Integrating Components of the Patient-Centered Medical Neighborhood into Nutrition Counseling for Hypertension within a Grocery Store: an Instrumental Case Study

DISSERTATION

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By

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Abstract

Over the past decade, the patient-centered medical home has emerged as a model for the delivery of healthcare. Patient-centered medical homes are expected to provide comprehensive care for their patients, however some services may not be available within the physical medical home. The patient-centered medical neighborhood model fills this gap; primary care providers refer their patients to healthcare services elsewhere in the community and then the community-based practitioners communicate with the primary care provider to coordinate care for the patient. Registered dietitians are effective at promoting behavior change and often are available in community setting, particularly in grocery stores. They also can offer flexible scheduling and hands-on education. However, since the dietitians are not connected to the patient’s electronic medical record, communication back to the primary care physician is challenging.

This instrumental case study examined nutrition counseling for 30 adults with hypertension, provided by a grocery store-based dietitian, and the communication back to the primary care provider using a novel, web-based nutrition charting portal. Changes in participants’ systolic blood pressure and dietary intake were assessed following the 12-week nutrition intervention. Patients, primary care providers, and dietitians also were interviewed in order to qualitatively assess the feasibility and acceptability of the patient-centered medical neighborhood model among the three groups of stakeholders.
Of the 30 adults enrolled, 19 completed the study protocol. Systolic blood pressure decreased, on average, by 3.6 mm Hg (SD 16.2 mm Hg; 95% CI -4.2 to 11.4 mm Hg) though this change was not statistically significant. Diet quality, as measured by the Healthy Eating Index 2010 total score, improved significantly with a mean increase of 11.6 (95% CI 7.7 to 15.5; P <0.001). Patients reported high satisfaction with the grocery store-based intervention and did not report any drawbacks to being seen in a grocery store compared to a more traditional healthcare setting. In interviews, several participants reported a preference for the grocery store compared to a medical office. Eighty four percent of the nutrition visit summaries generated by the web-based charting portal were successfully scanned into the patients’ electronic medical records, and while primary care providers felt that these summaries were helpful, there also were technical barriers to accessing the summary reports during a patient’s follow-up visit. The registered dietitians expressed a desire for bi-directional communication with the primary care providers. Overall, the intervention showed feasibility and acceptability, and also was related to important dietary changes. Additional research is needed to optimize care coordination between primary care providers and practitioners located in the medical neighborhood.
This dissertation is dedicated to my family.
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Table of Contents

Abstract ........................................................................................................................................ ii
Acknowledgments ........................................................................................................................... v
Vita .................................................................................................................................................. vi
Publications .................................................................................................................................... vi
Fields of Study ............................................................................................................................... vii
Table of Contents ........................................................................................................................ viii
List of Tables .................................................................................................................................. xiii
List of Figures ................................................................................................................................. xiv
Chapter 1: Introduction ................................................................................................................ 1

Emerging Models of Medical Care ................................................................................................. 1

The Patient-Centered Medical Home ............................................................................................ 1

The Patient-centered Medical Neighborhood .............................................................................. 2

Registered Dietitians in the Patient-centered Medical Neighborhood ...................................... 3

RDs in Grocery Stores ..................................................................................................................... 4

An Electronic Charting Portal for RDs in the Community ......................................................... 6

Nutrition Counseling for Hypertension: A Case Study of PCMN Implementation ............... 7
Nutrition Interventions for Hypertension ................................................................. 9

Hypertension and Accountable Care Organizations ............................................ 10

Current Nutrition Education Practices for Hypertension in Primary Care .......... 11

Overview and Objectives of the Study ................................................................. 12

A Note about this Document................................................................................ 13

Chapter 2: Integrating Components of the Patient-Centered Medical Neighborhood into Nutrition Counseling For Hypertension within a Grocery Store: A Quantitative Analysis ...................................................................................................................... 14

Introduction ............................................................................................................. 14

Registered Dietitians in the PCMN .................................................................... 16

Connecting the RD to Primary Care .................................................................... 17

Methods .................................................................................................................... 18

Recruitment, Inclusion, and Exclusion ................................................................. 18

Baseline Measures ............................................................................................... 19

Study Intervention ................................................................................................. 21

Communication with the PCP .............................................................................. 22

Follow-Up Measures ............................................................................................. 23

Process Measures and Chart Review .................................................................... 24

Analysis .................................................................................................................. 24

Results ...................................................................................................................... 25
Process Measures........................................................................................................................................... 26
Changes in Systolic Blood Pressure ........................................................................................................... 27
Changes in Dietary Intakes and Diet Quality ................................................................................................. 28
Discussion .................................................................................................................................................. 29
Conclusion .................................................................................................................................................. 34

Chapter 3: Integrating Components of the Patient-Centered Medical Neighborhood into Nutrition Counseling for Hypertension within a Grocery Store: A Qualitative Analysis of the Patient’s Perspective ........................................................................................................................................... 40
Introduction ................................................................................................................................................ 40
Methods ..................................................................................................................................................... 41
Overview and Study Design ......................................................................................................................... 41
Interview Process ......................................................................................................................................... 43
Analysis ..................................................................................................................................................... 43
Results ......................................................................................................................................................... 44
Nutrition Education Experiences from Various Healthcare Providers............................................................ 45
Location of the Nutrition Counseling ............................................................................................................. 46
Behavior Changes and Other Outcomes ....................................................................................................... 48
Barriers to Making Behavior Changes ........................................................................................................ 49
PCP Referral and Follow-Up ......................................................................................................................... 50
Satisfaction ................................................................................................................................................. 51
Chapter 4: Integrating Components of the Patient-Centered Medical Neighborhood into Nutrition Counseling for Hypertension within a Grocery Store: A Qualitative Analysis of the Primary Care Provider and Registered Dietitian Perspective .............................. 63

Introduction .................................................................................................................................. 63

Methods ....................................................................................................................................... 65

Overview and Study Design .......................................................................................................... 65

Communication with the PCP ....................................................................................................... 66

Outcome Measures: Qualitative Interviews .................................................................................. 67

Analysis .......................................................................................................................................... 67

Results ........................................................................................................................................... 68

PCP and RD Perceptions of Nutrition Counseling ....................................................................... 68

Benefits and Drawbacks of Grocery Store-Based Counseling .................................................. 70

Communication between the PCP and RD ................................................................................... 73

Primary Care Provider Referral to Nutrition Counseling in a Grocery Store ............................ 77

Discussion ...................................................................................................................................... 78

Chapter 5: Discussion and Summary ............................................................................................. 90

Conclusion ....................................................................................................................................... 94

References ....................................................................................................................................... 95

Appendix A: Participant Consent Form .......................................................................................... 106
Appendix B: Script for Obtaining Verbal Consent Informed Consent from Primary Care Providers and Registered Dietitians

Appendix C: Demographic Questionnaire

Appendix D: The Medication-Taking Subscale of the Bone-Hill Compliance to High Blood Pressure Therapy Scale

Appendix E: Sample VioScreen PCMN Nutrition Care Summary

Appendix F: Sample VioScreen Food-Frequency Questionnaire Summary
List of Tables

Table 1: Baseline characteristics of the sample .................................................. 37
Table 2: Healthy Eating Index 2010 scores at baseline and follow-up .................. 38
Table 3: MyPlate equivalent and select nutrient intake at baseline and follow-up .... 39
Table 4: Interview guide for semi-structured interviews with study participants .... 58
Table 5: Baseline characteristics of the sample (n=19) ...................................... 59
Table 6: Codebook used for analysis of the patient interviews and representative quotes 60
Table 7: Line of questioning for interviews with the primary care provider .......... 84
Table 8: Line of questioning for interviews with the registered dietitians ............ 85
Table 9: Codebook for primary care provider interviews ................................ 86
Table 10: Codebook for registered dietitian interviews ................................. 89
List of Figures

Figure 1: Participant flow through the study ............................................................. 35
Figure 2: Individual changes in systolic blood pressure from baseline to follow-up .... 36
Figure 3: Individual changes in Healthy Eating Index 2010 total score from baseline to follow-up .................................................................................................................. 36
Emerging Models of Medical Care

The Patient-Centered Medical Home

Over the past decade, the patient-centered medical home (PCMH) has emerged as a value-based model for the organization and delivery of primary care.\textsuperscript{1,2} To be considered a medical home, a healthcare organization must have five attributes. First, the medical home must provide comprehensive care for its patients, including preventative care, acute care, and chronic care. In order to provide this care, a team of medical professionals from different specialties is required. Secondly, the medical home must be patient-centered, meaning they must account for the individual needs and preferences of the patient when providing care. The medical home must also provide accessible services, such as short wait times for appointments and 24 hour access to communication, and the medical home must also demonstrate a commitment to quality and safety. Finally, a medical home must provide coordinated care for its patients. The overarching goal of the PCMH model is to improve what has been called the triple-aim of healthcare outcomes: quality; affordability; and the patient/professional experience.\textsuperscript{3}

A great deal has been published on the effectiveness of the PCMH on improving the triple-aim outcomes. A 2013 review of the PCMH model literature, conducted by the
Agency for Healthcare Research and Quality, examined evidence from six rigorously-conducted PCMH evaluations.\textsuperscript{4} There were some favorable outcomes for each of the three triple-aims, but much of the evidence was inconclusive and two evaluations showed that the PCMH model resulted in increased costs. Despite this mixed early evidence, more recent reviews, which include 58 studies of the PCMH, have shown strong evidence for reduced cost and improved healthcare utilization as a result of PCMH implementation.\textsuperscript{5,6} Furthermore, the longest-standing medical homes showed the most improvement in cost, which may explain some of the early evidence to the contrary.\textsuperscript{6}

Many private and public insurers now offer financial incentives to PCMH practices. The PCMH model was encouraged as part of the 2010 Patient Protection and Affordable Care Act, which allows for increased incentives for Medicaid patients receiving care in designated medical homes.\textsuperscript{7} The Affordable Care Act also allocated funding for the Center for Medicare and Medicaid Innovation, which, among other things, is conducting multiple ongoing demonstration projects evaluating the PCMH model.\textsuperscript{8} Given the financial support of the federal government, as well as several large, private insurers, the PCMH model of healthcare will likely continue to expand in the coming years.

\textit{The Patient-centered Medical Neighborhood}

Patient-centered medical homes are tasked with providing comprehensive care for their patients, and despite expanding services within the physical walls of a PCMH, patients often require services that are not offered within the primary care setting. These could include services that are simply not possible to offer in a primary care office (such as
emergency care or a fitness center), or services that a particular primary care office may not have the resources to provide (such as a pharmacist or psychologist). Fisher recognized this limitation of the PCMH and discussed that for a PCMH to be effective, primary care providers must be willing and able to coordinate with external specialists and sub-specialists in the surrounding community. The term patient-centered medical neighborhood (PCMN) was coined to describe this coordination. The PCMN framework was later expanded upon and in 2010 the American College of Physicians published a position paper recognizing the importance of the PCMN. The patient-centered medical neighborhood expands on the medical home framework by including sub-specialties physically located throughout the patient’s community. A critical component of the medical neighborhood definition and framework is that the sub-specialist or community-based practitioner and the primary care provider must communicate and coordinate. This communication allows for a continuity of care that would otherwise be lost. Though the care is still coordinated through one central hub (the primary care provider/medical home), the patient has the opportunity to interact with healthcare professionals that may not be located within the physical medical home location. While U.S. physicians tend to support the patient-centered medical neighborhood model, there is agreement within the medical community that refinement is necessary before it can be widely adopted.

Registered Dietitians in the Patient-centered Medical Neighborhood

Registered dietitians (RDs) are well-paired to become early adopters of the PCMN model and contribute to the evidence for the healthcare community as the PCMN framework is refined. Nutrition is a critical component to the treatment of many chronic diseases, such
as obesity, diabetes, and hypertension; however, nutrition counseling is often absent or inadequate during primary care visits.\textsuperscript{15–17} One study of 3,475 adult visits across 138 primary care providers observed that an average of one minute was spent on nutrition counseling. Additionally, nutrition counseling only occurred in 45\% of visits for diabetes, 25\% of visits for cardiovascular disease, 31\% of visits for hypertension, and 33\% of visits by patients with obesity.\textsuperscript{15} Lack of time is the most often reported barrier to providing nutrition counseling in the primary care setting, and lack of materials, training, and knowledge have also been consistently reported as barriers.\textsuperscript{18–22}

Given the current evidence, it may not be realistic to expect primary care providers to thoroughly address nutrition during primary care visits. However, RDs are nutrition experts and have proven to be evidence-based, effective facilitators of behavior change.\textsuperscript{23–32} Additionally, RDs are widely available in the community setting and the Academy of Nutrition and Dietetics is currently working to educate its members on the opportunities and expectations of working within a medical neighborhood.\textsuperscript{33}

\textit{RDs in Grocery Stores}

The grocery store is one community location where RDs are often available. The supermarket practice group of the Academy of Nutrition and Dietetics currently has over 400 members and several large grocery chains, such as Giant Eagle and Hy-Vee, staff RDs in hundreds of their stores across the country.\textsuperscript{34} Among other things, these RDs provide one-on-one nutrition counseling to the store’s customers using a fee-for-service model where the patient is able to pay an out-of-pocket fee if their insurance does not
cover nutrition counseling. For example, at one large, regional grocery store in the Central Ohio area, counseling sessions cost $60 for an initial one-hour session and $30 for subsequent thirty minute sessions. Insurance reimbursement for registered dietitians is currently being legislated; however, some insurance companies do provide coverage, which would reduce this cost even further. An additional advantage is that grocery store RDs provide application-based counseling by educating in the environment where the food decisions are made.

Importantly, nutrition counseling within a local grocery store eliminates or reduces some of the practical barriers to nutrition education attendance for the patient by offering a convenient location with evening and weekend appointment times. One mixed-method study found that conflict with a work schedule was one of the most frequently cited reasons for attrition from a diabetes self-management program. Respondents in the same study also cited distance to the education center and difficulty finding the center as reasons for non-attendance. Additionally, practical barriers, such as scheduling difficulties and competing demands, were primary barriers to attendance for veterans participating in a weight management program as well as veterans scheduled for outpatient nutrition counseling. Convenience has been reported as a barrier to attending cardiac rehabilitation programs, and parents commonly cite inability to miss work and scheduling issues as reasons for attrition in the pediatric weight management literature.
RDs within the grocery store eliminate an important barrier for primary care practices as well. While some primary care practices are beginning to employ dietitians within their office as part of their medical home team, many do not have in-house dietitians. RDs in the grocery store, and in the broader community, allow primary care providers to refer their patients to nutrition counseling without having to first devote resources to establish the infrastructure required to bring an RD in house.

However, a current major drawback of the RD in the grocery store is that they are not connected to the electronic medical record and, therefore, cannot easily coordinate care with the patient’s medical home or primary care provider. The primary care provider (PCP) has no knowledge that the visit occurred unless the patient decides and remembers to share this information. In turn, the PCP cannot provide meaningful follow-up or ensure that the nutrition care plan is appropriate given the patient’s other medical needs. Without this communication, the RD in the grocery store is not part of the patient-centered medical neighborhood, but rather a separate entity. By implementing a strategy for communication between the RD and the PCP, the RD can truly become part of the medical neighborhood model and the many advantages to nutrition care in the grocery store can be realized.

An Electronic Charting Portal for RDs in the Community

For this study, we used a tool called VioScreen PCMN (VioCare, Inc., Princeton, NJ), a novel electronic charting portal for registered dietitians. The reports generated from VioScreen PCMN can be used to generate a summary report of the visit that can be
shared from the community-based RD to the PCP, allowing for the implementation and testing of the PCMN model. This technology, developed by Rick Weiss, CEO of VioCare, Inc., and tested by a team at The Ohio State University in collaboration with VioCare, Inc., Giant Eagle, and the Department of Family Medicine, provides a secure platform for the dietitians in the medical neighborhood to share visit information and patient goals with the patient’s PCP. The VioScreen PCMN platform includes a real-time counseling session charting portal for PCMN RDs to document patient visits in the absence of an electronic medical record. This system generates a clinical summary report of each counseling session and a brief, personalized dietary assessment report that can be submitted back to the referring primary care provider. In preliminary testing, PCPs felt that these reports could be used to reinforce the RD message when managing patient care.

The present study used this novel technology to connect grocery store-based RDs to PCPs to evaluate the PCMN model for providing nutrition care to adults with hypertension.

Nutrition Counseling for Hypertension: A Case Study of PCMN Implementation

Hypertension (HTN), defined as a blood pressure equal to or greater than 140/90 mm Hg or the use of antihypertensive medications, is a major public health problem in the United States. In 2012 alone, over 60 million American adults were treated for hypertension at an expense of over $47 billion. Hypertension is independently, significantly, and positively related to mortality from coronary heart disease, other cardiovascular diseases, and stroke, and negatively related to life expectancy.
Pathophysiology of Hypertension

Blood pressure refers to the amount of force the blood places on the blood vessel walls. Systolic blood pressure is the force placed on the blood vessels when the heart is contracting; diastolic blood pressure is the force placed on the blood vessels when the heart is relaxed. An increase in blood pressure can be caused by an increased blood volume, resistance in the arteries, or both.

Blood pressure is regulated primarily by the renin-angiotensin-aldosterone pathway initiated in the kidneys. Normally, if increased pressure is detected in afferent arterioles in the kidneys, renin release by the juxtaglomerular cells is inhibited. This, in turn, inhibits production of angiotensin II, thereby inhibiting aldosterone production and decreasing water and sodium reabsorption by the kidneys. Angiotensin II also facilitates the release of other hormones such as antidiuretic hormone and norepinephrine, which help to increase blood pressure. Therefore, decreased production of angiotensin II down-regulates hormone production and decreases blood pressure. Renin release is also inhibited when the macula densa cells of the kidney sense an elevated concentration of NaCl.

The relationship between dietary intake, specifically sodium intake, and hypertension is complex and not entirely understood despite a great deal of research in the area. Increased sodium consumption can lead to increased blood volume and there may be genetic mutations related to renin production that prevent some individuals from properly regulating the increased blood volume. Complicating things further, there is evidence of...
varying effects of sodium intake among different sub-groups of the population; African Americans and women, for example, may be more sensitive to increases in sodium intake. Additional genetic mechanisms have been suggested, and a genetic link may explain why hypertension is more prevalent in certain population such as African Americans. Finally, growing evidence suggests that sodium intake may affect the cardiovascular system even in the absence of hypertension. Elevated sodium intake has been shown to affect the endothelial cells in the arteries as well as the thickness of the left ventricle, and may increase all-cause mortality in normotensive individuals.

**Nutrition Interventions for Hypertension**

Dietary management of hypertension is one of the cornerstones of treatment; the American College of Cardiology and the American Heart Association jointly concluded that the effects of following an appropriate dietary pattern may be sufficient to promote non-pharmacological control of blood pressure. The Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure referred to lifestyle changes as an “indispensable” part of hypertension management. In 2014, a systematic review for the U.S. Preventative Services Task Force (USPSTF) found that medium- (31-360 minutes) to high-intensity (>360 minutes) lifestyle interventions (i.e. behavioral counseling on dietary and physical activity changes) resulted in reductions in blood pressure. These interventions lead to a systolic blood pressure reduction of 2.29 mm Hg (95% CI 3.82 to 0.76).
Part of the standard nutrition intervention for HTN is the Dietary Approaches to Stop Hypertension (DASH) diet, which encourages fruits, vegetables, and whole grains as well as low-fat dairy and protein foods. The DASH diet limits foods high in saturated fat, as well as sweets and sugar sweetened beverages. Large scale studies have shown that the DASH diet along with other lifestyle recommendations (such as reduced sodium intake, moderate alcohol intake, and weight loss) is effective in reducing systolic blood pressure for hypertensive adults who are not taking medication, with systolic blood pressure changes of -1.3 to -11.5 mm Hg, depending on the magnitude of dietary change. For those taking antihypertensive medications, the addition of lifestyle and dietary interventions may lead to better blood pressure control and/or reduce the need for medication. In turn, this could lead to a significant cost reduction. In 2012, 40% of hypertension-related medical costs, approximately $19 billion, were from prescribed medicines.

