy, M. (2017). The role of inorganic nitrate and nitrite in CVD. <i>Nutrition Research Reviews</i> 30(2), 247-264.	Present supporting evidence of linkage of inorganic nitrate content to cardioprotective effects of plant -based foods	Design: Review Intervention: NA	Sample: NA Setting: NA	224 references used	Strong indications are shown for role of green-leafy vegetables and role in content of dietary nitrate in improving CVD risk factors

Reference	Research Question/ Objective	Study Design and Intervention	Sample and Setting	Methods for Data Collection and Data Analysis	Findings
Kent, L., Grant, R., Watts, G., Morton, D., Rankin, P., & Ward, E. (2018). HDL subfraction changes with a low-fat, plant-based Complete Health Improvement Program (CHIP). <i>Asia Pacific Journal of Clinical Nutrition</i> , 27(5), 1002-1009.	Objective to characterize HDL subfraction changes in individuals where HDL was lowered during the CHIP intervention, meaning a low-fat, plant-based diet and physical activity	Design: Intervention: 8 hr., volunteer, participant nutrition focused training via prerecorded lecture, cooking demonstrations and interactive group activities; measurements of ht, wt., & BP were taken at baseline and 30days; baseline taken for TC, LDL & HDL	Sample: n=22 Setting: Local community center	Significant decreases in HDL, BMI, fasting glucose, total cholesterol, LDL, SBP, with using the CHIP intervention; no significant change in triglycerides; noted inc in physical activity, consumption of whole plants; dec in animal foods and non-plant foods; also dec in small, intermediate and large HDL; measurements of ht,wt,	HDL decreases as individuals who transition to a low-fat, plant-based nutrition, low-fat, and physical activity -Smaller HDL subfractions dec w/plant-based eating and physical activity
Krause, A. J. and Williams K. A. (2017). Understanding and adopting plant-based nutrition: A survey of medical providers. <i>American Journal of Lifestyle Medicine</i> ,20(10), 1-7.	To determine the knowledge of medical community regarding plant-based nutrition and assess if participants would be willing to adopt or recommend this diet to patients	Design: Convience sample Survey Intervention: Survey using questionnaire	Sample: N=64 Physicians in an academic medical center setting Setting: university medical center setting	-individuals invited to voluntarily participate in completing 20 item study survey -x2 tests with 1 degree of freedom utilized for comparing frequencies of responses; responses of residents and fellows(combined) were compared with responses of attendings	- most participants indicated they were aware of the definition and health effects of plant-based nutrition -few participants were well versed in the details of this nutrition ->50% were open to maybe recommending this to patients
Kris-Etherton, P. M., Akabas, S. R., Bales, C. W., Bistran, B., Braun, L., Edwards, M. S., Laur, C., Lenders, C. M., Levy, M. D., Palmer, C. A., Pratt, C. A., Ray, S., Rock, C. L., Saltzman, E., Seidner, D. L., Van Horn, L. (2014). The need to advance nutrition education in the training of health care professionals and recommended research to evaluate implementation and	Objective is to evaluate current evidence-based models focused on nutrition and physical activity education for health care professionals	Design: Review Intervention:	Sample: NA Setting: NA		Health care professionals need to be better prepared to address nutrition- related aspects of chronic disease, as lifestyle challenges become more of a public health concern. Medical based nutritional instruction needs to become a standard in medical education programs.

