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Impact of Literacy on Obesity and Hypertension: A Quality Improvement Project

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Introduction

Social determinants of health (SDoH) are defined as factors, including things such as food security, housing, literacy, finances, and work and school environments, that affect health risks and outcomes (About Social, 2021). Healthcare disparities are often affected by one's social determinants. National data shows low-income populations present with considerable unmet needs, including food, housing, clothing, and quality health care. Closing the health disparities gap has long been the focus of healthcare organizations across the board.

The care coordination model (CCM) enables organizations to improve care through collaboration. CCM looks at care coordination from the perspective of a patient-centered medical home. One aspect of the model is providing patient support through education, helping patients with barriers to care, and difficulties they may encounter. Communities and healthcare organizations can improve healthcare disparities caused by SDoH, improving patient outcomes and their quality of life through the use of the CCM. Effectively educating patients on recognizing how SDoH affect their health and by providing resources to mediate their SDoH can empower patients to manage their health care and outcomes.

Problem Description

Studies have shown patients with unmet social needs have above-average rates of chronic conditions such as depression, hypertension, and diabetes, their utilization of the emergency department is higher, and they are more likely to miss health care appointments (Cole & Nguyen, 2020). This quality improvement project is located in two clinical sites within the Lakes Region of New Hampshire. The clinics serve the communities of the Three Rivers region and the surrounding towns within the Lakes Region, providing behavioral and medical services to various populations, with the greatest population having low socioeconomic status and being

vulnerable. The clinic and organizations in surrounding communities have long sought to address unmet needs amongst this population to improve health in the region. The SDoH suffered amongst the population include food insecurity, health literacy, housing and financial instability, transportation, and family addiction. Failing to address unmet needs within this population exacerbates their burden. However, the organization must first determine why these needs have been unmet.

Available Knowledge

Low socioeconomic status has been known to create higher levels of morbidity and mortality. It is vastly important to address this population's unmet needs to negate the increase in morbidity and mortality rates. The low-income population residing within the Lakes Region and Three Rivers communities suffers greatly from significant unmet medical needs. Many of these unmet needs stem from lack of affordable housing, food insecurity, financial instability, and addiction. The two clinics serving this population oversee the medical and behavioral health care for approximately 5,800 residents. Eight percent of these patients have been identified as having one or more SDoH.

Educational initiatives affecting poverty and SDoH have been evaluated related to health-related knowledge and attitudes in primary care (DeBonis, Meyer & Brodersen, 2020). According to the Census Bureau, more than one in seven people lives in poverty in the United States. Another 30% of the population is nearing the poverty line (DeBonis, Meyer & Brodersen, 2020). The target population has approximately 20% of the population living below the poverty level (Franklin, 2019). SDoH such as income, housing, food insecurity, and education play a vital role in the outcomes of this population. Findings indicate providing education to the patient

and the staff improves perceptions and understanding of how SDoH affect patients within low socioeconomic communities.

Recognizing the complexity of providing care to patients with unmet social needs is a crucial step in determining the process of improving their SDoH. Katz et al. (2018) sought to evaluate the connection between SDoH and the quality of care received from primary care providers. The study included approximately 627,000 patients from urban Canada, almost half were identified as being affected by SDoH. There was a universally negative impact of housing, income, social environment, and mental health on patient outcomes regarding breast cancer screening, chronic disease management, geriatric care, and utilization of regular office visits (Katz et. al, 2018). The quality of care given by primary care providers is affected due to higher demands given the complexity of the SDoH of the patient populations.

Access to educational opportunities is another factor of SDoH. It is imperative to highlight the importance of education on patient outcomes, noting that two of the most significant social factors affecting health are access to care and literacy. Rattermann, Angelov, Reddicks & Monk (2021) pointed out that the lack of quality education in the United States has the most dramatic inequalities based on socioeconomic status. The population included in the study was from a K-8 charter school located in a high-poverty community, noting that 83% were children of poverty. The notable importance of the study is that if the social determinants are addressed in the early years, the population is more likely to have better health outcomes in the long term.

Medical staff perceptions of SDoH often affect the care patients receive. An analysis was done to determine nurses' insights into how SDoH affect patient care and what can be done to address these needs to improve outcomes and services available for the patient population

(Schneiderman & Olshansky, 2021). This qualitative study included thirteen nurses interviewed via phone about their thoughts on SDoH. The interviews determined there is a greater need for patient education on how SDoH affect physical well-being along with the need to meet patients on their level to improve patient outcomes. It was also identified that addressing patients' unmet needs is interdisciplinary, including social workers, community health partners, and other health care professionals (Schneiderman & Olshansky, 2021). The clinic's CCM will be an effective model for utilizing clinic staff and community programs to educate and enable patients' self-management of chronic medical conditions.