**Hypertension and Accountable Care Organizations**

In addition to improved health for patients, hospital systems stand to benefit from a decreased prevalence of hypertension. Accountable care organizations (ACOs), which were introduced as part of the Patient Protection and Affordable Care Act, are eligible to share in any Medicare savings they achieve by improving the health of their patient population. ACOs receive a financial benefit from Medicare if they are able to meet specific performance standards. One of the performance standards for ACOs is the proportion of patients with blood pressure lower than 140/90 mm Hg. As of December 2013, there were more than 360 ACOs throughout the country and more recent
estimates show rapid growth, with 744 ACOs serving 23.5 million adults with Medicare as of January 2015. Since decreasing blood pressure is financially incentivized for these organizations, inexpensive and effective strategies for achieving this outcome will become increasingly important.

Current Nutrition Education Practices for Hypertension in Primary Care

Despite the overwhelming body of evidence recommending dietary and lifestyle interventions for the treatment of hypertension, these interventions have yet to be translated into usual care and only a fraction of patients with hypertension receive nutrition education. Eaton et al. observed that primary care providers delivered nutrition education to only 31% of their patients with hypertension. Ayala et al. showed that only 21% of adults with hypertension had been advised by a physician or health care professional to change their eating habits. This is likely due to the aforementioned PCP barriers to providing nutrition education (lack of time, training, etc.), as well as the fact that the recommended diet and lifestyle interventions require resources that are not available within the current health system. As a result, the U.S. Preventative Services Task Force recently called for additional research on how to best implement diet and lifestyle interventions for hypertension into practice.

Given a) this call for research on ways to successfully implement dietary interventions for hypertension, b) the significance of the problem of hypertension in the United States, c) existing standard and effective guidelines for nutrition intervention for hypertension, and d) the accessibility of RDs in local grocery stores, nutrition care for patients with
hypertension via grocery store dietitians was an obvious starting point for studying the implementation of a patient-centered medical neighborhood model for nutrition counseling.

Overview and Objectives of the Study

This pilot study examined the outcomes of implementing a PCMN model for nutrition counseling for individuals with hypertension. The nutrition counseling was provided by a grocery store-based dietitian in collaboration with a local primary care office. Patients were recruited from their primary care office and, after completing baseline study measures, were asked to see the RD three times over a period of 12 weeks. Following each nutrition visit, the visit summaries generated by VioScreen PCMN were sent back to the patient’s primary care provider. The patients were then seen for a follow-up study visit, during which they completed additional study measures as well as a qualitative interview. Participating PCPs and RDs were also interviewed at the conclusion of the study.

As a whole, this study was a mixed-method instrumental case study. An instrumental case study uses data from multiple sources, employing both qualitative and quantitative analyses, to provide insight into a particular issue. However, along with understanding the case itself, an instrumental case study is intended to facilitate understanding of a broader situation. For the present study, the “case” is defined as a nutrition intervention provided by RDs in the community to adults with hypertension, using the PCMN model assisted by technology which allows for communication with the PCP.
However, results from this study are intended to provide insight into the broader situation of nutrition care provided in the community using a PCMN model for delivery. While the results of our particular case are of interest, the overarching goal of the study was to understand the benefits and challenges associated with the PCMN model for nutrition care provision.

More specifically, the objectives of this study were to:

1. Measure the changes in systolic blood pressure and dietary intake following a nutrition intervention provided by a grocery store RD using components of the PCMN model (i.e. communication from the RD to the PCP).
2. Assess the attitudes of all stakeholders (patients, primary care providers, grocery store dietitians) towards the PCMN-based intervention.
3. Use the above results, along with process measures and data from patient chart review, to construct a thorough case study of nutrition care using the PCMN model.

A Note about this Document

This document is structured as an introduction, three manuscripts, and a conclusion. Per the School of Health and Rehabilitation Science’s guidelines for the dissertation document, each of the three manuscripts is intended to be a self-contained journal article. Therefore, portions of this document are intentionally redundant so that each manuscript can be read and understood independently.
Chapter 2: Integrating Components of the Patient-Centered Medical Neighborhood into Nutrition Counseling For Hypertension within a Grocery Store: A Quantitative Analysis

Introduction

Hypertension (HTN), or high blood pressure, affects over 60 million adults in the United States and is a major public health concern.\textsuperscript{42} Hypertension is independently and significantly related to mortality from coronary heart disease, other cardiovascular diseases, and stroke, as well as life expectancy.\textsuperscript{44–46} Recent estimates indicate that nationally, only 52\% of individuals with hypertension have controlled hypertension.\textsuperscript{72} Additionally, the cost of treating hypertension in the United States is estimated to be over $47 billion.\textsuperscript{43} As a whole, hypertension places a large burden on the U.S. health system.

Nutrition interventions, such as the Dietary Approaches to Stop Hypertension (DASH) diet, as part of a lifestyle modification program are recommended as the primary in hypertension treatment guidelines. The DASH encourages fruits, vegetables, and whole grains as well as low-fat dairy and protein foods.\textsuperscript{60} The DASH diet, along with other dietary changes such as reducing sodium and alcohol consumption, has been shown to be effective at improving hypertension outcomes.\textsuperscript{58} Additionally, for those taking antihypertensive medications, the addition of lifestyle and dietary interventions may lead to better blood pressure control and/or reduce the need for medication.\textsuperscript{57} In turn, this
could lead to a significant cost reduction. In 2012, 40% of hypertension-related medical costs, approximately $19 billion, were from prescribed medicines.\textsuperscript{43}

Despite the extensive evidence supporting dietary and lifestyle interventions for the treatment of hypertension, these interventions have yet to be translated into usual care and only a fraction of patients with hypertension receive nutrition education.\textsuperscript{15,67} In a study of adult primary care visits, nutrition counseling occurred for only 31% of patients with hypertension and lasted for an average of one minute.\textsuperscript{15} Lack of time is the most often reported barrier to providing nutrition counseling in the primary care setting, and lack of materials, training, and knowledge have also been consistently reported as barriers.\textsuperscript{18–22} As a result, the USPSTF recently called for additional research on alternate strategies for implementing diet and lifestyle interventions in practice.\textsuperscript{59}

Patient-centered medical neighborhoods have emerged as an extension of the patient-centered medical home. Patient-centered medical homes (PCMHs) are a value-based model for the organization and delivery of comprehensive primary care.\textsuperscript{1,2} Despite expanding services within the physical walls of a PCMH, patients often require services that are not offered within the primary care setting. The patient-centered medical neighborhood bridges this gap in care by including sub-specialties physically located throughout the patient’s community.\textsuperscript{12} However, a critical component of the medical neighborhood framework is that the community-based practitioner and the primary care provider must communicate and coordinate.\textsuperscript{11}
Registered Dietitians in the PCMN

Registered dietitians (RDs) are well-poised to become early adopters of the PCMN model and contribute to the evidence for the healthcare community as the PCMN framework is refined. RDs are nutrition experts and have proven to be evidence-based, effective facilitators of behavior change.\textsuperscript{23–32} Additionally, RDs are widely available in the community setting and the Academy of Nutrition and Dietetics is currently working to educate its members on the opportunities and expectations of working within a medical neighborhood.\textsuperscript{33} One community location at which RDs often are available is the grocery store. Among other things, these RDs provide one-on-one nutrition counseling to the store’s customers using a fee-for-service model where the patient is able to pay an out of pocket fee if their insurance does not cover nutrition counseling.

Importantly, nutrition counseling within a local grocery store eliminates or reduces some of the practical barriers to nutrition education attendance that have been previously reported. These barriers include inconvenient location and conflict with work schedule.\textsuperscript{35–38} The grocery store offers a convenient location with greater flexibility in scheduling patient appointments. Additionally grocery store RDs are able to provide application-based counseling by educating in the environment where the food decisions are made. More generally, RDs in the community also eliminate an important barrier for primary care practices. While some primary care practices are beginning to employ dietitians within their office as part of their patient-centered medical home team, most do not have in-house dietitians due to limited reimbursement for nutrition counseling. RDs in the broader community allow PCPs to refer their patients to nutrition counseling without
having to first devote resources and establish the infrastructure required to bring an RD in house, providing access to a service that would otherwise be unavailable.

*Connecting the RD to Primary Care*

A major drawback of the RD in the community is that they are not connected to the electronic medical record and, therefore, cannot easily coordinate care with the patient’s medical home or truly be a part of the medical neighborhood. One proposed solution is the use of Health Information Exchanges (HIEs) or Regional Health Information Organizations (RHIOs). HIEs and RHIOs are made up of multiple healthcare organizations which all share electronic medical records. Therefore, providers across all organizations can effectively communicate with one another. However, for most communities the use of an HIE or RHIO is unrealistic at this time due to the resources required to establish such systems, and therefore lower technical solutions have been suggested as good first steps to implementing a PCMN. For this study we implement one such solution by using a web-based nutrition charting portal to generate nutrition counseling summaries, which were sent from the RD to the PCP.

The objective of this pilot study was to evaluate the effectiveness of nutrition counseling for HTN provided in a community setting, with a novel component of formal communication between the RD and PCP, creating a PCMN model.
Methods
This pilot study used a single arm pre-test, post-test design and implemented a dietary intervention provided by a registered dietitian in the PCMN.

Recruitment, Inclusion, and Exclusion
Participants in this study were recruited out of three local primary care offices. For a period of approximately three months, a research assistant was stationed daily in one of the three Family Medicine offices, with the daily location determined by the clinic’s available office space. All patients 60 years old and younger were screened via chart review to determine if the patient met preliminary inclusion/exclusion criteria: documented diagnosis of HTN, age between 18-60 years, and no current prescription for insulin. Those over 60 years older were excluded because elevated blood pressure in this population is mostly related to arterial stiffness and may be less responsive to dietary interventions.74

Each morning, primary care providers were provided a list of patients who met the preliminary inclusion and exclusion criteria. The PCPs were then asked to briefly discuss the study with each eligible patient. If the patient was interested in hearing more about the study, the PCP brought the patient to see the research assistant at the conclusion of their visit. Potential participants were asked if they were currently pregnant (females only), if they were currently seeing a registered dietitian, and if they had any current medical conditions that caused them to consume an atypical diet (for example, recent bariatric surgery or dysphagia). An answer of “yes” to any of these questions excluded
the patient from further study participation. Participants were also required to have a measured blood pressure of ≥120 mm Hg (or ≥140 mm Hg if the participant was not prescribed at least one antihypertensive agent), however the baseline blood pressure measurement (as described below) was not collected until the participant had consented to study participation. Participants who did not meet the blood pressure inclusion criteria were excluded from the study following blood pressure measurement and were not considered study enrollees. Patients were recruited until a total of 30 patients were enrolled in the study.

*Baseline Measures*
Baseline measures were completed in the primary care office either on the date of the initial screening, or on a later date convenient for the participant. Participants were compensated with a $25 grocery store gift card upon completion of the baseline measures.

*Demographic Questionnaire*
Participants completed a brief demographic questionnaire with questions about race, education, and employment (Appendix C).

*Blood Pressure*
Standardized procedures were used, following the guidelines for the National Health and Nutrition Examination Survey physical examination⁷⁵, using a BP TRU BPM-100 automated blood pressure monitor, which has been validated and approved for clinical
use. The research assistant measured blood pressure on the right arm and participants were asked to sit upright and still, with their arm resting at chest level and with their palm facing upward. Measurements were taken after the participant had been sitting quietly for at least five minutes. Three blood pressure measurements were taken, each one minute apart, and the second and third measurement were averaged together to obtain the final blood pressure measurement.

**Dietary Assessment**

The electronic, graphic VioScreen food-frequency questionnaire (FFQ; VioCare, Inc., Princeton, NJ) was used to measure dietary intake. The VioScreen FFQ is based on the paper food-frequency questionnaires developed at the Fred Hutchinson Cancer Research Center which has been used in multiple large epidemiological studies. The VioScreen FFQ collects data on the consumption of 156 food items or food groups, along with portion size, which is presented graphically for each food. VioScreen also collects information on preparation method, food formulation (e.g., low-fat), and added fats or condiments. Participants are asked to consider foods and beverages that they have consumed at least once a month over the past three months. When compared to dietary intake collected via six 24-hour dietary recalls, the VioScreen FFQ was shown have an inter-method reliability of 0.67 to 0.90 for volume of macronutrients and 0.40 to 0.92 for volume of select micronutrients, which is at least as reliable as most paper based food-frequency questionnaires and more reliable than two other publically available food-frequency questionnaires. The test-retest reliability for the VioScreen FFQ ranged from 0.60 to 0.87 for macronutrients and 0.49 to 0.74 for select micronutrients.
Dietary intakes data related to hypertension and generated in the VioScreen report include cup, ounce, teaspoon, and gram equivalents for fruit, vegetable, dairy, grain, protein, added sugars, solid fats, and alcohol consumption based on data from the USDA’s Food Patterns Equivalents Database (FPED).\textsuperscript{80} Healthy Eating Index-2010 (HEI-2010) total score was used as a measure of overall diet quality in comparison to the Dietary Guidelines for Americans\textsuperscript{81} HEI-2010 is comprised of 12 component scores to assess diet quality of key dietary recommendations, with a cumulative score (0-100) indicative of overall diet quality. Finally, volume intakes of multiple macro and micronutrients were also assessed.

\textit{Study Intervention}

\textit{Nutrition Counseling Visits}

At the end of the participant’s baseline visit, the research assistant scheduled the participant’s first nutrition counseling session with the grocery store dietitian using the store’s online scheduling system. Patients could choose to be seen at one of three grocery stores. Prior to the initial counseling visit, the RDs were given access to the participants’ dietary assessment reports to use in their assessment process. Subjects completed a total of three visits with the dietitian over the course of approximately 12 weeks. The initial RD visit was approximately 60 minutes and subsequent visits were approximately 30-45 minutes. Automated reminder calls or emails (according to the subjects’ preference) about the RD visits were made prior to each appointment per usual care from the grocery store. There was no cost to the participant for the RD visits; however, the participants did
not receive any financial compensation (such as cash or a gift card) for completing the individual RD visits.

Study dietitians were employees of the grocery store and completed two study training sessions as well as Human Subjects training. The initial training session included an overview of the study, visit frequency and duration, and a general description of the RDs’ responsibilities with the study. The second training session was a detailed review of the guidelines for nutrition intervention for adults with HTN, instructions on how to access and use the electronic food-frequency questionnaire and electronic charting portal, and a review of the study-related documents the RDs would be asked to complete following each visit. Each RD was provided with a charting portal log-in and multiple fake patients were created prior to study commencement so that the RDs could practice interacting with the portal. Study funds were used to compensate the grocery store for the RDs’ time, however the RDs were not individually incentivized.

*Communication with the PCP*

The study RDs were asked to use the VioScreen PCMN web-based charting portal (VioCare, Inc., Princeton, NJ), which is designed specifically for nutrition counseling visits. Once the dietitian creates a new counseling session for a patient, the charting portal guides the dietitian through the steps of the Nutrition Care Process, the standardized framework used by registered dietitians to provide individualized patient care. The steps of the nutrition care process include assessment, nutrition diagnosis, a plan for intervention (including goals for the patient), and plans for monitoring and evaluation.
Following a counseling session, a summary of the session, including brief descriptions of each step of the nutrition care process, can be generated from VioScreen PCMN to be shared with other health care providers. Following each participant’s RD visits, a one page dietary intake summary, as well as the one-page counseling session summary for that visit were printed and securely faxed to the PCP by the research assistant. The PCP office was then responsible for scanning the nutrition materials into the patient’s electronic medical record for the PCP to review; the documents were saved as an “outside document” in the Media tab of the patient’s medical record. This is the same procedure used by the PCP offices for any external documentation on their patients.

*Follow-Up Measures*

After completing the three RD visits, participants were asked to return to their primary care office to meet the research assistant for a follow-up study visit. Participants who completed all follow-up measures were compensated with a $75 grocery store gift card. Participants completed a second VioScreen food-frequency questionnaire at their follow-up visit, and they also completed a second blood pressure measurement following the same measurement procedures stated previously. Participants also completed a semi-scripted qualitative interview regarding their experience with the grocery store dietitian; the results from these interviews are presented in Chapter 3 of this document.

Finally, each participant completed the medication-taking subscale of the Bone-Hill Compliance to High Blood Pressure Therapy Scale (Appendix D), which measures medication compliance, at his or her follow-up visit.83,84 The Bone-Hill medication taking...
subscale is nine items, scored using a four point Likert scale (none of the time = 1, some of the time = 2, most of the time = 3, and all of the time = 4). The items are summed and the total subscale score ranges from a minimum of 9 to a maximum of 36, with a higher score indicating poorer compliance.

Process Measures and Chart Review

Attendance at the RD visits was tracked throughout the study. A review of the participant’s electronic medical record was also conducted for all participants who completed the study. We reviewed any encounter (in-person, phone, or patient portal) that the patient had with their primary care provider during the study period. Encounters were reviewed and categorized based on whether it was or was not related to hypertension. Any mentions of the nutrition counseling visits during the PCP encounter were coded accordingly. Charts were also reviewed to assess whether the nutrition counseling summaries were, in fact, scanned into the participant’s medical record. Finally, prescribed antihypertensive medications were reviewed and any changes to medication type or dosage from baseline were documented.

Analysis

Baseline age, BMI, SBP, and DBP were compared for study completers versus non-completers using an independent samples t-test. A 2-tailed $P \leq 0.05$ value, adjusted to account for unequal variance between the groups where necessary, was used to determine statistically significant difference between the two groups. Categorical baseline
characteristics were compared for study completers versus non-completers using Fisher’s exact test. A 2-tailed P value ≤0.05 was used to determine significant differences.

A paired t-test was used to test for significant changes in SBP from baseline to follow-up, with a significance level of P≤0.05 designated \textit{a priori}. However, given that preliminary power calculations showed that a sample size of 41 would be needed to detect significant differences, statistically significant changes were not anticipated for this pilot study. Descriptive statistics around change in SBP were analyzed and will be used for power calculations for larger, randomized trials in the future.

The HEI-2010 total score and the 12 component scores were compared from baseline to follow-up using paired samples t-tests. To account for the increased risk of type 1 error due to multiple comparisons, a P ≤0.01 was used to indicate significant differences. Pearson correlations were calculated for change in HEI-2010 total score compared to change in SBP. Paired t-tests were also used to determine whether changes in intake of the 27 nutrients and food pattern components measured by FPED equivalents were statistically significant; a P ≤0.01 was used to determine significant differences for these tests as well. Descriptive statistics were used to describe data abstracted form the participants’ medical records.