Reference	Research Question/ Objective	Study Design and Intervention	Sample and Setting	Methods for Data Collection and Data Analysis	Findings
effectiveness. <i>The American Journal of Clinical Nutrition</i> , (99) 5,1153S-1166S.					
Kushner, R.F., Van Horn, L., Rock, C. L., Edwards, M. S., Bales, C. W., M. Kohlmeier, Akabas, S. R. (2014). Nutrition education in medical school: a time of opportunity, <i>The American Journal of Clinical Nutrition</i> , (99) 5, 1167S-1173S, https://doi-org.ezproxy4.library.arizona.edu/10.3945/ajcn.113.073510	Purpose is to provide innovative approaches for achieving excellence in medical nutrition education, as well as review current practices	Design: Review Intervention:	Sample: NA Setting: NA		It is imperative that nutrition education is integrated into the medical schools 4-year curriculum, especially in light of the prevalence of chronic disease; diet is an essential component of the health lifestyle; this must be accomplished as an inter- professional approach
Massera, D., Zaman, T., Farren, G. E., & Ostfeld, R. J. (2015). A Whole-Food Plant-Based Diet Reversed Angina without Medications or Procedures. <i>Case Reports in Cardiology</i> , 2015, 978906. http://doi.org/10.1155/2015/978906	Demonstrate how cholesterol guidelines are a critical component of cardiovascular disease risk reduction and health promotion	Design: case report Intervention: Whole food plant-based nutrition	Sample: 1 Setting: Out-pt setting	Educational instruction and adherence to WFPB nutrition; close monitoring and follow up of the following measures: BMI, BP, Total cholesterol, triglycerides, HDL, LDL and functional capacity	On a whole food plant-based diet over span of 2 years (with 4-month, 9 month and 1-year intervals), angina was reversed without medical or invasive therapy
McDougall, J., Thomas, L. E, McDougall, C., Moloney, G., Saul, B., Finnell, J. S, . . . Petersen, K. M. (2014). Effects of 7 days on an ad libitum low-fat vegan diet: The McDougall Program cohort. <i>Nutrition Journal</i> , 13(1), 1-7.	What effects does eating low fat, high-carbohydrate, moderate sodium, purely plant-based diet ad-libitum for 7days have on the biomarkers of cardiovascular disease and type 2 diabetes?	Design: Retrospective study Intervention: Dietary counseling, low-fat diet with minimal refined plant-based foods	Sample: 1,615 Setting: In-patient supervised residential program in local hotel	Subjects were recruited via internet marketing from a wide geographical area; given initial medical workup and seen by a medical doctor 2 more times during the 10 day program; Meals were prepared using prescribed guidelines, one of which was no animal derived ingredients; data was analyzed using Wilcoxon's signed -rank tests to compare baseline to 7 day values for all biomarker variables; Also McNemar's test for paired proportions was use to compare percentage of patients with normal biomarkers at baseline with elevated values at day 7	Weight loss was achieved for patients eating a high fiber, high carbohydrate, vegan diet who ate to feeling completely satisfied, over a 7-day period, as well as statistically significant decreases in total HDL, LDL, weight, BP, blood glucose creatinine and BUN.

Reference	Research Question/ Objective	Study Design and Intervention	Sample and Setting	Methods for Data Collection and Data Analysis	Findings
Ornish, D., Brown, S. E., Scherwitz, L. W., Billings, J. H., Armstrong, W. T., Ports, T. A., McLanahan, S. M., ...Gould, K., L., (1990). Can lifestyle changes reverse coronary heart disease? <i>Lancet</i> , 336(21), 129-133.	-determine if comprehensive lifestyle changes affect coronary atherosclerosis	Design: Prospective RCT, Intervention: 1 year of lifestyle changes	Sample: N=48 Setting: Physician's practice	Patients with documented CAD through angiography were randomly assigned to control or experimental group; experimental group was prescribed a lifestyle program which included low-fat-vegetarian diet, exercise and stress management classes; biweekly facilitated support meetings	Lesions >50% were analyzed- Intervention group: average percentage of diameter stenosis regressed from 61.1% to 55.8% after 1 year Control group: average percentage of diameter stenosis progressed from 61.4% to 64.4%. after 1 year
Ornish, D., Scherwitz, L. W., Billings, J. H., Gould, L., Merritt, T. A., Sparler, S., ...Brand, R. J. (1998). Intensive lifestyle changes for reversal of coronary heart disease. <i>JAMA</i> , 280 (23)	-to determine feasibility of patients to sustain intensive lifestyle changes for a total of 5 years and the effects of these lifestyle changes (without lipid-lowering drugs) on coronary artery disease	Design: RCT, invitational design Intervention: 1 year of lifestyle changes	Sample: N=48 Setting: Physician's practice	-patients with moderate to severe heart disease were randomized into an intervention group of intensive lifestyles change group, or control group of usual care -35 participants completed the 5-yr follow-up quantitative coronary arteriography	Intervention group: increased regression of coronary atherosclerosis after 5 years than after 1 year Control group: continued progression of coronary atherosclerosis and occurrence of > 2 time as many coronary events
Patel, H., Chandra, S., Alexander, S., Soble, J. Williams, K. A. (2017). Plant-based nutrition: An essential component of cardiovascular disease prevention and management. <i>Current Cardiology Reports</i> , (19)104.https://doi.org/10.1007/s11886-017-0909-zr	Objective is to discuss the role of plant-based nutrition as an adjunct to treatment and management of CVD	Design: Review Intervention: Review of 100 references	Sample: NA Setting: NA	NA	Consistent data has shown that Plant-based diets significantly decrease CVD risk factors; health care providers should seek to incorporate this discussion with patients into clinic visits
Salami, J. A., Valero-Elizondo, J., Ogunmoroti, O., Spatz, E. S., Rana, J. S., Virani, S. S., ... Nasir, K. (2017). Association between modifiable risk factors and pharmaceutical expenditures among adults with atherosclerotic cardiovascular disease in the United States: 2012-2013 Medical Expenditures Panel Survey. <i>Journal of the American Heart Association</i> , 6(6). e004996.	Examine associations between Modifiable Risk Factors (MRF) and pharmaceutical expenditures in a national representative population of individuals with established atherosclerotic CVD	Design: Retrospective study Intervention: Researchers merged the full year Medical Expenditure Panel Survey-Household Components (MEPS-HC), medical conditions and prescribed medicines files for 2012 and	Sample: n=4,248 Setting: Survey responders	Data collection via national survey, including non-institutionalized US individuals ≥ 40 years, with established ASCVD, as per ICD-9 codes or self-reported, BMI ≥ 18.5; public de-identifiable data files were used; Analysis was conducted using STATA 14 (Stata Corp); chi squared statistics were used to test for variations across different socioeconomic characteristics	Patients with ASCVD (regardless if had no CVD co-morbidities) with deteriorating MRF showed a strong association with higher annual pharmaceutical expenditures