Addressing SDoH and unmet needs have been a goal of health care organizations for decades. Horwitz, Chang, Arcilla & Knickman (2020) set to quantify the initiatives set out by organizations to address SDoH. They wanted to determine how important SDoH are to the United States and what health care organizations are doing to help improve patient outcomes? The researchers found between 2017 and 2019, 78 programs with 2.5 billion dollars in funds were geared toward investing in addressing SDoH. The initiatives focused on housing, education, transportation, food security, and social and community programs (Horwitz, Chang, Arcilla & Knickman, 2020). The goal was to improve the health of all Americans, no matter their socioeconomic status.

A systematic review examining the effects of social determinants on patient outcomes sought to determine how SDoH affect health care delivery and how interventions could benefit these patients. The patient population included patients in the United States and Canada who receive health care. Eighty studies of patients, both in-patient and primary care out-patient, were included in the systematic review revealing a need for an everyday measurement standard in determining the effectiveness of interventions. Knighton, Stephenson & Savitz (2018) noted that

the study showed that interventions are fragmented and limited. There is a need for interventions exclusively intended to impact health care outcomes for vulnerable populations.

SDoH are a global concern. The Amazonian population was assessed to determine how SDoH affect chronic disease, investigating how the population's chronic health is affected by their environment. The data was collected between 2008 and 2014 from a study examining the health of rural populations and how their health is affected by SDoH. Hypertension was among the top health concerns for the people within these populations, noting that SDoH are a leading cause of many chronic diseases. They recommended calling for written healthcare policies that address the population's SDoH to improve health outcomes (Silva, Padez, Moura & Filgueiras, 2016).

One randomized control trial was identified to measure the effectiveness of interventions performed, including the patient's SDoH in an "enhanced intervention" instead of specific hypertension interventions alone (McClintock & Bogner, 2017). The "enhanced intervention" included all the critical intervention components (control group) plus prioritized patient planning to identify patient priorities that may influence treatment adherence, dietary literacy, exercise, finances, and emotional well-being in patients with hypertension (McClintock & Bodner, 2017). The critical intervention group was provided education, treatment recommendations and monitored clinical conditions. After gathering readings using electronic blood pressure monitoring, the patients were randomly placed in either the "enhanced intervention" group or the control group. After the study, the patients in the enhanced group had a decrease in their blood pressure. They also identified additional unmet needs from these patients that were ultimately addressed, helping to improve blood pressure readings further. McClintock and Bogner (2017)

finally noted these findings should drive the use of standards of care that integrate the patients' SDoH when treating hypertension.

It is essential to understand how SDoH affect chronic medical conditions. Doyle, Chang, Levy & Rising (2019) reviewed how hypertension is affected by one's SDoH. They noted about 50% of the American population suffers from hypertension, costing around 46 billion dollars each year and causing close to 400,000 deaths every year (Doyle et al., 2019). Given that one's SDoH doubles the impact on hypertension and cannot traditionally be changed, the approach to addressing individual needs can also not be traditional. The outreach they implemented was coined COACH, or Community Outreach and Cardiovascular Health. The initiative utilized nurse practitioners in a federally qualified health center to improve hypertension over twelve months amongst the patient population. By addressing smoking status, diet, exercise, and medication adherence, the providers were able to significantly assist the patients in improving their blood pressure (Doyle et al., 2019).

The CDC notes that SDoH are directly related to cardiovascular health and stroke risk. The 2019 Behavioral Risk Factor Surveillance System (BRFSS) for hypertension in the United States and its territories found that about 35% of the population participating in the survey were previously told they have high blood pressure. The same study in New Hampshire found approximately 32% of the participants knew they had high blood pressure (BRFSS, 2020). Hypertension amongst the New Hampshire population was more prevalent in populations with lower household incomes, less education, greater BMI, who worked out less, and those who used tobacco products (BFFSS, 2020). People residing in lower socioeconomic counties were found to have higher incidents of hypertension (Prevalence, 2017).

The clinic chosen for this quality improvement initiative is in an area with known high poverty rates, lack of transportation, obesity, low education, problems related to a social environment and upbringing, and increased tobacco use rates. The 2019 Economic & Labor Market Information Bureau, NH Employment Security, noted the median weekly income for the population residing in the city one of the clinics is located was $915, with 20% of the population living below the poverty line (Franklin, 2019).

Table 1

Number of Patients with Social Determinants of Health

ICD-10 Code	**Pre-Screen**
Z55: Problems related to education and literacy	22
Z56: Problems related to employment or unemployment	4
Z57: Occupational exposure to risk factors	1
Z58: Adequate drinking supply	0
Z59: Problems related to housing and economic circumstances	117
Z60: Problems related to a social environment	12
Z61: Altered family relationships in childhood/ removal from the home	0
Z62: Problems related to upbringing	60
Z63: Other problems related to a primary support group, including family circumstances	161
Z64: Problems related to certain psychosocial circumstances	0
Z65: Problems related to other psychosocial circumstances	61
Total	**438**

Approximately 8% of patients in the population at the target clinics have been noted as having one or more SDoH (Table 1). Chronic diseases are affected by SDoH. The target

population has many patients diagnosed with hypertension and obesity (Table 2). Health literacy has been identified as one of the SDoH related to this population. There is a correlation between hypertension, obesity, and poor literacy (Table 3).