Results

Of the initial 30 participants enrolled in the study, 19 completed all three RD visits as well as the follow-up study visit. A CONSORT chart describing participant flow can be
found in Figure 1. Baseline characteristics of the sample, as well as the characteristics for study completers and non-completers, are described in Table 1. There were no statistically significant differences in any of the baseline demographic characteristics between study completers and non-completers and study non-completers were excluded from all remaining analyses. Though not statistically significant (P=0.09), baseline systolic blood pressure was higher for study non-completers (158 [SD 28] mm Hg) than study completers (138 [SD 13] mm Hg).

**Process Measures**

Across the 19 participants who completed the study, there were a total of 49 encounters with their primary care providers for an average of 2.6 encounters per participant. Nearly all of the participants (18 out of 19) had at least one encounter with their primary care provider over the course of the study period, 16 had at least one in-person encounter, and 10 had at least one in-person encounter for HTN follow-up. For six participants (33.3% of those with any encounter, 60.0% of those with an in-person HTN follow-up) the nutrition counseling visits were mentioned and documented during at least one encounter. Of the 57 RD notes (three per participant) that were sent to the primary care providers, 48 RD notes (84.2%) were successfully scanned into the patient’s electronic medical record. One RD note (for a participant who has not yet completed the study) was found erroneously scanned into another patient’s electronic medical record.
Changes in Systolic Blood Pressure

Mean SBP decreased from 138.1 (SD 13.3) mm Hg at baseline to 134.5 (SD 19.2) mm Hg following the intervention, a mean difference of -3.6 (SD 16.2) mm Hg (95% CI: -4.2 to 11.4); however, this difference was not statistically significant (P=0.35). Given the number of subjects who completed the study and the standard deviation of the change in SBP, a change in SBP of 11 mm Hg would have been the minimum needed to show significant reduction; 161 subjects would have been needed to reach significance with the mean SBP change observed in this study. Four participants had adjustments in their antihypertensive medications during the intervention period, as assessed via chart review. Three participants had an increase in their dosage, and one participant’s antihypertensive medication was discontinued during the intervention period. When the four participants with medication changes were excluded, mean SBP decreased from 137.5 (SD 13.5) mm Hg at baseline to 135.1 (SD 21.2) mm Hg at follow-up, a mean difference of -2.4 (SD 17.7) mm Hg (95% CI: -7.4 to 12.2; P=0.61). A depiction of individual changes in SBP from baseline to follow-up can be found in Figure 2. Systolic blood pressure decreased from baseline to follow-up for ten of the 19 participants (53%), including two participants who had an increase in their antihypertensive medication and one who had a decrease in medication. The remaining nine participants, including one who had an increase in antihypertensive medication, experienced an increase in systolic blood pressure.

Compliance with antihypertensive medication, as measured by the Hill-Bone Medication Compliance subscale, was high, with a mean score of 10.1 (SD 1.8) and a maximum score of 15, where 9 is the best possible compliance and 36 is the worst. Given the
homogeneity of medication compliance in the sample, it was not used as a co-variate in any analyses.

**Changes in Dietary Intakes and Diet Quality**

Mean HEI-2010 scores at baseline and follow-up, as well as the mean change in score, are displayed in Table 2. Mean baseline total score was 60.3 (SD 10.4) on a scale of 0 to 100, with 100 representing the healthiest dietary intake pattern, and increased by an average of 11.6 points (P<0.001). Individual changes in total HEI-2010 score are displayed in Figure 3. Only one participant had a decrease in their HEI-2010 total score from baseline to follow-up, and 13 of the 19 participants (68.4%) increased their HEI-2010 total score by more than 10%. Change in HEI-2010 total score was not significantly correlated with change in SBP ($r=0.24$, $P=0.32$). The positive relationship, although not significant, indicates a positive change (increase) in blood pressure with an increase in HEI-2010 score.

Four out of the 12 component scores significantly increased from baseline to follow-up: fatty acids, refined grains, whole grains, and empty calories. Two of the component scores, milk and protein foods, decreased from baseline to follow-up, although not significantly. The mean HEI-2010 sodium score did not change from baseline to follow-up.

Baseline and follow-up energy and intakes of selected macro and micronutrients, as well as the FPED equivalents for select food groups (as measured by the food-frequency
questionnaire), are presented in Table 3. From baseline to follow-up, sodium intake decreased by an average of more than 2g per day (P<0.001). Saturated fat (P<0.001), discretionary solid fat (P<0.001), and total fat (P<0.001) all decreased significantly from baseline to follow-up, as did servings of non-whole grains (P<0.001). Although typically encouraged as part of the DASH diet, servings of lean meat also decreased significantly (P<0.001). While not statistically significant at P≤0.01, fruit intake increased by an average of nearly one cup per day (P=0.04). Total vegetable intake decreased by an average of 0.4 cups per day (P=0.13); however, this decrease included a 0.2 cup reduction in white potatoes (P=0.04). Dark green vegetable intakes increased by an average of approximately one quarter cup per day (P=0.03).

Discussion
These results show that nutrition counseling from an RD within the community may be an effective strategy for providing hypertension nutrition counseling outside of the primary care office. Others have shown that nutrition counseling in the grocery store is a feasible option for providing nutrition care; Lewis et al. demonstrated that participants randomized to a grocery store intervention had a similarly low attrition rate and similar gains in knowledge when compared to participants receiving nutrition counseling in a clinic setting. However, the most novel component of the current study was the addition of communication between the RD and the PCP. This collaboration is at the crux of the PCMN model; without it, the grocery store RDs are not part of the medical home and therefore any of the potential benefits of the PCMH model are lost. In a randomized trial of 574 adults with hypertension, Lin et al. demonstrated that when a primary care
provider is involved in hypertension nutrition counseling, the effects of the counseling are greater than if the counseling is provided by a dietitian alone. While a high percentage of RD notes made it into the patient’s medical record, 60% of those with a HTN follow-up had a documented discussion with their PCP regarding the RD visits. A qualitative exploration of the patient-centered medical neighborhood model may provide insight into barriers to providing follow-up for the nutrition visits. It is also possible that PCP follow-up was provided but not documented as part of the encounter, or that follow-up will be provided at a later encounter. Additional research is needed to optimize the communication from the RD to the PCP to the patient.

Although a significant decrease in SBP was not detected, the change of -3.6 mm Hg is in line with what has been shown in previous hypertension interventions. A 2014 systemic review for the U.S. Preventative Services Task Force showed that medium- (31 to 360 minutes) to high-intensity (>360 minutes) nutrition and physical activity interventions for individuals with hypertension lasting less than 12 months lowered SBP by an average of 4.47 mm Hg (95% CI: -7.91 to -1.04 mm Hg). A review conducted as part of the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure showed that dietary changes can lead to a 2 to 14 mm Hg reduction in SBP, although the reviewed studies included controlled feeding trials which would presumably lead to greater changes in SBP than studies where the meals are not provided. The results from the present study provide preliminary evidence that SBP changes that are typically seen in clinical trials may be achieved in the PCMN setting. It is important to note, however, that the wide confidence intervals observed for
mean change in SBP indicate that the observed reduction in SBP may have been due to chance. It is also possible that only certain sub-groups of the sample responded to the intervention. The results from this study did not show any patterns in responders versus non-responders to the intervention. For example, out of the ten participants who did decrease their SBP, four were white and six were non-white. Similarly, neither change in HEI-2010 score nor change in sodium intake was significantly correlated with change in SBP and therefore we cannot conclude that sub-groups with greater dietary changes saw greater SBP changes. This study will need to be replicated on a larger scale to determine whether the intervention truly leads to a decrease in SBP. However, across the population, small decreases in SBP can make a clinically important impact on hypertension comorbidities. A population-wide SBP decrease of 3 mm Hg is estimated to decrease stroke mortality by 8% and coronary heart disease by 5%. These data support the development of trials appropriately powered to assess the impact of PCMN-based nutrition counseling on hypertension.

The mean baseline HEI-2010 total score for this sample (60.3) was similar to the estimated average HEI-2010 total score for the US population (59.0). Reedy et al. studied HEI-2010 scores for over 400,000 adults ≥50 year old, divided the sample into quintiles based on HEI-2010 total score, and assessed risk for cardiovascular disease mortality based on quintile. At baseline, the sample from our current study would fall into quintile 2 (second lowest HEI-2010 scores). At follow-up, the mean HEI-2010 total score would place our sample into quintile 4. This shift represents a 6% reduction in cardiovascular disease mortality risk for men and an 8% decreased risk for women. The
changes in HEI-2010 scores from the present study represent not only statistically significant changes, but also clinically important dietary change linked to potentially reduce mortality risk.

The dietary changes observed for this sample were aligned with the DASH diet which encourages fruits, vegetables, and whole grains as well as low-fat dairy and protein foods. The DASH diet also limits foods high in saturated fat, as well as sweets and sugar sweetened beverages. Results from this study showed a slight increase in fruit (cup equivalents) as well as a decrease in refined grain (ounce equivalents) and grams of discretionary solid fat, and an improved HEI-2010 empty calorie score. However, lean meat intake decreased. A reduction in sodium and alcohol intake is also recommended for individuals with hypertension. In our sample, sodium intake decreased drastically from baseline to follow-up, however this change should be interpreted with caution given the moderate test-retest reliability of micronutrient intake for the FFQs. Despite the moderate reliability in estimating sodium using an FFQ, the magnitude of the change in sodium intake suggests a pattern of behaviors related to sodium; even if the real decrease in sodium intake was only half of the observed decrease, it would still represent a clinically meaningful decrease. Alcohol intakes were modest at baseline and persisted within the recommendation of no more than one to two drinks per day.

It is important to consider the limitations of self-reported dietary intake data as a primary endpoint for these data. Socially desirable responses may have played a role in the significant dietary changes observed in this study. The participants completed three visits
with the RD between their baseline FFQ and their follow-up FFQ. During those visits counseling sessions focused on appropriate dietary intake for individuals with hypertension. Their responses on the follow-up FFQ may have reflected the shift in knowledge rather than a modification in eating habits. However, this would at least show that learning had occurred during the nutrition counseling sessions. Additionally, in qualitative interviews collected as part of this case study, patients reported dietary changes that align with those reported in the FFQ, triangulating the quantitative findings. Finally, the sample recruited for this study may have had greater readiness to change than the general population, given that they were willing to enroll in a study that involved nutrition counseling, which limits the generalizability of the results.

Although it was designed as a pilot, the relatively small sample size and single-arm design were limitations of this study. Additionally, to further test the effect of the communication between the RD and the PCP (i.e. the main PCMN component of this model), RCTs with a main intervention of RD/PCP communication are needed. The results of the present study provided valuable feedback for fine-tuning the RD/PCP communication process. There are also inherent limitations of all methods of dietary assessment, including food-frequency questionnaires, which do not offer precise estimates of nutrient intakes and one must take these limitations into account when interpreting the dietary results. However, FFQs do allow assessment of broad dietary patterns, including those that are part of DASH diet-based education.
**Conclusion**

Utilization of the PCMN model to provide nutrition care in the community may have a broad impact in addressing chronic disease treatment. Although the current study examined adults with hypertension, dietary intakes impact clinical outcomes in numerous chronic conditions. Therefore, RDs in the community may be able to successfully intervene across a wide range of chronic disease states using the PCMN model. This study showed that the PCMN model for providing nutrition care can be feasible and effective; however, future research should focus on improving strategies for transferring information from the RD to the PCP, as well as assessing barriers to PCP usage of this information in patient follow-up visits.
Figure 1: Participant flow through the study
Figure 2: Individual changes in systolic blood pressure from baseline to follow-up

Figure 3: Individual changes in Healthy Eating Index 2010 total score from baseline to follow-up
<table>
<thead>
<tr>
<th>Total sample (n=30)</th>
<th>Completers (n=19)a</th>
<th>Non-completers (n=9)a</th>
<th>Pb</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age (years)</strong></td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td></td>
</tr>
<tr>
<td>Age (years)</td>
<td>48.4 (6.7)</td>
<td>49.3 (7.0)</td>
<td>46.3 (5.3)</td>
</tr>
<tr>
<td>Baseline BMI</td>
<td>35.17 (7.1)</td>
<td>34.18 (5.1)</td>
<td>34.6 (7.0)</td>
</tr>
<tr>
<td>SBP (mm Hg) baseline</td>
<td>142.9 (20.7)</td>
<td>138.1 (13.3)</td>
<td>157 (28.3)</td>
</tr>
<tr>
<td>DBP (mm Hg) baseline</td>
<td>90 (10.8)</td>
<td>88.3 (11.4)</td>
<td>94.8 (9.2)</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>53.3% (16)</td>
<td>42.1% (8)</td>
<td>66.7% (6)</td>
</tr>
<tr>
<td>M</td>
<td>46.6% (14)</td>
<td>57.9% (11)</td>
<td>33.3% (3)</td>
</tr>
<tr>
<td><strong>Employment</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employed part-time</td>
<td>6.7% (2)</td>
<td>10.5% (2)</td>
<td>0.0% (0)</td>
</tr>
<tr>
<td>Employed full-time</td>
<td>66.7% (20)</td>
<td>78.9% (15)</td>
<td>55.6% (5)</td>
</tr>
<tr>
<td>Retired</td>
<td>6.7% (2)</td>
<td>0% (0)</td>
<td>0.0% (0)</td>
</tr>
<tr>
<td>Not employed</td>
<td>20% (6)</td>
<td>10.5% (2)</td>
<td>44.4% (4)</td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High school or GED</td>
<td>13.3% (4)</td>
<td>15.8% (3)</td>
<td>11.1% (1)</td>
</tr>
<tr>
<td>Some college</td>
<td>43.3% (13)</td>
<td>31.6% (6)</td>
<td>55.6% (5)</td>
</tr>
<tr>
<td>College graduate</td>
<td>33.3% (10)</td>
<td>42.1% (8)</td>
<td>22.2% (2)</td>
</tr>
<tr>
<td>Graduate school</td>
<td>10% (3)</td>
<td>10.5% (2)</td>
<td>11.1% (1)</td>
</tr>
<tr>
<td><strong>Race</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>African-American</td>
<td>46.7% (14)</td>
<td>42.1% (8)</td>
<td>55.6% (5)</td>
</tr>
<tr>
<td>White</td>
<td>43.3% (13)</td>
<td>47.4% (9)</td>
<td>44.4% (4)</td>
</tr>
<tr>
<td>Other</td>
<td>10% (3)</td>
<td>10.5% (2)</td>
<td>0.0% (0)</td>
</tr>
</tbody>
</table>

*C* Completers and non-completers do not add up to 30 because 2 participants are scheduled for follow-up visits but have not yet completed the visit. They are therefore neither completers nor non-completers

*b* Study completers versus non-completers

*c* 2x2 comparison (any employment versus retired/not employed)

*d* 2x2 comparison (not college graduate versus college graduate and above)

*e* 2x2 comparison (white versus non-white)

Table 1: Baseline characteristics of the sample
Table 2: Healthy Eating Index 2010 scores at baseline and follow-up

<table>
<thead>
<tr>
<th>HEI-2010 score (max. score)</th>
<th>Baseline mean (SD)</th>
<th>Follow-up mean (SD)</th>
<th>Change mean (SD)</th>
<th>95% CI&lt;sup&gt;a&lt;/sup&gt;</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total HEI-2010 Score (100)</td>
<td>60.3 (10.4)</td>
<td>71.9 (9.2)</td>
<td>11.6 (8.2)</td>
<td>7.7, 15.5</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Total Fruit (5)</td>
<td>2.7 (1.7)</td>
<td>3.8 (1.7)</td>
<td>1.1 (1.7)</td>
<td>0.3, 2.0</td>
<td>0.011</td>
</tr>
<tr>
<td>Whole Fruit (5)</td>
<td>3.0 (1.9)</td>
<td>4.3 (1.3)</td>
<td>1.2 (1.9)</td>
<td>0.3, 2.2</td>
<td>0.011</td>
</tr>
<tr>
<td>Total Vegetable (5)</td>
<td>4.3 (0.9)</td>
<td>4.8 (0.5)</td>
<td>0.5 (1.0)</td>
<td>0.1, 1.0</td>
<td>0.033</td>
</tr>
<tr>
<td>Greens and Beans (5)&lt;sup&gt;b&lt;/sup&gt;</td>
<td>3.6 (1.4)</td>
<td>4.4 (1.2)</td>
<td>0.8 (1.3)</td>
<td>0.1, 1.4</td>
<td>0.019</td>
</tr>
<tr>
<td>Whole Grains (10)</td>
<td>2.9 (2.6)</td>
<td>4.4 (3.2)</td>
<td>1.5 (2.3)</td>
<td>0.4, 2.6</td>
<td>0.010</td>
</tr>
<tr>
<td>Dairy (10)</td>
<td>6.1 (2.5)</td>
<td>5.5 (3.1)</td>
<td>-0.6 (3.6)</td>
<td>-2.3, 1.2</td>
<td>0.490</td>
</tr>
<tr>
<td>Protein Foods (5)</td>
<td>4.8 (0.8)</td>
<td>4.5 (1.0)</td>
<td>-0.3 (1.0)</td>
<td>-0.8, 0.2</td>
<td>0.252</td>
</tr>
<tr>
<td>Seafood &amp; Plant Proteins (5)</td>
<td>3.1 (1.9)</td>
<td>3.7 (2.0)</td>
<td>0.6 (2.2)</td>
<td>-0.5, 1.6</td>
<td>0.270</td>
</tr>
<tr>
<td>Fatty Acids (10)</td>
<td>4.4 (2.0)</td>
<td>6.8 (3.0)</td>
<td>2.4 (2.7)</td>
<td>1.1, 3.7</td>
<td>0.001</td>
</tr>
<tr>
<td>Refined Grains (10)&lt;sup&gt;c&lt;/sup&gt;</td>
<td>7.8 (2.4)</td>
<td>9.7 (0.6)</td>
<td>1.9 (2.4)</td>
<td>0.8, 3.1</td>
<td>0.003</td>
</tr>
<tr>
<td>Sodium (10)&lt;sup&gt;c&lt;/sup&gt;</td>
<td>2.4 (2.4)</td>
<td>2.4 (2.9)</td>
<td>0.0 (3.3)</td>
<td>-1.6, 1.6</td>
<td>0.965</td>
</tr>
<tr>
<td>Empty Calories (20)&lt;sup&gt;c&lt;/sup&gt;</td>
<td>15.0 (4.1)</td>
<td>17.5 (3.1)</td>
<td>2.5 (2.4)</td>
<td>1.3, 3.6</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

<sup>a</sup>95% confidence interval of the mean difference from baseline to follow-up