Reference	Research Question/ Objective	Study Design and Intervention	Sample and Setting	Methods for Data Collection and Data Analysis	Findings
doi:10.1161/JAHA.116.004996		2013			
Satija A., Hu F.B. (2018). Plant-based diets and cardiovascular health. <i>Trends in Cardiovascular Medicine</i> , 28 (7), 437-441.	Provide overview of benefits to cardiovascular system as related to plant-based nutrition and incorporate clinical and public health applications	Design: Clinical review Intervention: NA	Sample: NA Setting: NA	NA	Plant-based diets have been greatly associated with overall improved cardiovascular profile and lower risk of CVD; Supplements and fortified foods will provide adequate levels of nutrients such as vitamin B12 and Vitamin D; differences in cultural preferences can be addressed with the wide variety of plant-based foods, herbs and spices;
Satija, A., Bhupathiraju, S. N., Spiegelman, D., Chiuve, S. E., Manson, J. E., Willett, W., Rexrode, K. M., Rimm, E. B., Hu, F. B. (2017). Healthful and unhealthful plant-based diets and the risk of coronary heart disease in U.S. adults. <i>Journal of the American College of Cardiology</i> , 70, (4), 411-422.	Objective was to examine associations between plant-based diet indices and CHD incidence.	Design: Prospective cohort study Intervention: -graded plant-based indices were used to observe the associations of these indices with CVH incidence in over 200,000 men and women health professionals in the United States	Sample: 3 cohorts, total of 209,298 subjects Setting:	-graded plant-based indices were used to assess lifestyle, health behaviors and medical history using a questionnaire every 2 years; -exclusions were individuals with CVD at baseline, with cancer (except non-melanoma skin cancer), stroke, coronary artery surgery at baseline	In-take of a plant-based diet index rich in healthier plant foods is correlated with significantly lower CVD risks, however a plant-based diet index with less healthy plant foods is associated with higher CVD risks
Tousoulis, C., Kampoli, A., Papageorgiou, C. T. N., and Stefanadis, C. (2012). The role of nitric oxide on endothelial function. <i>Current Vascular Pharmacology</i> 10(4). https://doi.org/10.2174/157016112798829760	Relate the role of nitric oxide on the endothelium and the relationship of nitric oxide to vasodilation and inflammation on the coronary arteries	Design: Review Intervention: NA	Sample: NA Setting: NA	NA	A greater understanding and awareness have come about as to the role of nitric oxide in mediating regulation of the endothelium; many chronic and co morbid conditions are associated with promoting inflammation, platelet formation and thrombus formation all contributing to manifestation of atherosclerosis
Tuso, P., Ismail, M., Ha, B., & Bartolotto, C. (2013). Nutritional update for	Objective is to present evidence which substantiates plant-based nutrition and	Design: Case study and Review	Sample: NA Setting:	Monitoring of patient with HTN, elevated random glucose, A1C, Cholesterol, BMI and multiple	-63 yo patient was weaned off of 5 of his 6 medications and decreased dose on the 6 th medication; HbA1C