<sup>b</sup>Included Dark Green, Orange Vegetables, and Legumes

<sup>c</sup>Component scores are reverse coded; higher score indicates healthier diet pattern
<table>
<thead>
<tr>
<th>MyPlate Equivalents</th>
<th>Baseline mean (SD)</th>
<th>Follow-up mean (SD)</th>
<th>Change mean (SD)</th>
<th>95% CI(^a)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total dairy (c)</td>
<td>2.4 (1.7)</td>
<td>1.5 (1.6)</td>
<td>-1.0 (1.4)</td>
<td>-1.6, -0.3</td>
<td>0.009</td>
</tr>
<tr>
<td>Milk (c)</td>
<td>1.1 (1.1)</td>
<td>0.8 (0.9)</td>
<td>-0.3 (1.0)</td>
<td>-0.8, 0.2</td>
<td>0.229</td>
</tr>
<tr>
<td>Cheese(c)</td>
<td>1.3 (1.5)</td>
<td>0.6 (0.8)</td>
<td>-0.7 (1.4)</td>
<td>-1.3, 0.0</td>
<td>0.062</td>
</tr>
<tr>
<td>Yogurt (c)</td>
<td>0.1 (0.2)</td>
<td>0.1 (0.1)</td>
<td>0.0 (0.1)</td>
<td>-0.1, 0.1</td>
<td>0.775</td>
</tr>
<tr>
<td>Total fruit (c)</td>
<td>1.2 (1)</td>
<td>2.2 (2.1)</td>
<td>0.9 (1.9)</td>
<td>0.1, 1.8</td>
<td>0.04</td>
</tr>
<tr>
<td>Total vegetable excluding legumes (c)</td>
<td>3.1 (1.9)</td>
<td>2.7 (1.6)</td>
<td>-0.4 (1.2)</td>
<td>-1.0, 0.2</td>
<td>0.132</td>
</tr>
<tr>
<td>White potato (c)</td>
<td>0.6 (0.4)</td>
<td>0.4 (0.3)</td>
<td>-0.2 (0.4)</td>
<td>-0.4, -0.0</td>
<td>0.038</td>
</tr>
<tr>
<td>Dark green vegetable (c)</td>
<td>0.4 (0.3)</td>
<td>0.6 (0.5)</td>
<td>0.2 (0.4)</td>
<td>0.0, 0.5</td>
<td>0.028</td>
</tr>
<tr>
<td>Legumes (c)</td>
<td>0.1 (0.1)</td>
<td>0.1 (0.1)</td>
<td>-0.1 (0.1)</td>
<td>-0.1, 0.0</td>
<td>0.045</td>
</tr>
<tr>
<td>Total grain (oz)</td>
<td>6.9 (3.4)</td>
<td>3.2 (2.2)</td>
<td>-3.7 (4)</td>
<td>-5.7, -1.8</td>
<td>0.001</td>
</tr>
<tr>
<td>Whole grain (oz)</td>
<td>1.2 (1.1)</td>
<td>1.1 (1.4)</td>
<td>-0.1 (1.4)</td>
<td>-0.8, 0.6</td>
<td>0.78</td>
</tr>
<tr>
<td>Non-whole grain (oz)</td>
<td>5.7 (3.1)</td>
<td>2.1 (1.5)</td>
<td>-3.6 (3.4)</td>
<td>-5.3, -2.0</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Lean meat from meat, poultry, fish (oz)</td>
<td>7.4 (3.7)</td>
<td>3.8 (2.6)</td>
<td>-3.6 (3.2)</td>
<td>-5.1, -2.0</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Lean meat from eggs (oz)</td>
<td>0.6 (0.5)</td>
<td>0.7 (1.0)</td>
<td>0.1 (0.7)</td>
<td>-0.2, 0.5</td>
<td>0.459</td>
</tr>
<tr>
<td>Lean meat from nuts and seeds (oz)</td>
<td>0.8 (1.5)</td>
<td>0.7 (0.9)</td>
<td>-0.1 (1.7)</td>
<td>-1.0, 0.7</td>
<td>0.723</td>
</tr>
<tr>
<td>Lean meat from soy (oz)</td>
<td>0.1 (0.1)</td>
<td>0.1 (0.2)</td>
<td>0.0 (0.2)</td>
<td>-0.1, 0.1</td>
<td>0.978</td>
</tr>
<tr>
<td>Discretionary solid fat (g)</td>
<td>55.9 (29.1)</td>
<td>26.0 (20.9)</td>
<td>-29.9 (19.9)</td>
<td>-39.5, -20.3</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Added sugars (tsp)</td>
<td>15.2 (14.2)</td>
<td>7.8 (5)</td>
<td>-7.4 (13.3)</td>
<td>-13.8, -1.0</td>
<td>0.027</td>
</tr>
<tr>
<td>Alcohol (drinks)</td>
<td>0.5 (0.7)</td>
<td>0.4 (0.6)</td>
<td>-0.2 (0.4)</td>
<td>-0.4, 0.0</td>
<td>0.089</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Nutrients</th>
<th>Baseline mean (SD)</th>
<th>Follow-up mean (SD)</th>
<th>Change mean (SD)</th>
<th>95% CI(^a)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy (kcal)(^b)</td>
<td>2637 (1107)</td>
<td>1653 (785)</td>
<td>-984 (1112)</td>
<td>-1520, -448</td>
<td>0.001</td>
</tr>
<tr>
<td>Total carbohydrate (g)</td>
<td>293 (132)</td>
<td>201 (123)</td>
<td>-92 (153)</td>
<td>-166, -19</td>
<td>0.017</td>
</tr>
<tr>
<td>Total protein (g)</td>
<td>121 (57)</td>
<td>71.3 (41.9)</td>
<td>-50.1 (49.6)</td>
<td>-74.0, -26.1</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Total fat (g)</td>
<td>108 (50)</td>
<td>64.1 (31.2)</td>
<td>-43.8 (44.6)</td>
<td>-65.3, -22.3</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Total cholesterol (mg)</td>
<td>381 (199)</td>
<td>265 (234)</td>
<td>-116 (138)</td>
<td>-183, -50</td>
<td>0.002</td>
</tr>
<tr>
<td>Total fiber (g)</td>
<td>24.3 (10.1)</td>
<td>21.3 (12.7)</td>
<td>-3.1 (10.7)</td>
<td>-8.2, 2.1</td>
<td>0.226</td>
</tr>
<tr>
<td>Total saturated fat (g)</td>
<td>36.8 (19.5)</td>
<td>18.9 (12.1)</td>
<td>-17.9 (14.2)</td>
<td>-24.8, -11.1</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Sodium (mg)(^b)</td>
<td>5145 (2344)</td>
<td>3075 (1616)</td>
<td>-2071 (1943)</td>
<td>-3007, -1134</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

\(^a\)95% confidence interval of the mean difference from baseline to follow-up
\(^b\)Estimates from food frequency questionnaires for energy and sodium have high variability and should be interpreted with caution.

Table 3: MyPlate equivalent and select nutrient intake at baseline and follow-up
Chapter 3: Integrating Components of the Patient-Centered Medical Neighborhood into Nutrition Counseling for Hypertension within a Grocery Store: A Qualitative Analysis of the Patient’s Perspective

Introduction

Nutrition is a critical component to the treatment of many chronic diseases, such as obesity, diabetes, and hypertension, and although PCPs agree that nutrition education is important, barriers such as lack of time and lack of training prevent adequate nutrition counseling during primary care visits. For example, one study of adults in primary care showed that nutrition counseling only occurred in 45% of visits for diabetes, 25% of visits for cardiovascular disease, 31% of visits for hypertension, and 33% of visits by patients with obesity. This limits patient access to the nutrition care that is needed.

Few primary care offices employ in-house registered dietitians (RDs); however, RDs are readily available in many communities and have proven to be effective facilitators of behavior change. This makes RDs a good fit for the patient-centered medical neighborhood (PCMN) model for healthcare delivery. As patient-centered medical homes are integrated into the health care system, a complimentary patient care model has emerged. The PCMN expands on the medical home framework by including sub-specialties physically located throughout the patient’s community. Though the care is still coordinated through one central hub (the primary care provider/medical home), the
patient has the opportunity to interact with healthcare professionals that may not exist within the physical medical home location. This may be particularly important for smaller practices or more rural primary care offices that do not have the resources to offer auxiliary health services within their office or healthcare system.

It has become increasingly common for grocery stores to employ dietitians who are available for customer consultation. Nutrition counseling within a grocery store may have many advantages. Grocery store RDs provide application-based counseling by educating in the environment where the food decisions are made. Grocery stores also often provide a more convenient location and parking, a lower cost, and offer evening and weekend appointment times. A small body of literature has provided preliminary evidence for the effectiveness and acceptability of nutrition counseling in the grocery store, however neither of these interventions included communication from the RD to the PCP.85,90

The purpose of this study was to qualitatively assess the patients’ experiences interacting with the PCMN model for providing nutrition care in a real-world setting.

Methods

Overview and Study Design

This study used an instrumental case study design and was part of a larger case study investigating nutrition counseling in the PCMN. A detailed description of the study can be found in Chapter 2. Briefly, adults with hypertension were recruited from three primary care offices. After completing a series of baseline measures, including a blood
pressure measurement, demographic questionnaire, and food-frequency questionnaire, the participants attended three nutrition counseling visits with a dietitian in a grocery store over the course of twelve weeks. The initial RD visit was approximately 60 minutes and subsequent visits were approximately 30-45 minutes. Following the participant’s visits with the RD, a one page summary of the participant’s food-frequency questionnaire, as well as the counseling session summary for that visit were printed and faxed to the PCP by the research assistant. The PCP office was responsible for scanning the nutrition materials into the patient’s electronic medical record for the PCP to review. The participants then completed follow-up measures in their primary care office, including a repeat blood pressure measurement, food-frequency questionnaire, and a qualitative interview.

**Participants**

Participants in this study were recruited out of three local primary care offices. All patients 60 years old and younger were screened via chart review to determine if the patient met preliminary inclusion/exclusion criteria: documented diagnosis of HTN, age between 18-60 years, and no current prescription for insulin. If the patients were interested in the study after being approached by their primary care provider, the research assistant explained the study in more detail and conducted a baseline blood pressure measurement after consenting the patient. All patients had to have a systolic blood pressure of 120 mm Hg or greater, or 140 mm Hg or greater if they were not currently prescribed antihypertensive medication(s). Patients who met all inclusion/exclusion
criteria and were interested in participating were enrolled in the study; recruitment continued until 30 participants were enrolled.

**Interview Process**

Interviews were conducted after the participants had completed all three visits with the registered dietitians. They were conducted by the research assistant in a private office in the participant’s primary care office.

The line of questioning for the semi-structured interviews was designed to garner feedback around four major areas of interest: 1) previous experiences receiving nutrition counseling, particularly in the primary care setting, 2) the patient’s experience with the nutrition counseling from the RDs in this study, 3) behavior and other changes that resulted from the nutrition counseling, and 4) PCMN-specific topics such as attitudes towards the community-based location, or continuity of care between RD and PCP. Interview questions were designed accordingly and the line of questioning for the patient interviews is displayed in Table 4.

**Analysis**

All interviews were transcribed verbatim and were reviewed independently by two members of the research team. Interviews were analyzed as they became available; the initial codebook was created using the first three interviews and then was iteratively revised throughout the analysis process using the constant comparison method.91 The major parent codes were designated *a priori* based on the four specific areas of interest;
codes for each sub-themes were constructed based on concepts emerging organically within each parent topic. The two researchers independently coded each interview with Ethnograph 6.0 (Qualis Research, Colorado Springs, CO), using existing code words and also identified any themes that had not previously been codified. The two researchers then reviewed each interview together to compare coding agreement. Any disagreements were discussed and resolved. Based on a sample of three transcripts (16% of the total sample), inter-rater reliability (defined as the rate of agreement between the two coders) was 83%. Most of the disagreements were due to differing interpretations of the codebook definitions, which were subsequently revised for clarity. Thematic analysis was used to identify quotes that personify the phenomenon in the participants’ own words.

Multiple strategies were used to establish trustworthiness in the data collected from this study. First, two reviewers independently reviewed and coded the interview transcripts, as described above. Secondly, quantitative data collected as part of this case study and described in Chapter 1 was used to triangulate the participants’ reported experiences. Finally, negative evidence was coded and is reported in the results of this report.

Results

Out of the 30 participants initially enrolled in the study, 19 completed follow-up visits and participated in the qualitative interview; saturation was reached from these 19 interviews. Demographic characteristics of the sample can be found in Table 5. The final codebook included 21 sub-codes; these codes, representative quotes, and counterevidence where available are displayed in Table 6.
Several patients had received previous nutrition counseling from a healthcare provider, most often their primary care provider. Common recommendations from the healthcare provider were broader recommendations to decrease sodium, carbohydrate, and fat intake, increase fruit, vegetable, and whole grain intake, reduce portion size, and adjust the timing of meals (for example, not eating at night). For some patients, their PCP had recommended that they lose weight, lower their blood pressure, or adjust their diet but did not offer any specific dietary guidance. “You know I have had maybe a doctor mention ‘well you need to cut your calories’, they might say something like that.” Most patients expressed that the counseling from the RD was more detailed and specific than what they had received from other healthcare providers.

In contrast, patients appreciated the specific, individualized dietary recommendations provided by the grocery store RDs. “I've always known that, you know, I should eat more healthy, but as far as knowing what to eat more healthy means, I didn't know entirely like, you know, how much I should eat, like how many servings of this and, you know, of what I should do.” Another patient commented, “And anything I told her, certain things I didn't like, she gave me options that I could try rather than what I don't like.”

Overall, the patients felt that the dietitians were very knowledgeable. Many of the patients appreciated that the RD had time to review dietary recommendations and also took the time to listen to the patient and answer questions. Several patients expressed that
the RDs were friendly, non-judgmental, and were willing to meet the patient where they were as far as readiness to change. “I told her I can't quit drinking a lot of diet coke and so, you know, she didn't say, ‘Well you need to stop right away’, or, she was like you know, ‘You just need to cut back’, and things like that so. She never looked down on you or anything.”

Some of the patients also discussed how helpful it was to have encouragement from the RDs. “But I think it was just an eye opener and that, you know, this can be done and you can do this, and sometimes you just need encouragement from somebody, you know, not that I'm one to look for praise from everybody but that encouragement I think helped me. I really do.” Another patient commented, “[The RD said], you know, ‘you know what to do, cause I can tell that you know what to do, you just need to do it. So when are you going to do it?’ So, that's basically—that's why I appreciated it so much.”

*Location of the Nutrition Counseling*

Many of the patients expressed that the location of the counseling did not make a difference to them. Distance from home or work was more important than the actual setting. Multiple patients thought it was strange at first to be in a grocery store, but once they were in the RD’s office it felt private and professional, similar to a regular office setting, and their misgivings were alleviated. “I just went in and went to her office, and once you close the door, you don't even know you're in an office or a gas station. It's like, you know, it's a professional setting and she had all the information there and everything. I didn't—it didn't matter where I was at once you were in the office.”
While many patients were indifferent to the location, some preferred the grocery store setting to the office setting. Two patients felt that the grocery store was a more relaxed setting. “Because sometimes when you come into a doctor's office you feel like it's so formal, so, not so much sterile but so, it's a doctor's office, you know you're–you either come to a doctor's office because you're sick, something's going on. Um, even though I worked in them for years. But you always have that feeling so I don't know that you relax as much as I did in that grocery store setting. I felt more comfortable.” One patient felt that the grocery store was more convenient than going to a doctor’s office. “And I thought it was easier [than going to a doctor’s office], ‘cause you have to pay for parking, you gotta get out, you gotta drive further, kind of a hassle. [Then] when you get there [the grocery store] at 4:30 you're ready at 4:30. At the doctor's you're there til 5:00, 5:10 and then they rush you.”. Still others liked that they were able to plan their grocery shopping around their RD visits. Another commonly-reported benefit of being located in the grocery store was the access to hands-on education within the aisles of the grocery store. One patient commented, “She was able to actually pinpoint things in the store whereas she wouldn't have been able to do that in the doctor's office.”

The patients did not identify any drawbacks to the counseling taking place in the grocery store versus a medical office. When asked about difficulties scheduling visits with the grocery store RDs, a commonly reported barrier to nutrition education in the literature,\textsuperscript{36–39} the patients had very little feedback; the general consensus was “it was fine”. Most patients felt that the RDs were flexible as far as scheduling appointments and most did not have trouble finding times during which both they and the RD were available.
Behavior Changes and Other Outcomes

One often-reported change was an increased awareness of diet. Many patients reported that logging their food and discussing their diet with the RD made them more cognizant of their actual intake. Several patients also reported that the counseling made them more aware of appropriate portion sizes. “The plate she showed us that divides, you know, like you should have this much this, this much this, that was really an eye opener. The size of the plate, the size of the portions were like [participant expresses surprise], “I have spaghetti on the whole plate, just not that little piece over there”. So that stuck with me a lot.”

Patients reported a wide variety of dietary behavior changes. Frequently reported dietary changes included eating more fruits and vegetables, drinking more water and cutting out soda, consuming less sodium, cooking more at home, or making healthier choices when eating out, consuming smaller portions, consuming fewer dairy products, such as cheese, or switching to low-fat dairy products, consuming less bread, packing lunches/preparing meals ahead of time, and label reading or looking at restaurant menus/nutrition info ahead of time. Many patients reported eating a generally “more balanced diet.” Several patients reported that they only made small changes to their intake, but the changes still had an impact.

Some of the patients reported metabolic changes, such as weight loss or a decrease in blood pressure, in addition to their dietary changes. One patient reported that he was pleased to be able to discontinue his antihypertensive medication.
Accountability to the RD was a commonly reported motivator for behavior change. One patient commented, “In the beginning it's more like ‘Well, I'd better do this, I'd better do that because I know I have to go back and see her.’ It became more routine, where it wasn't like a conscious effort, it was just something I just did.” Although many patients reported that the accountability was helpful, there also seemed to be a sense of guilt associated with the accountability. As one patient stated, “You know, I have to go, like going to confession or something, I have to go in here and tell her that I didn't switch the milk or I ate two big plates of spaghetti or, so it was that type of thing.” Other motivators included declining health or advancing age. For example, one patient explained, “As I was getting older I needed to integrate more fruits and vegetables into my diet.”

**Barriers to Making Behavior Changes**

Several patients reported cultural norms, such as large portion size, high carbohydrate intake, or high oil intakes, as a barrier to making nutrition changes. Others reported simply enjoying larger sizes. Multiple patients reported a perceived addiction to food or cravings for certain foods, and another commonly reported barrier was the time required to plan and prepare healthy meals. “I mean, with a teenager and an adolescent, we're on the go constantly, and being able to do something quickly yet nutritiously has been a challenge. You know, convenient aren't always healthy foods.” There was a perception among several patients that eating healthy is more expensive; however, one patient reported that he thought he spent less money on food while eating healthy. For some, it was challenging to implement diet changes if other family members in the household were not following the same eating plan. “For me the most difficult thing has been taking
information home to my wife and discussing it with her. And she agrees, she sees the benefit of all of it, but not having gotten the information first hand, maybe, you know, it's not as effective for her and therefore not for us as a couple.”

**PCP Referral and Follow-Up**

Several patients illustrated the impact a PCP can have when referring to a specialist. Multiple patients explained that they had already been considering seeing a dietitian and referral to this study gave them a place to start. “I was even thinking, you know, I need to go back and see a dietitian, kind of get back in the groove when the doctor asked me if I wanted to participate in this. He just… the timing was just perfect for me. And I, of course, I wanted to do that.” For one patient, the mere fact that the PCP mentioned the study was enough to prompt action. “Just having her tell me about it, I thought, ‘Oh, somebody else notices, maybe I should’, you know [get nutrition counseling]”

Some of the patients had not yet been back for a follow-up visit with their PCP at the time of their interview. Of those that had been back, the patients generally described the PCP’s follow-up as brief, just asking the patient how it’s going, if anything at all. Per the patients’ reports, the conversations about the nutrition counseling were often, but not always, initiated by the patient. For those with metabolic changes, the PCPs offered positive reinforcement. “She just told me to keep up the good work. I've even lowered my cholesterol and everything is the way she wants to see it.”
Of the patients that have not been back to see their PCP for a follow-up visit, many of them reported intention to bring up the nutrition counseling with the PCP at their next visit. Some patients felt that they would just mention that they are seeing the RD unless the PCP specifically asks for additional information. “He's pretty busy so, you know, he may ask and just see how it went and, a lot of time that's what happens, and then if he needs more information he'll ask more, and I'll give him more.”

Other patients expect the follow-up conversation to be dictated by metabolic changes. One patient has experienced a reduction in blood glucose levels and is eager to share with his PCP that the reduction is due to the nutrition counseling. Other patients seemed less sure of their metabolic outcomes, but felt that changes in their metabolic measures will lead to a conversation about nutrition counseling. “I'm hoping that the next time I go there will be a significant weight loss and she'll say, ‘Oh, how did you do that?’” Another patient commented, “Well it depends on how good my cholesterol levels are looking. She might be getting on me saying, ‘What did you learn!’”.

*Satisfaction*

Overall, patient satisfaction with the nutrition counseling was very high. Many patients shared their positive experiences and expressed that they would recommend the counseling to others. “I can't think of anything that I would change, I mean, it was very…..it was very rewarding and it was enlightening.” Two of the patients had plans to continue with the nutrition counseling after the conclusion of the study. Several others explained that they were interested in continuing with the nutrition counseling, but they
did not have insurance benefits to cover the cost, or they were still in the process of exploring what their insurance would cover.

Multiple patients expressed that they would consider going back in the future if they started to struggle with their diet again. Some of the patients who did not plan on continuing the nutrition counseling felt that they now have adequate dietary knowledge, and felt that “the ball is in my court”. Others were unsure of any additional benefits of continued visits. “She's given a lot of knowledge and I think I, you know, I pretty well have it.” Finally, one patient mentioned that whether or not he continues with the nutrition counseling will depend on his doctor’s recommendation.

The most commonly reported recommendation for improving the nutrition counseling was to add more visits, although many were happy with the three visits. Multiple patients reported that it would be helpful to include a family member in the counseling. “But, you know, not just because he needs it, but you know it would be really good if we could do it together.”

Discussion
The purpose of this study was to understand patient experiences receiving nutrition counseling within the patient-centered medical neighborhood. Overall, patients reported a positive experience with the nutrition education and the PCMN model for providing nutrition care. Patients reported that the nutrition education from the RD was more detailed than what they have received in the past. This was expected, as the average time
spent on nutrition education during a primary care visit has been shown to be approximately one minute.\textsuperscript{15} Patients in this study seemed to appreciate the time the RD was able to spend providing an individualized nutrition plan and answering patient questions.

Patients provided quite a bit of feedback on the helpfulness of the nutrition counseling and were generally eager to talk about behavioral and other changes. Some of the most helpful components, as reported by the patients, were the specificity of the nutrition recommendations and the food log that the RD asked patients to keep. Patients reported many dietary changes, which were also reflected in the quantitative portion of this study reported in Chapter 2 of this document. Additionally, several patients reported increased awareness of their diet and even resulting metabolic changes. The sub-themes that emerged under the broader themes of “experience with the RD” and “behavior change” were similar to those that have been reported previously in the literature. In one qualitative analysis of a community-based dietary and physical activity intervention, competence of the professional, accountability, and motivation were some of the most commonly reported sub-themes.\textsuperscript{92} Additionally, the barriers to dietary change reported by the participants, such as lack of time, desire for larger portion sizes, or lack of familial support, have been reported elsewhere in the literature.\textsuperscript{93,94} Although the line of questioning was not based on the health belief model, these reported perceived benefits and perceived barriers map to components of the model.\textsuperscript{95} Further examination of how the patients’ reported experiences fit with the health belief model may provide additional information as to how and why the PCMN model led to behavior change.
Interestingly, multiple patients indicated that their doctor’s referral to the study was a “tipping point”, causing them take action they may not have otherwise taken. One review of barriers to patient attendance at cardiac rehabilitation programs, which, like nutrition counseling in the grocery store, are outpatient specialty interventions, reported that the most common barrier to attendance was simply the lack of a physician referral. In fact, when taking into account demographic, medical, and psychosocial variables, physician referral has been shown to be the strongest predictor of cardiac rehabilitation attendance. Our data provide an initial indication that physician referral may be an important factor in nutrition counseling attendance as well. Viewing this through the lens of the health belief model, PCP referral may be a “cue to action”, or a strategy that may activate readiness and action in the patient. The wide availability of RDs in the grocery store setting, and initial indications of its effectiveness and acceptability, may make it easier for PCPs to refer patients to nutrition counseling. Although RDs are not often available within the medical home, expanding care to the medical neighborhood provides additional options for referral, particularly if the community practitioner is able to communicate with the PCP.

Patients in this study were largely indifferent to the fact that the nutrition counseling took place in a grocery store versus a traditional medical setting. The distance of the store from their home or workplace was more important than the actual setting. Some reported initial skepticism about having a medical visit in a grocery store, but their hesitations were short-lived. Several patients indicated benefits of being in a grocery store over a traditional clinic setting, particularly the hands-on aspect of the counseling, and none of
the patients reported drawbacks of being see in the grocery store. Given the widespread availability of retail RDs, nutrition counseling within the grocery store may be a suitable option for primary care patients seeking nutrition education, especially for those without access to nutrition care within the primary care office, or those who find the grocery store to be a more convenient location. Scheduling difficulty is a commonly reported reason for attrition from outpatient nutrition counseling\textsuperscript{35–37,39}; however the patients in this study did not report any difficulties with scheduling. This may be due to the flexible hours available in the grocery store setting.

This study included communication from the RD back to the PCP, an important component of the PCMN model that is thought to help provide continuity of care for the patient. Patients that did have a follow-up visit generally reported only brief conversations with their PCP and the majority were patient-initiated. The fact that the discussions were brief is not necessarily unexpected or troublesome; we might expect only brief follow-up from the PCP when they know that the RD is providing an in-depth intervention. However, more information is needed as to why the PCP did not typically bring up the nutrition counseling. For example, was it because they were unaware of the counseling (i.e. the note from the RD was not effectively integrated into the electronic medical record)? Or, were the PCPs aware of the counseling but found it unnecessary to follow up with the patient? There is evidence that patient follow-up with their PCP after hospital discharge is beneficial,\textsuperscript{97,98} however there is little information as to the communication that occurs between the patient and PCP during the follow-up visits, and also scant evidence on follow-up visits after outpatient specialty care However, these
results align with one study that showed that an average of one minute is spent on nutrition counseling during primary care visits. Qualitative data collected from the PCPs participating in this study will help address some of these questions and are presented in Chapter 4 of this document. Many patients that have not yet been back to their PCP indicated intent to discuss the nutrition counseling with their PCP, although they felt that the conversation may depend somewhat on their metabolic outcomes. Patients were not explicitly told that this was an intervention focusing on the patient-centered medical neighborhood model, and none expressed that the communication from their RD to the doctor or subsequent PCP follow-up was out of the norm; however, they were not specifically asked about the novelty of those components.

The feedback that we received from the participants largely was not specific to hypertension care. Therefore, community-based RDs may be a suitable option for patients with other chronic diseases for which medical nutrition therapy is advised, such as diabetes or obesity. Further research is needed to explore whether results would be similar if the RD was based in another community setting such as a recreation center or workplace.

One limitation of this study is that the follow-up study visits occurred approximately 12 weeks after their baseline visit which did not allow enough time for all participants to have a follow-up visit with their PCP. Therefore, we must be cautious about drawing conclusions about how PCPs provide follow-up care. Additionally, there may have been bias in the responses provided by the patients in this study. The patients may have been
inclined to provide socially desirable responses, and we also did not interview the participants that dropped out of the study, which may have introduced a non-response bias. However, six of the nine non-completers dropped out before even beginning the nutrition counseling and one dropped out only after completing all three RD visits. Future research on the reasons for attrition from nutrition counseling in the PCMN is warranted.

Conclusion

The patients in this study felt that the grocery store RD was able to provide more detailed and specific nutrition advice than their PCP, and that nutrition counseling in the grocery store was an acceptable and effective intervention. Therefore, RDs practicing in community settings may be a valuable resource for patient-centered medical homes that are expanding to the medical neighborhood model. The PCMN model may be particularly valuable in rural settings or small community health centers, where specialists are not likely to be available within the office or health system. More research is necessary to assess the affect the PCMN model has compared to traditional community-based care without communication with the PCP.
1. Tell me about the types of dietary advice your health care providers have given you in the past.
   a. Who has given you this advice in the past?
   b. How was your experience in this study different than how you have been given dietary advice in the past from your healthcare providers?

2. Tell me about your experiences seeing the registered dietitian (RD).
   a. Tell me about any benefits, if any, you experienced from the nutrition counseling.
   b. Was there anything that you didn’t like about seeing the dietitian?
   c. Was the RD able to help you improve your diet? How so/why not?
   d. What changes have you made to your diet, if any?
   e. What has remained challenging for you, if anything?

3. [Have you been back to see your physician since you saw the dietitian?] When you went back to see your physician, did you talk about the visits with the dietitian?
   a. If so, what did you talk about?
   b. Did they give you any further advice? Tell me about it.

4. Do you think it was better to see the dietitian in the grocery store or would it be better to see her in the doctor’s office? Why or why not?
   a. Was it easier to find a time for the visit?

5. How did you feel about the online nutrition assessment that you took prior to your first visit? Do you think it was helpful for the dietitian to have this information ahead of time?

6. Now that the study is coming to an end, will you continue to see the RD? Why or why not?
   a. Would you recommend the service to a friend? Why or why not?

7. What would you have changed about this experience, if anything?

8. Is there anything else you would like to tell me about your experience in this study?

Table 4: Interview guide for semi-structured interviews with study participants
<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>49.3 (7.0)</td>
</tr>
<tr>
<td>Baseline BMI</td>
<td>34.18 (5.1)</td>
</tr>
<tr>
<td>Baseline SBP (mm Hg) baseline</td>
<td>138.1 (13.3)</td>
</tr>
<tr>
<td>Baseline DBP (mm Hg) baseline</td>
<td>88.3 (11.4)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>% (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
</tr>
<tr>
<td>Male</td>
</tr>
<tr>
<td>Employed part-time</td>
</tr>
<tr>
<td>Employed full-time</td>
</tr>
<tr>
<td>Retired</td>
</tr>
<tr>
<td>Not employed</td>
</tr>
<tr>
<td>High school or GED</td>
</tr>
<tr>
<td>Some college</td>
</tr>
<tr>
<td>College graduate</td>
</tr>
<tr>
<td>Graduate school</td>
</tr>
<tr>
<td>African-American</td>
</tr>
<tr>
<td>White</td>
</tr>
<tr>
<td>Other</td>
</tr>
</tbody>
</table>

Table 5: Baseline characteristics of the sample (n=19)
<table>
<thead>
<tr>
<th>Code Word</th>
<th>Definition and representative quotes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Previous nutrition education</strong></td>
<td></td>
</tr>
</tbody>
</table>
| CW | Previous nutrition education from coursework/teaching.  
“I’ve had courses, you know, in this area.” |
| HCP | Previous nutrition education from a healthcare provider.  
“I was advised, uh, that I should, uh avoid taking salt, sodium, because of my high blood pressure.”  
“Well it was more of, in general, you know make sure you get your fruit and vegetables.” |
| NHP | Previous nutrition education from a non-healthcare provider. |
| NPA | Nutrition education not previously addressed. |
| **Experience with the RD and/or the nutrition counseling** | |
| ADD | Things that could be added/improved/changed.  
“I kind of felt like if I had had just another couple of visits with her it may have helped me a little bit more.”  
“I actually wish it went a little longer”  
“My husband needs to go through it.”  
Counter: “I thought we’d go in, have a visit and then I thought like we were going to go around and shop or something.” |
| HELP | Things that were helpful from the RD/nutrition counseling.  
“She had time to listen and to give specifics.”  
“Definitely what was beneficial for me was being specific about what to eat, and not just how to eat.”  
“I got a understanding about, just like when she had me chart my food, that really helped me see.”  
Counter: “I was looking for something that would tell me exactly what meals to eat, like for breakfast for lunch, for dinner, you know, and my snacks. It was not that.” |
| SAT | Satisfaction with RD counseling; includes desire/plans to continue RD visits.  
“She was very knowledgeable and she was very easy to talk to.”  
“I would definitely recommend to others. I think it’s a great program.”  
“I just think it was really good. I mean it was very educational.”  
Counter: “I think I’ve got enough information. I think the ball is on my side now.” |

Table 6: Codebook used for analysis of the patient interviews and representative quotes
Table 6 continued

<table>
<thead>
<tr>
<th><strong>Behavior changes or other outcomes from the nutrition counseling</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ACC</strong></td>
<td>Accountability to RD; pleasing someone.</td>
</tr>
<tr>
<td>&quot;In the beginning it's more like, well, I'd better do this, I'd better do that because I know I have to go back and see her.&quot;</td>
<td></td>
</tr>
<tr>
<td>&quot;I think it was a reminder like, oh I don't want to gain weight before I go to the dietitian.&quot;</td>
<td></td>
</tr>
<tr>
<td><strong>AOD</strong></td>
<td>Awareness of diet. Increase in knowledge but not necessarily change in behavior.</td>
</tr>
<tr>
<td>&quot;What I should be doing&quot;.</td>
<td></td>
</tr>
<tr>
<td>&quot;She made me take a step back and actually look at what I was eating.&quot;</td>
<td></td>
</tr>
<tr>
<td>&quot;Later on I could look and see, you know, it's like dang I screwed up right here.&quot;</td>
<td></td>
</tr>
<tr>
<td>&quot;What I though was one serving of meat, wasn't one serving. It was more like two instead.&quot;</td>
<td></td>
</tr>
<tr>
<td><strong>BAR</strong></td>
<td>Barriers to making behavior changes.</td>
</tr>
<tr>
<td>&quot;I think portion size will always be a challenge for me, just because I enjoy eating.&quot;</td>
<td></td>
</tr>
<tr>
<td>&quot;It's almost, I'd say I have a food addiction.&quot;</td>
<td></td>
</tr>
<tr>
<td>&quot;It was mostly about my lifestyle being busy.&quot;</td>
<td></td>
</tr>
<tr>
<td><strong>CHG</strong></td>
<td>Changes in eating or purchasing behavior, label reading, long-term changes after the counseling is over.</td>
</tr>
<tr>
<td>&quot;I've started to eat more vegetables and fruits.&quot;</td>
<td></td>
</tr>
<tr>
<td>&quot;The thing of it I got out of it was I ate more diverse.&quot;</td>
<td></td>
</tr>
<tr>
<td>&quot;I definitely cut out salt.&quot;</td>
<td></td>
</tr>
<tr>
<td>&quot;They were small changes but they were enough to make a difference.&quot;</td>
<td></td>
</tr>
<tr>
<td>Counter: &quot;I feel like I try to live a pretty healthy lifestyle to begin with. So, I didn't need to make a lot of changes but, you know, a couple of tweaks here and there.&quot;</td>
<td></td>
</tr>
<tr>
<td><strong>MC</strong></td>
<td>Metabolic changes achieved due to the intervention. Weight loss, changes in BP, or medication use.</td>
</tr>
<tr>
<td>&quot;My sugar levels are a lot lower.&quot;</td>
<td></td>
</tr>
<tr>
<td>&quot;I was at 211 or 212 [pounds], I'm down to like 195.&quot;</td>
<td></td>
</tr>
<tr>
<td><strong>PCMN process</strong></td>
<td></td>
</tr>
<tr>
<td><strong>FFQ</strong></td>
<td>Discussion of FFQ/VioScreen nutrition assessment, whether it was used during RD visit, time required to complete, ease of completion.</td>
</tr>
<tr>
<td><strong>HO</strong></td>
<td>Hands-on education in grocery store</td>
</tr>
<tr>
<td>&quot;The dietitian took me through the store and showed me different brands that might have lower sodium.&quot;</td>
<td></td>
</tr>
<tr>
<td>&quot;She was about to actually pinpoint things in the store whereas she wouldn't have been able to do that in the doctor's office.&quot;</td>
<td></td>
</tr>
<tr>
<td>Table 6 continued</td>
<td></td>
</tr>
<tr>
<td>-------------------</td>
<td></td>
</tr>
<tr>
<td><strong>LOC</strong></td>
<td>Location of visit in grocery store versus doctor's office, convenience of location, benefits or drawbacks of location.</td>
</tr>
<tr>
<td>&quot;The grocery store was fine.&quot;</td>
<td></td>
</tr>
<tr>
<td>&quot;As long as it's convenient for you, which it was.&quot;</td>
<td></td>
</tr>
<tr>
<td>&quot;I was comfortable going there. It was fine. I didn't have a problem with that at all.&quot;</td>
<td></td>
</tr>
<tr>
<td><strong>REF</strong></td>
<td>PCP process of referring participant to study</td>
</tr>
<tr>
<td>&quot;She just told me that she thought I would be a good candidate for this study.&quot;</td>
<td></td>
</tr>
<tr>
<td>&quot;And I was even thinking, you know, I need to go back and see a dietitian.&quot;</td>
<td></td>
</tr>
<tr>
<td><strong>VISIT</strong></td>
<td>Visit timing/frequency/number of visits, scheduling, convenience of scheduling, barriers to continuing visits after study.</td>
</tr>
<tr>
<td>&quot;She pretty much had quite a bit open.&quot;</td>
<td></td>
</tr>
<tr>
<td>&quot;I think 3 [visits] was a good number.&quot;</td>
<td></td>
</tr>
<tr>
<td>Counter: &quot;I mean, it wasn't necessarily the most convenient.&quot;</td>
<td></td>
</tr>
<tr>
<td><strong>Follow-up from the primary care provider</strong></td>
<td></td>
</tr>
<tr>
<td><strong>NOPCP</strong></td>
<td>Participant has not been back to see PCP since starting nutrition counseling.</td>
</tr>
<tr>
<td><strong>PCPD</strong></td>
<td>PCP discussed the nutrition counseling with the patient. Conversation can be initiated by PCP or patient.</td>
</tr>
<tr>
<td>&quot;She just asked how it was going I believe, and that was pretty much it.&quot;</td>
<td></td>
</tr>
<tr>
<td>&quot;I mentioned it to her and we talked, went over some of the things that had improved and she was impressed.&quot;</td>
<td></td>
</tr>
<tr>
<td><strong>PCPI</strong></td>
<td>Participant intends to discuss nutrition counseling with PCP at next/upcoming visit.</td>
</tr>
<tr>
<td>&quot;When I have my next appointment I was definitely going to let him know that I did it.&quot;</td>
<td></td>
</tr>
<tr>
<td>&quot;Well it depends on how good my cholesterol levels are looking.&quot;</td>
<td></td>
</tr>
<tr>
<td><strong>PCPND</strong></td>
<td>Nutrition counseling not discussed with PCP.</td>
</tr>
</tbody>
</table>
Chapter 4: Integrating Components of the Patient-Centered Medical Neighborhood into Nutrition Counseling for Hypertension within a Grocery Store: A Qualitative Analysis of the Primary Care Provider and Registered Dietitian Perspective

Introduction

The patient-centered medical home model has become a national healthcare priority. Patient-centered medical homes are tasked with providing comprehensive care for patients, and although the services available within the medical home are expanding, many types of specialty care may not be available. The patient-centered medical neighborhood (PCMN) expands on the medical home framework by including specialties physically located throughout the patient’s community. Though the care is still coordinated through one central hub (the primary care provider/medical home), the patient has the opportunity to interact with healthcare professionals that may not exist within the physical medical home location.