Reference	Research Question/ Objective	Study Design and Intervention	Sample and Setting	Methods for Data Collection and Data Analysis	Findings
physicians: Plant-based diets. <i>The Permanente Journal</i> , 17(2), 61-6.	present guidelines for providers presenting these guidelines to patients	Intervention: NA	NA	medications for CVD and DM-provided education and prescribed low sodium, plant-based nutrition; monitored monthly in primary care clinic x16 weeks	dropped from 11.1% to 6.3% and cholesterol decreased from 283 md/dL to 138mg/dL -Plant-based diets have shown to have significant benefits of weight loss and reduced risk of CVD when compared to nutrition that is not plant-based
Vetter, M., Herring, S., Sood, M., Shah, N., & Kalet, A. (2008). What do resident physicians know about nutrition? An evaluation of attitudes, self-perceived proficiency and knowledge. <i>Journal of the American College of Nutrition</i> , 27(2), 287-298.	Evaluate attitudes, self-perceived proficiency and knowledge related to clinical nutrition among of medical interns.	Design: Survey Intervention: Validated questionnaire used to anonymously assess nutritional knowledge with a multiple-choice quiz	Sample: 61 Setting: -university based internal medicine training program	-111 item close-ended questionnaire was used, assessing nutritional attitudes using validated Nutrition in Patient Care Survey (NIPS), rated on a 5-point Likert scale -current interns completed questionnaire during a seminar at the end of their 1 st year of residency; incoming interns completed the survey during their orientation	- Interns of internal medicine view nutritional counseling as a priority for optimal patient care, but indicated they lack the knowledge and confidence to effectively provide adequate nutrition education to patients
Wall, H. K., Ritchey, M. D., Gillespie, C., Omura, J. D., Jamal, A., & George, M. G. (2018). Vital signs: Prevalence of key cardiovascular disease risk factors for million hearts 2022 - United States, 2011-2016. <i>MMWR. Morbidity and mortality weekly report</i> , 67(35), 983-991. doi:10.15585/mmwr.mm673	Objective of this report is to establish a baseline for CVD risk factors which are identified be decreased by the 2017-2021 initiative, Million Hearts, (goal of which is to prevent one million acute cardiovascular events over 5 years) as well as highlight recent changes over time. This initiative is co- led by US Department of Health and Human Services, CDC and Centers for Medicare and Medicaid	Design: Cohort survey Intervention: -Extraction of survey information from previous national surveys	Sample: N=3 Setting: 3 national surveillance systems used to gather data	Up to three survey cycles were examined using sex, age, race/ethnicity-adjusted regression analysis and adjusted t-tests to examine prevalence changes from 2011-2012; results were considered significant for p values <0.05	A recognized plateau in the decline of CVD and the prevalence of CVD risk factors remains elevated; It is necessary to implement evidence-based strategies to achieve the Million Hearts 2022 goal
Williams, K. A. and Patel, H. (2017). Healthy plant-based diet: What does it really mean? <i>Journal of the American College of Cardiology</i> , 70(4), 423-425.	Present and review the concept and benefits of plant-based diets	Design: Editorial Intervention: NA	Sample: NA Setting: NA	NA	Plant based diets are positively correlated with improved, cardiovascular disease, improved risk factors and decreased progression and incidence of CVD

Reference	Research Question/ Objective	Study Design and Intervention	Sample and Setting	Methods for Data Collection and Data Analysis	Findings
Wright, N., Wilson, L., Smith, M., Duncan, B., & Mchugh, P. (2017). The BROAD study: A randomized controlled trial using a whole food plant-based diet in the community for obesity, ischemic heart disease or diabetes. <i>Nutrition & Diabetes</i> , 7(3),1-10	Goal to explore the effectiveness of a community based WFPB nutrition program focused on long-term behavior changes, especially cooking	Design: RCT Intervention: Provided facilitated education and long-term cooking classes -twice weekly x12 weeks and Vit B12 supplementation	Sample: n=33 Individuals ages 35-70yrs, diagnosed with at least one of the following: DM2, ischemic heart disease, HTN, Hypercholestere mia; control n=32, intervention n=33 Setting:	Subjects attended facilitated meeting twice weekly x 12 weeks, educated with following WFPB diet, no restriction son exercise; BMI and cholesterol were measured at baseline and 6 months, then extended to 12 months;	At 6-month period, intervention group had greater dec in mean BMI, and in cholesterol reduction at 6 months and 12-month points

APPENDIX F:
EXECUTIVE SUMMARY

**Executive Summary
Results of QI Project on**

**IMPROVING PRIMARY CARE PROVIDERS' KNOWLEDGE AND INTENT
TO RECOMMEND WHOLE FOOD PLANT-BASED NUTRITION
EDUCATION FOR PATIENTS WITH CARDIOVASCULAR DISEASE**

By

Gina L. Gardner, MSN, RN, DNP(c)
UNIVERSITY of ARIZONA
College of Nursing

October 20, 2019

EXECUTIVE SUMMARY

Background: Cardiovascular disease has the highest rate of mortality nationally and worldwide. Diet and nutritional practices are factors that have a direct impact on cardiovascular well-being. Whole food plant-based (WFPB) nutrition has been shown to have a significant benefit on the cardiovascular system, in particular repair of the endothelial lining of the blood vessels. In spite of evidenced research, many patients at risk or diagnosed with cardiovascular disease are not provided WFPB nutrition recommendations by primary care providers (PCPs); PCPs often report not having enough education on nutritional interventions.