Nutrition counseling from a registered dietitian (RD) is an effective intervention for several chronic diseases such as obesity, disordered lipid metabolism, and hypertension. Due to limited reimbursement for nutrition counseling, RDs are not typically available within the medical home, but they are more widely available in the community, practicing in locations such as private practice, grocery stores, and employee wellness. This situation provides the ideal environment for implementation of the patient-
centered medical neighborhood model. A critical component of the medical neighborhood is that the community-based practitioner is able to communicate with the patient’s primary care provider (PCP)\(^1\); however, this presents a challenge since most community-based practitioners do not have access to the patient’s electronic medical record.

This qualitative study examined the reported desires, practices, and challenges around communication between PCPs and an RD located outside of the medical home following implementation of a novel tool for facilitating communication from the RD to the PCP. More specifically, we examined a model for providing nutrition counseling by a grocery store-based RD for adults with hypertension. It is becoming increasingly common for grocery stores to employ in-store dietitians available for customer consultation and there are many advantages to nutrition care in the grocery store. Grocery store RDs provide application-based counseling by educating in the environment where the food decisions are made. Grocery stores also often provide a more convenient location and parking, a lower cost, and offer evening and weekend appointment times.

PCPs and RDs are important stakeholders in the emerging patient-centered medical home and neighborhood models. This objective of this study was to describe the benefits and challenges of PCMN implementation from the perspective of the PCP and the RD.
Methods

Overview and Study Design

This instrumental case study was part of a larger case study investigating nutrition counseling in the PCMN. A detailed description of the study can be found in Chapter 2. Briefly, adults with hypertension were recruited from three primary care offices. After completing a series of baseline measures, including a blood pressure measurement, demographic questionnaire, and food-frequency questionnaire, the participants attended three nutrition counseling visits with a dietitian in a grocery store over the course of twelve weeks. The initial RD visit was approximately 60 minutes and subsequent visits were approximately 30-45 minutes. The participants then completed follow-up measures in their primary care office, including a repeat blood pressure measurement, food-frequency questionnaire, and a qualitative interview.

Participants

For this portion of the case study, primary care providers with patients participating in the nutrition intervention, and the RDs providing the nutrition intervention, were recruited after the patients had completed their nutrition counseling visits.

Intervention

The dietitians were asked to use a secure online charting portal called VioScreen PCMN (VioCare, Inc., Princeton, NJ) to complete their documentation for the participants’ visits. The VioScreen PCMN charting portal guides the dietitian through the current standard of care that registered dietitians use to provide individualized patient care.82 The RDs in this
study typically use an electronic charting system to complete documentation during or after patient visits; however, VioScreen PCMN was used for this study because of the summary report that can be automatically generated after a patient visit. Following a counseling session, a summary of the session, including a brief description of the nutrition assessment, diagnosis, goals, and evaluation, can be generated from VioScreen PCMN to be shared with other health care providers. VioScreen PCMN also allows for results from its graphical food-frequency questionnaire\textsuperscript{79,102}, which was used for the participants’ baseline and follow-up measures, to be linked to a patient’s account. RDs were able to access the food-frequency questionnaire results prior to the participant’s first appointment.

\textit{Communication with the PCP}

Following the participant’s first visit with the RD, a one page summary of the participant’s food-frequency questionnaire, as well as the counseling session summary for that visit was printed and faxed to the PCP by the research assistant. Upon receiving the fax, staff within the PCP office scanned the documents and attached them as “outside documents” in the Media section of the patient’s electronic medical record. This is the same procedure used by the PCP offices for any external documentation regarding their patients. The counseling session summaries for the two subsequent RD visits were also printed and faxed to the PCP’s office.
**Outcome Measures: Qualitative Interviews**

After the majority of the study patients completed all three RD visits, the PCPs and RDs participated in semi-structured qualitative interviews. The interviews were conducted individually in a private setting in the clinician’s workplace. The PCP interview was focused on the PCP’s communication with RDs throughout the study, and their perceptions of nutrition counseling. The interview guide for the PCPs is located in Table 7. PCPs who did not recall the format of RD communication were shown an example of both the food-frequency questionnaire report and the counseling session note summary (Appendices E and F). The interview guide for the RDs focused on their communication with the PCPs, and the perceived benefits and drawbacks of being located outside of the medical home. The interview guide for the RDs can be found in Table 8.

**Analysis**

All interviews were transcribed verbatim and were reviewed independently by two members of the research team. For both the PCPs and RDs, the initial codebooks were developed by one study team member after reviewing all interviews. Two team members then independently coded each interview with Ethnograph 6.0 (Qualis Research, Colorado Springs, CO), using existing code words and editing or adding to the codebook as necessary using the constant comparison method. The two researchers then reviewed each interview together to compare coding agreement. Any disagreements were discussed and resolved. Thematic analysis was used to identify quotes that personify the phenomenon in the clinicians’ own words.
Multiple strategies were used to establish trustworthiness in the data collected from this study. First, two reviewers independently reviewed and coded the interview transcripts, as described above. Secondly, quantitative data collected as part of this case study, and described in Chapter 1, was used to triangulate the clinicians’ reported experiences. Finally, negative evidence was collected, coded, and reported as part of this study.

Results
Seven out of the 13 PCPs that had patients who participated in the study completed interviews. Eight parent themes and 13 sub-themes emerged from the interviews. The final PCP codebook with representative quotes is displayed in Table 9. Both study RDs participated in the interviews and the RD codebook with representative quotes is displayed in Table 10.

PCP and RD Perceptions of Nutrition Counseling
Several of the PCPs mentioned that, for patients with hypertension, they regularly discuss basic dietary changes, such as reducing sodium intake. Overall, the PCPs agreed that nutrition education is important; however, multiple PCPs reported time as a barrier to providing in-depth nutrition education for their patients. “Outside of mentioning, ‘are you following the diet’, ‘are you watching your salt’, etcetera, I don’t go much beyond that. More as a time factor than anything else.”

Many of the PCPs spoke of benefits to the patient seeing an RD in general, regardless of the setting or location. The PCPs most frequently discussed that an RD has more time to
go through the nutrition education and, therefore, can go into more detail. PCPs also discussed that the additional time allows the RD to set specific goals with the patients, whereas PCPs often only have time to give broad recommendations. “It also gives them a better guideline on what to do when it comes to their diet instead of just saying ‘eat healthy’.” PCPs did note some perceived barriers to nutrition counseling and behavior change. One of the patient barriers most frequent reported by the PCPs was the cost of the RD visit and/or lack of insurance coverage for nutrition counseling, which would mean an out-of-pocket expense for the patient. Another patient barrier commonly reported by the PCPs was the time required to see the RD, particularly if the patient has to take time off of work for the visit. Finally, the PCPs noted that nutrition care may be difficult for patients who are already dealing with multiple medical concerns. “Especially if it comes with a new diagnosis, you know, a new diagnosis of high blood pressure, high cholesterol, or diabetes can be scary for patients, and if all of a sudden they have to make big lifestyle changes, new medicines, and seeing a dietitian, it's just one more thing that overwhelms them.”

The RDs’ discussion of nutrition counseling focused on the variety of individual needs and goals of the patients. The registered dietitians recognized that each patient was at a different readiness level, which impacts counseling strategies. The RDs discussed some of the individual barriers to dietary changes. For example, if a patient is unemployed or has a strange work schedule, they may not have a routine which, in turn, may affect their diet. Others, including many of the patients seen as part of this study, had some existing knowledge of the relationship between diet and blood pressure, they just needed
motivation. “Most of the people know what sodium is, they know what carbs are, they just needed a little bit of direction but they had that general knowledge of what they should be doing. They just weren't doing it.”

Benefits and Drawbacks of Grocery Store-Based Counseling

Many PCPs felt that the ability for the grocery store RD to provide hands-on education is a distinct benefit to being located in a grocery store. Other PCPs agreed that the education might stick with the patient better since it’s occurring in the place where food decisions will be made and that if the patient shops right after their visit, there is less time for the patients to forget what they learned. PCPs also explained that the grocery store is a convenient location for the patient. “Now, they may be in a hurry and want to get in and out. But they have to go to the grocery store. And if they're going to the grocery store that means they're not working. So, I think that would be another distinct advantage of having a dietitian in the grocery store, is that, they have to go there anyway. And they have to go there regularly.”

The RDs agreed that the opportunity for hands-on nutrition education is a unique benefit to being located within the grocery store. They discussed taking patients into the aisles to look at specific foods that were discussed during the counseling sessions, or using products in the store to practice label reading. The RDs pointed out that if you are in a clinical setting and you tell a patient to look for a certain product or to compare products, the patient may not always follow up on that recommendation. “I had a patient that had no clue that the sodium in chicken could vary. So we walked out and looked at the salt in
chicken, you know, your frozen chicken and then just your regular raw chicken… because it worked versus saying, ‘Hey just go look at chicken’, they may or may not ever do it.” Additionally, the RDs pointed out the flexible hours that the grocery store RDs are able to offer. “Our hours are different so it's easier for people to see us because we can have a weekend appointment, we can have an evening appointment, and it's not just that 9 to 5.”

Alternately, the PCPs discussed several benefits of the RD being located in the clinic versus the grocery store. Several PCPs explained that an RD in their clinic is easily accessible for the PCP. “If I have somebody right here and now that, you know, if there's a dietitian available that I can say, ‘Hey can you come in here and talk to them [the patient] about X, Y, Z’ or, ‘I can't figure out why they're not losing weight and they just seem to be following everything I tell them. Can you talk to him for a little bit’?”

Additionally, when there is an RD located in the office, it makes it easier for the PCP to refer the patient for nutrition counseling. “I know she's available, it's a reminder, I don't have to think, ‘Oh now I want [the patient] to go to a dietitian, now I have to find one on their plan’, and ‘Oh, I have to see where they're located’, ‘Oh, we have to communicate with them’, you know, she's here, this is the person, we'll get you set up.” Additionally, many PCPs felt that being located in the office may help with patient attendance because it’s a location with which the patients are already familiar. If the PCP recommends that the patient see an RD, the patient can also schedule their nutrition counseling appointment before leaving the PCP’s office.
Other PCPs felt that they do not have much face-to-face interaction with the RD in their office so the grocery store location would not have drawbacks, as long as the RDs were able to access the patients’ electronic medical records. However, they felt that grocery store RDs without medical record access would be at a disadvantage. “When you're kind of out in the community, patients aren't always in tune with what medicines they're on, what conditions they have, what their lab work shows. So, the dietitian in that kind of setting could potentially be in the dark. They could provide probably some general information but it might not allow for them to be as specific and tailored as possible without being able to coordinate and have access to their medical history.”

The drawbacks pointed out by the grocery-store RDs mirrored those of the PCPs. One of the drawbacks addressed by the RDs was the general lack of communication with patients’ primary care providers, including a lack of access to the patients’ laboratory values. “When I work with some patients and we're really trying to focus on improving results, from like a lab standpoint, I like having their numbers upfront and then also, you know, if it's been 3 months, having it at that 3 month mark as well.” However, one dietitian pointed out that communication with the PCP still may not occur in a clinical setting, but continued on to explain that physical location is not the main barrier as “usually the doctor and the dietitian don't sit back to back in offices anyway.” The implication of this statement is that the true barrier is the lack of a system to communicate with the PCP, and not the physical location of the RD.

Another drawback mentioned by one RD is that some individuals perceive grocery store dietitians as being less reputable, or they feel they would receive better care in a doctor’s
office. “I've actually had patients say to me, ‘I've known about you for a year but you're in a grocery store’, like that didn't make sense in their head.”

Communication between the PCP and RD

Four of the seven PCPs interviewed reported seeing or knowing about the note sent from the grocery store RD, while the others did not recall seeing the note from the RD. Most, but not all, of the PCPs were aware that one or more of their patients was seeing the RD as part of this study.

Although the PCPs did acknowledge that receiving the summary from the RD created “just another piece of paper to read”, they felt that the time required to review the summary was acceptable, especially given the benefits it provided. The PCPs reported that the most helpful component of the VioScreen summary from the RDs was the list of goals that the RD set with the patient, and the patient’s progress towards meeting the goals. The PCPs felt that this could guide their nutrition discussion when the patient comes in for a follow-up visit with their PCP. It served as a reminder to the PCP about what to address with the patient, and it allowed the PCP to simply reinforce the goals set by the RD rather than having to create goals with the patient from scratch. “It changed what I reinforced. I said, ‘So you've been to see the dietitian. Are you sticking with that? Are you following the plan? Do you understand the plan’”? Some PCPs felt that receiving information from the RD made it easier to talk to the patient about nutrition. “I can kind of piggyback on a goal that's already been set by the dietitian. So in a patient that maybe I had been a little bit more generic with, it might give me easier segue into,
‘Well what keeps you from reaching this particular goal’. So it might allow me to delve a little deeper with some people if it's one barrier has already [been] eliminated because I can already just kind of reinforce what's already been talked about.”

One PCP commented that having the communication back to the PCP from the RD makes the patients more accountable. “I think they'll take more seriously I think if they know it's something I'm going to be looking at.” The PCPs also appreciated that the summary from the RD was concise. “Anything more than that is not something that I'm either going to spend a lot of time going through or understanding, and I'll have relied on them [the RD] to do it.” While the PCPs nearly unanimously reported that the goal summary would be helpful, very few reported actually using the goal summary during follow-up visits with their patients.

The PCPs did not have much feedback on the helpfulness of the food-frequency questionnaire summary. One PCP felt that it was helpful to be able to see the patient’s sodium intake. Another thought it was helpful to see what the patient is actually eating and what their diet habits are since the PCP does not have time for detailed nutrition assessment during their brief encounters with the patients. “I feel like sometimes knowing what the patient is actually eating versus maybe what they tell me, there could be a little discrepancy, so I think it's helpful to know. Because I mean when I see them I obviously wouldn't be able to go through it as thoroughly, but I can say, ‘Oh I see that you were eating this, are you still eating it?’ Just to touch upon some things.” However,
multiple PCPs reported that the FFQ summary was not as helpful to them as the summary of the goals.

Finally, the PCPs stressed that ideally communication should be sent through the electronic medical record in a format that is easy to find without having to remember that the patient is seeing an RD. They explained that unless the RD’s note is seamlessly integrated into the electronic medical record, the PCP has to depend on the patient to report that he or she is being seen by the RD. “Anything that gets scanned to the EMR is very hard to find. Time consuming and cumbersome. So that's an immediate hurdle for doing something like that [providing patient follow-up]. If it could be done as part of the chart, it would be a whole lot easier to use that information and follow up.” One PCP mentioned that, if the RDs collect weight and blood pressure measurements for the patients, would also be helpful to see those measurements in the report.

For the RD’s part, both reported that, outside of this study, they typically send follow-up notes to the patients’ PCP after their nutrition visit. However, this depends on the patient’s preference. One RD explained that the patients do not always want a note sent back to their doctor. “If it's a patient coming in just for weight loss, sometimes they don't ask–or they don't want that follow-up because it's something that they're trying to just do on their own.” Although both RDs report sending follow-up notes to the doctors, communication with the PCPs outside of this study is typically one-directional. Both RDs reported occasionally receiving phone calls from PCPs or notes from a specialist in the past to coordinate patient care, however this is usually for patients that have a complex
medical history. Most often, there is no communication from the PCP prior to the patient’s visit or throughout their nutrition counseling and most information about the patient comes from patient self-report. One RD explained that patients sometimes drive the care coordination by taking the initiative to bring in their lab results to the dietitian. These lab results can then be used as positive reinforcement for the patient, or to guide the nutrition counseling. The same dietitian also discussed that, even without a formal communication protocol, providers occasionally call to make sure they are “on the same page”.

Specific to this study, the RDs reported very little communication with the PCP; neither RD reported any direct communication with the PCP other than the RD note that was sent to the PCP following the nutrition visits. One RD explained that communication with the PCP came indirectly. “I think a lot of the information from the primary care physician came through the patient. So the patients would tell me their primary care physician is doing this, or wants them to do that.”

Both RDs indicated a desire for some type of communication with the PCP. Specifically, they indicated that information about the patients’ diagnoses, laboratory values (both at the beginning of the counseling as well as follow-up measures), and the PCP’s plan of care for the patient would be helpful. One RD mentioned, “…sometimes patients only give you half of the picture.” According to the RDs, having this information from the PCP would allow them to track patient outcomes and it would also allow them to reinforce the PCP’s plan of care during their nutrition session. Finally, one RD discussed
that receiving this information from the PCP would allow more time for education, as less time would be required for assessment. Although both RDs indicated a desire for communication with the PCP, one RD pointed out that the communication is more important for the more medically complex patients.

**Primary Care Provider Referral to Nutrition Counseling in a Grocery Store**

The PCPs were clear that the biggest factor when deciding where to refer a patient for nutrition counseling is the patient’s preference. Several of the PCPs commented that they would refer patients to any location where the patient would actually go and benefit from the visit. “I don't care where it's at, the YMCA, or the grocery store, as long as they'll go and they feel like they're getting some feedback from it.” The referral location may also depend on the accessibility, cost, and insurance coverage for the patient. One PCP explained that referral to a grocery store RD would be more likely after hearing about positive experiences from patients. “I think I would be more likely to refer if I got more feedback. And like I said, I haven't really gotten any feedback. So, I want to feel like there's some benefit to me saying that, and not a commercial for the grocery store.”

Some PCPs indicated that they would prefer to refer to an RD within the medical system because that allows for communication via the electronic medical record. However, they still felt that the patient’s preference is more important. “If for insurance purposes or patient convenience, it's easier for them to go to the grocery store, ultimately I want to go wherever the patient can get the care that they need.”
The RDs explained that physicians who are familiar with the RDs seem to be the most likely to refer patients. “We definitely have specific doctors in each of our markets that send patients to us, but that's not the majority.” Most of their patients are self-referred after seeing marketing materials in the store or on social media. One RD pointed out that for patients that have some hesitation about seeing a new healthcare provider, it may help to call and talk to the RD first. “Or [the patient can] call me and, you know, ask questions and make an appointment, so that they feel comfortable with who they're going to as well. So, I think there is a lot of fear with patients and referrals and, I don't know, just ‘is that the right person’”.

Discussion

Communication between the PCP and other specialists in the community is a keystone of the PCMN model. This study examined the PCP and RD perceptions of the PCMN model as a whole and the communication that they had with each other.

Consistent with the literature, the PCPs in this study reported that they feel nutrition education is important, but lack the time for adequate counseling with their patients.18,19,21 The PCPs saw benefits in referring to an RD, no matter the location, but cost to the patient was a commonly reported barrier to referral. The PCPs’ concern about cost is not unwarranted. There is evidence that higher out-of-pocket costs for patients may decrease medication adherence.103,104 Although considering the financial situation of the individual patient is an important part of personalized care, PCPs should be cautious not to under-refer. Lack of PCP referral has been shown to be a barrier to attending outpatient
More specifically, in a study examining determinants of dietary counseling utilization, Alameddine et al. showed that the main determinant was referral by a physician; the relative risk calculated using their reported data showed that those who were referred to an RD by their physicians were 16.7 times more likely to see an RD than those who were not referred by their physician. In comparison, those with insurance coverage for nutrition counseling were 1.6 times more likely to see an RD than those without coverage. However, when interpreting the results of this study, it is important to note that it was conducted in the Middle East; there may be cultural differences in the importance of physician referral in comparison to other possible barriers to nutrition attendance. Still, combined with the results from the aforementioned studies and the results of the present study, there are initial indications that PCP referral is an important component of outpatient visit attendance.

The RDs noted that they received more referrals from the physicians with whom they have a relationship, a sentiment that was mirrored by one PCP who explained she would be more likely to refer to a grocery store RD after hearing positive feedback. In a qualitative analysis of relationships between primary care physicians and diabetes educators, others have shown that developing working relationships, trust, and rapport are critical factors in delivering a successful interdisciplinary intervention. Developing strategies for relationship-building between PCPs and community-based practitioners may help improve the PCMN model.
Many of the PCPs noted potential benefits of being seen in a grocery store for nutrition counseling, however the most commonly reported drawback was the potential lack of communication with the dietitian. This intervention tried to address this barrier by sending reports from the RDs to the PCP after each nutrition visit. Unfortunately, though 84% of the RD notes made it into the patient’s medical record, several of the PCPs reported not seeing this note. Others reported that it was not easily accessible in the patient’s EMR which directly prevented at least one PCP from referring to the note during patient follow-up. For this study, the RD notes were scanned into the “Other Media” section of the patient’s electronic medical record. This section of the medical record can be accessed with relative ease if a PCP knows to look there. However, there are no flags or alerts that come up during a patient visit to inform the PCP that a new document is available. Therefore, the PCP may have seen the RD note before or immediately after the note was scanned into the medical record, but may not have remembered to view the note again during the patient’s follow-up visit unless the patient reminded their PCP that they were being seen by the RD. If the electronic medical record platform allowed for outside encounters (i.e. visits with clinicians in the medical neighborhood) to be viewed in the “Encounters” tab (the section that comes up by default when reviewing a patient’s medical record), the PCPs would potentially be more likely to see the note. Another potential solution may be an alert that comes up during a patient encounter, informing the PCP that the patient has had an outside encounter or outside documentation added to their chart since their last visit. Both of these solutions would require changes to the electronic medical record software which would likely be resource-intensive.
Overall, the PCPs thought that receiving patient goals from the dietitian in a concise format, such as the VioScreen PCMN summary report, was or would be useful for them and that they could use those goals to provide more targeted follow-up to their patients. Therefore, addressing some of the technical barriers that made the note difficult to access may improve the utilization of the RD note during patient follow-up.

The RDs reported that the communication via the VioScreen PCMN chart summary was the only direct PCP communication that the RDs reported. This was somewhat expected given that this intervention was only intended to facilitate unidirectional communication (from the RD to the PCP). The RDs highlighted their desire for bidirectional communication, which is also discussed in the literature as a goal of the PCMN model\textsuperscript{109}, and is an important next step for research. The RDs discussed the role of patient report in communication from the PCP. This introduces an interesting question about the patient’s role in the PCMN. Some have discussed the use of “low-tech” solutions to PCMN communication when high-tech regional health exchanges are not feasible.\textsuperscript{73,109} Perhaps the patient could be one “low-tech” solution, by delivering medical reports between their various providers when they return for follow-up. This strategy would have some limitations compared to a higher tech solution. For example, patients may lose track of their records from the outside providers, and the PCP would have to wait until the patient’s follow-up visit to see the records. The expectations would also need to be clearly communicated with the patient. However, patient engagement has been discussed as a valuable method for improving patient-centeredness in the medical home\textsuperscript{110}, and expanding the patient’s role to include assistance with clinician communication may be
one way to increase patient engagement in their health care. Despite the limitations, in the absence of seamless bidirectional integration of community-based healthcare into the electronic medical record, the patient may be a valuable communication resource.

This study is not without limitations. First, out of the 13 PCPs with patient’s participating in this intervention, the PCPs with the most participating patients declined to participate in the interviews. Therefore, the data from the PCPs interviewed may be skewed towards those with the least interaction with the PCMN model implemented for this study. Anecdotally, the PCPs reported a lack of time/competing demands as reasons for non-participation, and the fact that the PCPs with the most patients enrolled in the study did not participate in the interview may have simply been coincidence. Alternatively, PCPs who recruited fewer patients into the study may have felt a greater obligation to participate in the interview portion. The PCPs were not incentivized to participate in either recruitment or the interviews, so all of their time commitment was in-kind.

Secondly, inter-professional communication is a critical component of the PCMN model, and several of the PCPs did not see the RD visit summaries that were scanned into the patient charts. However, one of the important steps in studying the PCMN is identifying the challenges to implementation that will help drive the PCMN refinement desired by U.S. physicians.\textsuperscript{12-14} This study not only showed the components of nutrition care in the PCMN that are effective, it also highlighted barriers that can be addressed to further improve the model.
Overall, both PCPs and RDs were able to identify benefits of nutrition counseling in the grocery store and to point out changes that could be made to improve communication and referral. This study provided encouraging results regarding PCMN implementation.
1) Are you aware of any patients who have been seeing the dietitian as part of this research study?

2) From your perspective, what were the benefits or drawbacks of nutrition counseling from the Giant Eagle registered dietitian (RD)?
   a) Did your patients provide any positive or negative feedback about their experiences? Tell me about them.

3) Describe your communication with the RD during the study period, if any.
   a) Did you review the reports that she sent back?
   b) How did you use information you received about the visits, if at all?
   c) What was most helpful in these reports?
   d) What was least helpful?
   e) Did you feel that reviewing the notes from the RD made your job easier or harder? How so?
   f) What could be done to make the information from the RD more useful for you?

4) Did you change how you addressed lifestyle behaviors with these patients when you knew they were being referred to an RD? How so/why or why not?

5) Will you continue to refer patients to the grocery store RD? Why or why not?

6) Is there anything else you would like to share about your experience with the study or the grocery store-based RD model?

Table 7: Line of questioning for interviews with the primary care provider
1) Describe your interactions or communication with any of the primary care providers (PCPs) or any of the office staff.
   a) Did you have any more or less communication with the PCP than you would typically for non-study patients?
   b) How often did you communicate with the PCPs? Tell me about communication difficulties, if there were any.
   c) Would you have liked any more or less communication with the PCP? What would you have liked more or less communication about?

2) Was there any additional information you would have liked from the healthcare system/primary care provider to help you work with the patients?

3) Tell me how you felt about the process we used for referring patients?

4) Tell me how you felt about the process for communicating their after-visit information back to their PCP.

5) What would you change about this process, if anything?

6) Did you perceive any benefits or drawbacks to being physically located in the grocery store versus being located in the healthcare setting? Tell me about them.

7) Is there anything else you would like to share about your experience with the study?

Table 8: Line of questioning for interviews with the registered dietitians

85
<table>
<thead>
<tr>
<th>Name</th>
<th>Description and representative quotes</th>
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</thead>
</table>
| **PCP dietary counseling** | Description of dietary counseling that the PCP typically provides for their patients  
"I think probably generally it would be salt and then fried or fatty foods would be the biggest thing."  
"You can't get really in depth because you don't have time."  
"Because if I'm very busy and I'm communicating with the patient about a variety of things, the depth that's necessary...goes away." |
| **Benefits of RD** | Benefits of a patient seeing a dietitian for nutrition counseling, regardless of setting  
"If patients are interested in change and you put them in front of someone who can help them change, to me that is always a positive thing."  
"The dietitian can help set an individualized care plan for that patient, provide those guidelines." |
| **Patient barriers** | Barriers to patients seeking nutrition counseling or implementing nutrition changes  
"If it's not free, it depends on the patient."  
"I think a lot of it is time management and fear of the unknown."  
"Number one: insurance doesn't cover it. Number two: they have to take time off work." |
| **PCP knowledge of RD** | PCP aware or unaware that their patient was receiving nutrition counseling/of RD notes  
**Aware of patients** | PCP is aware of patient seeing the RD  
**Familiar with RD chart** | PCP has seen the chart from the RD  
**Not aware of patients** | PCP is not aware of any patients that were seen by the RD  
**Not familiar with RD chart** | PCP has not seen the RD chart note or did not remember seeing it |
| **RD in grocery store** | PCP perceptions of the RD being physically located in the grocery store  
**Benefits of grocery store** | Benefits of receiving nutrition counseling within the grocery store  
"The benefit might be that they could grocery shop with them, or they can kind of show them like, this is the aisle."  
"Now, they may be in a hurry and want to get in and out. But they have to go to the grocery store." |

Table 9: Codebook for primary care provider interviews
Table 9 continued

<table>
<thead>
<tr>
<th>Drawbacks of grocery store</th>
<th>Drawbacks of nutrition counseling within the grocery store</th>
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</table>
| "There’s always a benefit if the other professional is physically in my office. Simply because patients know how to get there, they're more likely to follow through."
| "When you’re kind of out in the community, patients aren’t always in tune with what medicines they’re on, what conditions they have, what their lab work shows.”
| Counter: “I'm not aware of any drawbacks.” |

<table>
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<tr>
<th>Location preference</th>
<th>PCP discussion of whether they would prefer to send patient to grocery store or office RD</th>
</tr>
</thead>
</table>
| "Whichever one they'll go to. Whichever, you know, whatever works.”
| "I would refer my patients to any dietitian that I can get them to go to, based on accessibility, cost, insurance coverage, etcetera.”
| "I think preferentially I’d probably still do within the [health system] just because I like to be able to see what they said, I like for them to be able to see what I'm doing, and for us to work collaboratively.”
| "They don't need to be necessarily in the building, but just some sort of continuity.” |

<table>
<thead>
<tr>
<th>Patient feedback</th>
<th>Feedback that PCP has received from patients regarding RD in grocery store</th>
</tr>
</thead>
</table>
| "Nothing specifically. In general they liked it.”
| "It just sounds like he's not really been willing to implement the recommendations that they have [made].” |

<table>
<thead>
<tr>
<th>RD communication</th>
<th>Current or desired communication with RDs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accountability</td>
<td>RD sending note back to the PCP makes the patient more accountable to the goals they set with the RD</td>
</tr>
<tr>
<td>&quot;If the patient knows that the dietitian has sent me information...it makes it that much more serious to them.”</td>
<td></td>
</tr>
<tr>
<td>Desired RD comm</td>
<td>Communication that the PCP would like to have from an RD in the grocery store</td>
</tr>
</tbody>
</table>
| "I would want to know just what recommendations they made, so the patient can kind of follow up on what the plan was.”
| "Probably just state the goals, like not so many details.” |

continued
Table 9 continued

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
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<tbody>
<tr>
<td>RD comm helpful</td>
<td>Communication from the grocery store RD that was helpful</td>
</tr>
<tr>
<td></td>
<td>&quot;It's almost like what the agreement was between the dietitian and the patient. So it was great.&quot;</td>
</tr>
<tr>
<td></td>
<td>&quot;It was helpful especially when they were setting goals.&quot;</td>
</tr>
<tr>
<td>RD comm in office</td>
<td>Communication with the RD that is located within the PCP office</td>
</tr>
<tr>
<td></td>
<td>&quot;Most of the communication is done through the patient chart, which is part of the electronic medical record.&quot;</td>
</tr>
<tr>
<td>RD comm unhelpful</td>
<td>Communication from the grocery store RD that the PCP did not find helpful</td>
</tr>
<tr>
<td></td>
<td>&quot;It's just another piece of paper that I have to read.&quot;</td>
</tr>
<tr>
<td></td>
<td>&quot;The complete nutritional breakdown was not something that's helpful for me.&quot;</td>
</tr>
<tr>
<td>PCP follow-up</td>
<td>Description of the follow-up that the PCP does/would do after a patient has seen the RD</td>
</tr>
<tr>
<td></td>
<td>&quot;It's always, 'so you just met with the dietitian, you were here before, these were your goals, where are you now?'&quot;</td>
</tr>
<tr>
<td></td>
<td>&quot;I still ask about their diet, but I looked at the dietitian's note and say here are the stuff that you're supposed to do, are you doing them now?&quot;</td>
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<tr>
<td>RD referral</td>
<td>Description of whether the PCP does/would refer to a grocery store RD</td>
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<tr>
<td></td>
<td>&quot;I'm open to anything that the patient is open to.&quot;</td>
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<td></td>
<td>&quot;If I could see positive feedback from them, yes I would [refer].&quot;</td>
</tr>
<tr>
<td>Name</td>
<td>Description and representative quotes</td>
</tr>
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<td>----------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
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</tbody>
</table>
| Study communication  | Communication with the PCPs specifically for this study  
"Other than completing like the electronic health records and submitting I didn't have any personal interaction with the doctors."

| Typical communication | Typical communication with PCP or other medical providers  
"I'll ask the patient if they'd like me to send a follow-up note to their doctor."

| Desired communication | Desired communication with PCP or other medical providers  
"I think it's nice to have communication with the doctors. Sometimes patients only give you half of the picture."  
"It's definitely helpful to have their information beforehand."

| Referral              | Physician referral to the RD  
"Typically the doctor will give them my business card."

| VioScreen chart       | VioScreen charting portal                                                                                                                                 |
| VioScreen FFQ         | VioScreen FFQ                                                                                                                                                  |
| Drawbacks             | Drawbacks of being located within the grocery store  
"The only potential drawback is communication with the physician."

| Benefits              | Benefits of being located within the grocery store  
"I love being able to take patients out in the aisles."

| Patient               | Patient motivation, needs, goals  
"Like where are they with their readiness to change."

| Coordination          | RD coordinating care as part of the healthcare team  
"I do have some patients that wait to come and follow-up with me until after they've seen their doctor and have lab results."

|                      | "I've had physicians call me, or nurse practitioners call me about a patient because they wanted to make sure we were on the same page."

Table 10: Codebook for registered dietitian interviews
Chapter 5: Discussion and Summary

The participants in this study reduced their systolic blood pressure blood pressure (SBP) by a mean of 3.6 mm Hg, a reduction that is in line with SBP changes reported in the literature following medium to high intensity interventions or controlled feeding trials; however, this change was not significant.\textsuperscript{58,59} According to the U.S. Preventative Services Task Force definitions, this study would be considered a medium intensity intervention (31 to 360 minutes)\textsuperscript{59}; the patients had approximately 120 to 150 minutes of counseling from the registered dietitian. Since this was a pilot study with a relatively small sample size, we did not expect to have ample power to detect statistically significant changes in SBP. However, the participants in this study showed greater variability around change in blood pressure (SD 16.2 mm Hg) than was estimated from the literature prior to the study (SD 10 mm Hg).\textsuperscript{62} Based on the results of this study, a sample size of 161 participants would have been needed for the change in SBP to be statistically significant, a sample size larger than was originally predicted. With the sample size and standard deviation observed in this study, participants would have needed an 11 mm Hg change in SBP to achieve statistical significance.

While the participants in this study did not have a significant decrease in SBP, there were several significant changes to their dietary intake, including an improved Healthy Eating
Index (HEI) 2010 total score. Not only did the mean HEI-2010 total score increase, but nearly every participant who completed the study saw an increase in their individual HEI-2010 total score. The dietary changes that the participants made, including an increase in whole grains and a decrease in empty calories were related to the DASH diet. A large change in sodium intake was observed, however this should be interpreted cautiously as food-frequency questionnaires do not have high reliability when measuring individual nutrients \textsuperscript{77,111,112} and are better at assessing dietary patterns over a period of time.\textsuperscript{113} Although the total daily sodium intake appeared to decrease, the HEI-2010 sodium score did not change. This may be due to the fact that HEI-2010 scores are standardized to measure intake per 1,000 calories. If participants decreased their overall sodium intake, but simultaneously decreased their caloric intake, the absolute intake of sodium would decrease but the amount of sodium per 1,000 calories may not, leaving the sodium HEI-2010 score unaffected. The caloric intake for this sample did appear to decrease, but again, this should be interpreted with caution given the limitations of food-frequency questionnaires.

Importantly, the patients did not note any drawbacks of receiving nutrition counseling in the grocery store. Some participants actually preferred the more relaxed atmosphere and the hands-on education. The most important component of location, as reported by the patients, was proximity to work or home. In general, the patients appreciated the detailed and personalized nutrition advice provided by the RDs, and they felt that it was more in-depth than what their PCPs were able to provide. The patients also provided some evidence of the importance of PCP referral to specialists, which has been observed
The registered dietitians (RDs) interviewed in this study indicated that they receive more patient referral from the physicians with whom they have developed a relationship. Others have shown that PCPs tend to refer within an informal network of specialists\textsuperscript{114} and additional research on strategies for building relationships between PCPs and community-based healthcare professionals may be warranted.

PCPs indicated that cost to the patient is a major barrier to referral to outside nutrition care. One benefit of the grocery store-based nutrition counseling is that it is provided at a fixed, relatively low cost (particularly for the follow-up visits which are $30 per session in the grocery store used for this study). If patients have insurance coverage for nutrition counseling, this cost is reduced even further. The fixed cost allows PCPs to have a clear discussion with the patient regarding the price of the counseling and indicate exactly what the maximum out-of-pocket expense will be. Although cost may still be a barrier for some patients, the transparency in the pricing may make it easier for PCPs to at least initiate a conversation about referral.

The PCPs overall felt that the RD visit summary was or would be helpful since it was a concise description of the patient’s goals. The summary allowed them to provide more personalized follow-up to their patients instead of asking more broadly about nutrition. Additionally, multiple PCPs commented that having the PCP reinforce the RD counseling gives it more credibility and makes the patient more accountable. Lin et al. have shown that when both a physician and a dietitian counsel a patient on dietary changes related to hypertension there is a greater effect than when counseling is provided by the RD alone.\textsuperscript{86}
This is additional evidence of the importance of PCP follow-up. However, PCPs stressed that the note from the RD needs to be easily accessibly in the patient’s electronic medical record for it to be useful, and one PCP pointed out that the RD note for this study was difficult to find in the medical record. Additional research on how to best communicate between community specialists and the PCP using the electronic health record will be important, as some have called health information technology the most important tool in supporting the PCMN model.\textsuperscript{115}

Chart review data showed that 60% of participants who had a hypertension-related follow-up visit with their primary care provider during the study period had a conversation with their PCP about the nutrition counseling. It was not clear from chart review, but qualitative interviews indicated that most of the conversations regarding the nutrition counseling were initiated by the patient. Some of the patients indicated their eagerness to discuss the changes that they had made with their PCP, so potentially the patient initiated the conversation before the PCP had a chance. Ultimately, it may not matter whether the patient or PCP initiated the conversation; communication from the patient may be a helpful reminder for the PCP. Once the PCP is aware that the patient is receiving nutrition counseling, he or she may be prompted to look through the patient’s medical record for a note from the RD.

The RDs interviewed for this study indicated that they typically write a summary note following each patient visits and send it to their patients’ PCPs. Therefore, the intervention and communication that they provided as part of this study was essentially
the same at their typical care. The RDs expressed that it is helpful to have communication from the PCP, specifically around lab values or other metrics. The American College of Physicians (ACP) has suggested the use of a care coordination agreement between PCPs and community-based healthcare professionals, which would formalize bidirectional communication and outline the expected information flow.\textsuperscript{11} The ACP recognizes the challenges in implementing such agreements, and refers to them as an “aspirational goal”. However, further research on the use of care coordination agreements could ultimately lead to the type of communication that the RDs desire from the PCPs.

Conclusion

The PCMN model for offering nutrition care in a grocery store to adults with hypertension led to significant dietary changes and was acceptable to important groups of stakeholders. Further research is needed to optimize the communication flow from the RD to the PCP, and potentially from the PCP to the RD. This model may be effective for other chronic diseases that are related to dietary intake.
References


32. Taylor RW, Brown D, Dawson AM, et al. Motivational interviewing for screening and feedback and encouraging lifestyle changes to reduce relative weight in 4-8 year


The Ohio State University Consent to Participate in Research

**Study Title:** Nutrition counseling in the patient-centered medical neighborhood for adults with hypertension

**Principal Investigator:** Dr. Christopher Taylor, PhD, RD, LD

- **This is a consent form for research participation.** It contains important information about this study and what to expect if you decide to participate. Please consider the information carefully. Feel free to discuss the study with your friends and family and to ask questions before making your decision whether or not to participate.