Objective: The purpose of this project was to assess the knowledge base of PCPs in the area of WFPB nutrition, as well as to provide information and awareness regarding the benefits and relationship of WFPB nutrition to patients at risk or diagnosed with cardiovascular disease.

Methods: This project utilized a quasi-experimental pretest/posttest design, to compare knowledge base and awareness of PCPs before and after an educational intervention highlighting the benefits and recommendations of WFPB nutrition for individuals at risk or with a diagnosis of CVD. A convenience sample of PCPs from a local medical center were used, where participants' participation was solely voluntary. Pretest and posttest surveys utilized multiple choice and five-point Likert-scale questions; free text responses were allowed at the end of the post test. Descriptive statistics were used for data analysis.

Results: A total of 25 PCPs completed both pre-and post-survey for data analysis. All categories of the multiple-choice knowledge assessment questions demonstrated 8% to 24% increments of improvement. In areas of WFPB knowledge measured with Likert scale categories, the majority showed improvement in these areas.

Conclusion: Improved PCPs knowledge and intent to recommend WFPB nutrition to patients at risk or diagnosed with CVD occurred. At this organization, knowledge, self-rated knowledge and comfortability in recommending WFPB nutrition to their patients was achieved. The data from this project will serve as a baseline for future means to assist providers in making WFPB recommendations to improve patient outcomes. A follow up survey of PCPs to see if they are incorporating education on WFPB nutrition into their patient teaching in 3 to 6 months is recommended. It is also recommended that for PCPs who are making these recommendations, that the Registered Dieticians in those same areas reinforce WFPB nutrition to those same patients and caregivers.

APPENDIX G:
THE UNIVERSITY OF ARIZONA INSTITUTIONAL REVIEW BOARD APPROVAL
LETTER



Human Subjects
Protection Program

1618 E. Helen St.
P.O. Box 245137
Tucson, AZ 85724-5137
Tel: (520) 626-6721
<http://hgw.arizona.edu/compliance/home>

Date: June 28, 2019
Principal Investigator: Gina Lisette Gardner

Protocol Number: 1905659551
Protocol Title: IMPROVING PRIMARY CARE PROVIDERS' KNOWLEDGE AND INTENT TO RECOMMEND WHOLE FOOD PLANT-BASED NUTRITION EDUCATION FOR PATIENTS WITH CARDIOVASCULAR DISEASE

Determination: Human Subjects Review not Required

Documents Reviewed Concurrently:

Data Collection Tools: *Posttest.docx*
Data Collection Tools: *Pretest.docx*
HSPF Forms/Correspondence: *Advisor Confirmation Email.pdf*
HSPF Forms/Correspondence: *Gardner_A_Apr17_determination_v2019-02-25(1) (1) (1).pdf*
Informed Consent/PHI Forms: *Garnder DNP Project_disclosure form June.docx*
Informed Consent/PHI Forms: *Garnder DNP Project_disclosure form June.pdf*
Other Approvals and Authorizations: *Gardner_DNP Memo_Signed.pdf*
Other Approvals and Authorizations: *Gardner_QI Determination 6-27-19.pdf*
Other Approvals and Authorizations: *NUR922_Site Authorization_GGardner_Signed.pdf*
Participant Material: *File Location PowerPoint.docx*

Regulatory Determination/Comments:

- Not Research as defined by 45 CFR 46.102(l): As presented, the activities described above do not meet the definition of research cited in the regulations issued by U.S. Department of Health and Human Services which state that "Research means a systematic investigation, including research development, testing, and evaluation, designed to develop or contribute to generalizable knowledge. Activities that meet this definition constitute research for purposes of this policy, whether or not they are conducted or supported under a program that is considered research for other purposes. For example, some demonstration and service programs may include research activities. For purposes of this part, the following activities are deemed not to be research."

The project listed above does not require oversight by the University of Arizona.

If the nature of the project changes, submit a new determination form to the Human Subjects Protection Program (HSPF) for reassessment. Changes include addition of research with children, specimen collection, participant observation, prospective collection of data when the study was previously retrospective in nature, and broadening the scope or nature of the study activity. Please contact the HSPF to consult on whether the proposed changes need further review.

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