- **Your participation is voluntary.** You may refuse to participate in this study. If you decide to take part in the study, you may leave the study at any time. No matter what decision you make, there will be no penalty to you and you will not lose any of your usual benefits. Your decision will not affect your future relationship with The Ohio State University. If you are a student or employee at Ohio State, your decision will not affect your grades or employment status.

- **You may or may not benefit as a result of participating in this study.** Also, as explained below, your participation may result in unintended or harmful effects for you that may be minor or may be serious depending on the nature of the research.

- **You will be provided with any new information that develops during the study that may affect your decision whether or not to continue to participate.** If you decide to participate, you will be asked to sign this form and will receive a copy of the form. You are being asked to consider participating in this study for the reasons explained below.

1. **Why is this study being done?**

   For this study, participants will see a registered dietitian in a local grocery store to receive nutrition counseling for high blood pressure. We are studying whether nutrition counseling from a registered dietitian in a grocery store helps to control blood pressure. We are also interested in whether the patients and the medical
providers like or dislike the treatment. You are being asked to participate in this research because you have high blood pressure and take medication(s) to control your blood pressure.

2. How many people will take part in this study?

We expect to include 30 people in this study.

3. What will happen if I take part in this study?

If you enroll in this study, you will have a total of five visits; two with the research assistant and three with the registered dietitian. All of these visits will take place over six months.

Visits with the research assistant: Visits with the research assistant will take place in the Ohio State University Family Medicine office where your primary care provider is located. You will not have to pay for any of these visits and your insurance company will not be billed.

- Visit 1- During the first visit, you will have your blood pressure measured, you will be asked to take an electronic survey about foods you typically eat, and the research assistant will collect contact information from you. We will also ask for your permission to view your electronic medical record. After the visit, the research assistant will collect additional information from your medical record. This will include your birth date, your sex, and your race. This visit will take approximately one hour.

- Visit 2- The second visit with the research assistant will be 6 months after your first visit. During this visit, your blood pressure will be measured, you will complete an electronic survey about the foods you typically eat, and you will take a paper survey about the medications that you take to control your blood pressure. During this visit, the research assistant will also interview you about your experience with the registered dietitian and with the study. This interview will be audio recorded and then typed word-for-word. This visit will take approximately 1.5 hours.

After the visit, the research assistant will collect additional information from your medical record. This will include any communication that you had with your provider during the study (including office visits, phone calls, and MyChart messages). We will count the number of communications that you had with your provider and count how many were about high blood pressure. Finally, we will look at the medications that you take to control your blood pressure to see if there were any changes to the type or dose during the study.

Visits with the registered dietitian: Visits with the registered dietitian will take place at the Gahanna, Dublin, or Upper Arlington Giant Eagle. The visits will be about 6-8 weeks apart and each visit will last about one hour. After each visit, the registered dietitian will
write a note about the visit and send it to your primary care provider. The registered dietitian will also complete a survey after each visit where she will list all the topics that were covered and the time spent on each topic. This survey will be sent to the research team. You will not have to pay for any of these visits and your insurance company will not be billed.

4. How long will I be in the study?

This study will last approximately 3-6 months, depending on when your final dietitian visit takes place. Your last study visit will take place after you have completed your final visit with the dietitian. You may leave the study at any time. If you decide to stop participating in the study, there will be no penalty to you, and you will not lose any benefits to which you are otherwise entitled. Your decision will not affect your future relationship with The Ohio State University or your medical care.

5. Can I stop being in the study?

You may leave the study at any time. If you decide to stop participating in the study, there will be no penalty to you, and you will not lose any benefits to which you are otherwise entitled. Your decision will not affect your future relationship with The Ohio State University.

6. What risks, side effects or discomforts can I expect from being in the study?

Because all study information will be stored electronically, there is a small risk that someone could view your information without permission. We do not expect any other risks from participating in this study.

7. What benefits can I expect from being in the study?

You will receive free nutrition counseling as part of this study. This may help improve your blood pressure. The results from this study also may help improve nutrition counseling for patients in the future.

8. What other choices do I have if I do not take part in the study?

You may choose not to participate without penalty or loss of benefits to which you are otherwise entitled. Your medical care will not be affected, and if you are a student or employee at Ohio State, your decision will not affect your grades or employment status.
If you are interested in receiving nutrition counseling but do not want to enroll in this study, there are other options available. The CarePoint Gahanna Family Medicine office has a registered dietitian available for their patients. The registered dietitians at Giant Eagle also sees patients who are not involved in the study, however there is a fee for these appointments.

9. Will my study-related information be kept confidential?

All of the information that is collected during this study, including your blood pressure measurements, surveys, information collected from your medical chart, and surveys completed by the registered dietitian will be stored in a spreadsheet saved in a secure computer file. We will work to make sure this information is not seen by anyone outside of the study staff, but because the information is stored electronically, there is a chance someone could access your information without permission.

All of the information collected during the study may be shared with the study team. This includes Dr. Taylor and Ms. Watowicz, and also Dr. Sarah Anderson (a professor in Public Health at Ohio State), Dr. Amy Darragh (a professor in Health and Rehabilitation Science at Ohio State), and Dr. Randy Wexler (a physician at Ohio State). Your primary care provider will also be aware that you are participating in the study, and they will receive a report from the registered dietitian after your visit. The registered dietitian will receive the results from your survey about the foods you typically eat.

The survey about foods you typically eat will be completed on a secure sockets layer (SSL) secure Internet site. An SSL security internet site uses technology to make sure the information you enter on the website stays private. The notes written by the dietitian after your nutrition counseling visits will also be completed using an SSL secure Internet site. We will work to make sure that no one sees your information without approval. But, because we are using the Internet, there is a small chance that someone could access your online information without permission.

Efforts will be made to keep your study-related information confidential. However, there may be circumstances where this information must be released. For example, personal information regarding your participation in this study may be disclosed if required by state law.

Also, your records may be reviewed by the following groups (as applicable to the research):
- Office for Human Research Protections or other federal, state, or international regulatory agencies;
- The Ohio State University Institutional Review Board or Office of Responsible Research Practices;
- The sponsor supporting the study, their agents or study monitors; and
If this study is related to your medical care, your study-related information may be placed in your permanent hospital, clinic, or physician’s office records. Authorized Ohio State University staff not involved in the study may be aware that you are participating in a research study and have access to your information.

Once the study is over, we may present our results in journal articles or other presentations. We will never use your name or any other identifying information when we present the results. Data that we collect for this study will be kept for up to three years after the end of the study. At that point, any information that can identify you, including your name, birth date, or visit dates will be permanently removed from our data and destroyed.

A description of this clinical trial will be available on http://www.ClinicalTrials.gov, as required by U.S. law. This website will not include information that can identify you. At most, the website will include a summary of the results. You can search the website at any time.

You may also be asked to sign a separate Health Insurance Portability and Accountability Act (HIPAA) research authorization form if the study involves the use of your protected health information.

10. What are the costs of taking part in this study?

There is no cost to participate in this study.

11. Will I be paid for taking part in this study?

By law, payments to subjects are considered taxable income. If you participate in this study, you will receive a $25 Giant Eagle gift card after completing the first study visit with the research assistant, and a $75 Giant Eagle gift card after completing the second study visit with the research assistant.

12. What happens if I am injured because I took part in this study?

If you suffer an injury from participating in this study, you should notify the researcher or study doctor immediately, who will determine if you should obtain medical treatment at The Ohio State University Wexner Medical Center.

The cost for this treatment will be billed to you or your medical or hospital insurance. The Ohio State University has no funds set aside for the payment of health care expenses for this study.
13. What are my rights if I take part in this study?

If you choose to participate in the study, you may discontinue participation at any time without penalty or loss of benefits. By signing this form, you do not give up any personal legal rights you may have as a participant in this study.

You will be provided with any new information that develops during the course of the research that may affect your decision whether or not to continue participation in the study.

You may refuse to participate in this study without penalty or loss of benefits to which you are otherwise entitled.

An Institutional Review Board responsible for human subjects research at The Ohio State University reviewed this research project and found it to be acceptable, according to applicable state and federal regulations and University policies designed to protect the rights and welfare of participants in research.

14. Who can answer my questions about the study?

For questions, concerns, or complaints about the study, or you feel you have been harmed as a result of study participation, you may contact Dr. Chris Taylor at 614-688-7972.

For questions about your rights as a participant in this study or to discuss other study-related concerns or complaints with someone who is not part of the research team, you may contact Ms. Sandra Meadows in the Office of Responsible Research Practices at 1-800-678-6251.

If you are injured as a result of participating in this study or for questions about a study-related injury, you may contact Dr. Chris Taylor at 614-688-7972.
**Signing the consent form**

I have read (or someone has read to me) this form and I am aware that I am being asked to participate in a research study. I have had the opportunity to ask questions and have had them answered to my satisfaction. I voluntarily agree to participate in this study.

I am not giving up any legal rights by signing this form. I will be given a copy of this form.

<table>
<thead>
<tr>
<th>Printed name of subject</th>
<th>Signature of subject</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>AM/PM</td>
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<tr>
<td>Date and time</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Printed name of person authorized to consent for subject (when applicable)</th>
<th>Signature of person authorized to consent for subject (when applicable)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AM/PM</td>
</tr>
<tr>
<td></td>
<td>Date and time</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Relationship to the subject</th>
<th>Date and time</th>
</tr>
</thead>
</table>

**Investigator/Research Staff**

I have explained the research to the participant or his/her representative before requesting the signature(s) above. There are no blanks in this document. A copy of this form has been given to the participant or his/her representative.

<table>
<thead>
<tr>
<th>Printed name of person obtaining consent</th>
<th>Signature of person obtaining consent</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AM/PM</td>
</tr>
<tr>
<td></td>
<td>Date and time</td>
</tr>
</tbody>
</table>

**Witness(es)** *May be left blank if not required by the IRB*

<table>
<thead>
<tr>
<th>Printed name of witness</th>
<th>Signature of witness</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AM/PM</td>
</tr>
<tr>
<td></td>
<td>Date and time</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Printed name of witness</th>
<th>Signature of witness</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AM/PM</td>
</tr>
<tr>
<td></td>
<td>Date and time</td>
</tr>
</tbody>
</table>
Appendix B: Script for Obtaining Verbal Consent
Informed Consent from Primary Care Providers and Registered Dietitians

“As you know, I am studying nutrition counseling within the grocery store for adults with hypertension. I would like to ask you a series of questions about your experience with the study and with this model of care. I would like to make a tape recording of our discussion, so that I can have an accurate record of the information that you provide to me. I will transcribe that recording, and will keep the transcripts confidential and securely in my possession. I will erase the tape after I transcribe it.

The information you share with me will help us explore the feasibility and acceptability of this intervention.

The interview will take approximately 30 minutes.

I will not link your name to anything you say in the text of my dissertation or any other publications. Your employment location will not be stated in any publications or presentations, however we cannot assure confidentiality of employer information, as certain colleagues are already aware of the ongoing collaboration between our study team, OSU Family Medicine, and Giant Eagle and therefore may be able to deduce where this research is taking place. Therefore, there is a risk that your statements may be ultimately linked back to you or your office.

There are no other expected risks of participation.

Participation is voluntary. If you decide not to participate, there will be no penalty or loss of benefits to which you are otherwise entitled. You can, of course, decline to answer any questions and you can stop participating at any time, without any penalty or loss of benefits to which you are otherwise entitled.

If you have any additional questions concerning this research or your participation in it, please feel free to contact me, my dissertation supervisor or our university research office at any time.

(The respondent will be given an information card)

Do you have any questions about this research? Do you agree to participate and may I record our discussion? If so, let’s begin…”
Appendix C: Demographic Questionnaire

BASELINE QUESTIONNAIRE

1. What is your phone number (with area code)? ______________________________

2. Is there an alternate phone number that we can use to reach you? ______________________

3. What is your email address? ______________________________

4. Preferred contact method?
   ___ Email
   ___ Phone call
   ___ Text message

5. Do you currently work?
   ___ Yes, part-time
   ___ Yes, full-time
   ___ No, retired
   ___ No, not employed at this time

6. What is the highest grade or level you have completed?
   ___ Less than 9th grade
   ___ 9-11th grade (Includes 12th grade with no diploma)
   ___ High school graduate/GED or equivalent
   ___ Some college or associate degree
   ___ College graduate
   ___ Graduate school or professional school after college

7. Which category best describes you race/ethnic background?
   ___ Black/African American
   ___ Mexican American or other Latino
   ___ White/Caucasian
   ___ Other (please specify: ___________)

114
8. In general, how healthy is your overall diet? Please circle your response.

Very unhealthy   Somewhat unhealthy   Somewhat healthy   Very healthy

9. How would you rate your knowledge about healthy eating? Please circle your response.

Very low   Somewhat low   Somewhat high   Very high

10. How confident are you that you:

<table>
<thead>
<tr>
<th>Know how to eat a healthy diet?</th>
<th>0% chance</th>
<th>25% chance</th>
<th>50% chance</th>
<th>75% chance</th>
<th>100% chance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Could improve your eating?</td>
<td>0% chance</td>
<td>25% chance</td>
<td>50% chance</td>
<td>75% chance</td>
<td>100% chance</td>
</tr>
<tr>
<td>Could eat 5 servings of fruits and vegetables a day?</td>
<td>0% chance</td>
<td>25% chance</td>
<td>50% chance</td>
<td>75% chance</td>
<td>100% chance</td>
</tr>
<tr>
<td>Could balance your calories to manage your weight?</td>
<td>0% chance</td>
<td>25% chance</td>
<td>50% chance</td>
<td>75% chance</td>
<td>100% chance</td>
</tr>
<tr>
<td>Could limit how many foods high in fat that you eat?</td>
<td>0% chance</td>
<td>25% chance</td>
<td>50% chance</td>
<td>75% chance</td>
<td>100% chance</td>
</tr>
<tr>
<td>Could limit how many foods high in sugar that you eat?</td>
<td>0% chance</td>
<td>25% chance</td>
<td>50% chance</td>
<td>75% chance</td>
<td>100% chance</td>
</tr>
<tr>
<td>Could eat a healthy diet?</td>
<td>0% chance</td>
<td>25% chance</td>
<td>50% chance</td>
<td>75% chance</td>
<td>100% chance</td>
</tr>
</tbody>
</table>

11. How ready are you to change your diet? Are you prepared to change, already changing, or somewhere in the middle? Please circle the number that best matches your answer:

0  1  2  3  4  5  6  7  8  9  10

Not prepared to change   Already changing
### How often do you...

<table>
<thead>
<tr>
<th>Activity</th>
<th>None of the time</th>
<th>Some of the time</th>
<th>Most of the time</th>
<th>All of the time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forget to take your HBP medication?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Decide not to take your HBP medication?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Forget to get prescriptions filled?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Run out of HBP pills?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skip your HBP medication before you go to the doctor?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Miss taking your HBP pills when you feel better?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Miss taking your HBP pills when you feel sick?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Take someone else’s HBP pills?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Miss taking your HBP pills when you are careless?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix E: Sample VioScreen PCMN Nutrition Care Summary

NUTRITION CARE SUMMARY

Attending Clinician: [redacted]  
Patient: [redacted]  
Height: 64 inches (162.5 cm)  
Weight: 168 lbs. (76.2 kg)  
Bmi: 29.0

Summary

Assessment

Notes: Pt states BP runs 160/00. Has gained about 28# in 10 years.

Food Allergies: None known.

Food Avoidances: None known.

Nutrition Diagnosis

Notes: Pt use to weigh 140 and was comfortable at that weight.

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Specify</th>
<th>Code #</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excessive energy intake</td>
<td></td>
<td>N1-13</td>
</tr>
</tbody>
</table>

Monitoring & Intervention

Goal #1: Created Date: 12-28-2015

Patient Goal: Eat 2-3 servings of fruit and 3-5 servings of vegetables per day

Nutrition: 5-10 servings of fruits and vegetables per day

Monitoring: Track with the food tracker sheet.

Evaluation: Track with the food tracker sheet.

Intervention: Pt is lacking in fiber and fruit intake. Pt will work on increasing fruit and vegetable intake.
Appendix F: Sample VioScreen Food-Frequency Questionnaire Summary

Personal Health and Nutrition Summary

Name: [Redacted]
Gender: Female
Age: 36
Completed on: [Redacted]
Report Date: [Redacted]
Organization: OSU

BMI: 28.0
Goal: 18.5 - 24.9

Estimated Energy Requirement: 2017 calories/day

Food Eating Patterns
Meeting the eating pattern goals is important for healthier living

<table>
<thead>
<tr>
<th>Food Eating Pattern</th>
<th>Your Servings</th>
<th>Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fruits and Vegetables</td>
<td>10.4</td>
<td>✔</td>
</tr>
<tr>
<td>Low Fat and Skim Milk Products</td>
<td>0.5</td>
<td>✗</td>
</tr>
<tr>
<td>Whole Grain Foods</td>
<td>1</td>
<td>✗</td>
</tr>
<tr>
<td>Fish</td>
<td>3.9</td>
<td>✔</td>
</tr>
<tr>
<td>Fried Foods</td>
<td>0.2</td>
<td>✔</td>
</tr>
<tr>
<td>Sweet Foods</td>
<td>0.6</td>
<td>✔</td>
</tr>
<tr>
<td>Alcohol</td>
<td>0.5</td>
<td>✔</td>
</tr>
</tbody>
</table>

Key Nutrients
Vitamins and minerals are nutrients that your body needs to grow and develop normally

<table>
<thead>
<tr>
<th>Nutrients</th>
<th>Average Daily</th>
<th>% of RDA</th>
<th>Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protein</td>
<td>83 g</td>
<td>-</td>
<td>✔</td>
</tr>
<tr>
<td>Carbohydrate</td>
<td>196 g</td>
<td>-</td>
<td>✔</td>
</tr>
<tr>
<td>Dietary Fiber</td>
<td>28 g</td>
<td>-</td>
<td>✗</td>
</tr>
<tr>
<td>Calcium</td>
<td>943 mg</td>
<td>94%</td>
<td>✗</td>
</tr>
<tr>
<td>Vitamin A</td>
<td>30659 IU</td>
<td>1314%</td>
<td>✗</td>
</tr>
<tr>
<td>Vitamin C</td>
<td>226 mg</td>
<td>301%</td>
<td>✔</td>
</tr>
<tr>
<td>Iron</td>
<td>12 mg</td>
<td>67%</td>
<td>✗</td>
</tr>
<tr>
<td>Vitamin D</td>
<td>321 IU</td>
<td>160%</td>
<td>✔</td>
</tr>
</tbody>
</table>

Nutrients to Limit
Exceeding the following nutrient goals might be harmful to your health, please consult a healthcare professional

<table>
<thead>
<tr>
<th>Nutrients</th>
<th>Average Daily</th>
<th>% of RDA</th>
<th>Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Fat</td>
<td>64 g</td>
<td>33%</td>
<td>✔</td>
</tr>
<tr>
<td>Saturated Fat</td>
<td>19 g</td>
<td>10%</td>
<td>✗</td>
</tr>
</tbody>
</table>

Sodium: Recommended: less than 2300 mg
Cholesterol: Recommended: less than 300 mg

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118