Table 2

Patient Identified with Hypertension and/or Obesity Related to Social Determinants of Health

SDoH	HTN	Obesity	SDoH/HTN	SDoH/Obesity	SDoH/Obesity/HTN
438	2,425	1,808	85	134	49

Table 3

Correlation Between Patients with Hypertension, Obesity, and Social Determinants of Health

Age	Hypertension	Obesity	SDoH- Literacy
18-29	2	1	0
30-49	12	8	2
50-64	33	23	7
65+	38	17	5
Total	85	49	14

Several SDoH can affect obesity, including housing, finances, education, literacy, and family upbringing. Javed et al. (2022) collected data from 165,000 adults categorized as obese. Patient's SDoH, such as economic stability, neighborhood, physical environment, social cohesion, community and social context, food, education, and the healthcare system, were evaluated related to the participant's weight. Results revealed that SDoH were associated with up

to 70% higher rates of obesity, calling for increased awareness in addressing each patient's SDoH to improve outcomes (Javed et al., 2022).

Obesity has been an ongoing epidemic in the United States for more than four decades. Longer working hours, two working parents, and homes with single parents have made making good food choices more difficult. The rise of fast-food restaurants on every corner with prices often less than the cost of a salad has made choosing high sodium, high-fat foods the reality for many families struggling financially. These choices have led to the rise of obesity and high blood pressure in children and adults at rates never seen before.

Obesity has been known to lead to severe and potentially life-threatening conditions. These conditions include diabetes, hypertension, hyperlipidemia, and coronary artery disease. Several factors affect a patient's weight, including genetics, diet, injuries, literacy, and other chronic medical conditions. Jiang, Lu, Zong, Ruan, & Liu (2016) found that increased weight and intravascular fat cause sodium retention. This action is considered to have a significant role in the "development of obesity-related hypertension, a chronic medical condition in which the blood pressure is persistently at or >140/90 mmHg" (Jiang, et al. 2016, p. 2395).

The regular consumption of high-sodium fast foods has been associated with increased rates of hypertension. Many studies have been conducted to assess the relationship between a fast-food diet and cardiovascular health. Realizing that nearly 70% of American adults are considered overweight or obese, Alsabieh et al. (2019) investigated how a fast-food diet affects blood pressure and quality of life for 60 adults ranging in age from 19 to 23. Participants were evaluated based on how many fast-food meals they consumed weekly. The results indicated the participants consuming more fast-food meals a week had more significant metabolic differences and higher blood pressure readings (Alsabieh et al., 2019). Noting that regular fast-food intake is

a significant participant in cardio-metabolic disease, including obesity, type II diabetes mellitus, metabolic syndrome, and cardiovascular disease.

Health literacy affects how patients perceive their health and manage chronic conditions. Ninety million Americans suffer from low health literacy, many exacerbated by other SDoH. Poor health literacy affects obesity due to misunderstandings about weight, health management, diet, nutrition, and food labels. Lanpher, Askew, and Bennett (2016) studied how literacy affects weight and weight management amongst low socioeconomic populations. They found that tailoring an educational program based on the literacy of patients can be successful in sustained weight loss.

Poor outcomes in patients with hypertension are also related to health literacy. With nearly half of the United States population finding it difficult to understand health information, which becomes more significant after the age of 65 years, it is imperative to examine interventions to reach the lowest level of health literacy. Halladay et al. (2017) found initiating a multidisciplinary approach targeting health literacy can reduce blood pressure by up to ten mmHg after twelve months.

Rationale

Addressing one or more SDoH can significantly impact patient outcomes. Addressing the SDoH of health literacy by dietary education, teaching patients how to understand food labels, and educating on blood pressure monitor and medication adherence not only empowers patients, it improves their overall health by decreasing weight and improving blood pressures. Home blood pressure monitoring in poorly controlled hypertension patients can effectively increase patient knowledge and decrease blood pressure (Visanuyothin, Plianbangchang & Somrongthong, 2018). This outcome supports home blood pressure monitoring for the targeted

patient population. Utilizing home blood pressure monitoring, with or without telemedicine, has been cost-effective and reduces blood pressure readings compared to office blood pressure monitoring alone (Monahan, Jowett, Nickless, Franssen, Grant, Greenfield, Hobbs, Hodgkinson, Mant & McManus, 2019).

Specific Aims

This quality improvement project addressed SDoH and reduced health disparities by providing enabling services as a critical component of a comprehensive community health center model of care by utilizing dedicated staff and community partnerships to provide education and resources to patients. More specifically, addressing needs to improve hypertension amongst the clinic population suffering from unmet needs due to their SDoH.

Addressing the SDoH of the patients in the clinic took a CCM approach involving intake and referral coordinators, patient advocate, chief executive officer, chief financial officer, clinical director, human resource director, practice manager, medical interpreters, behavioral health clinicians, providers, hypertension educator, dietitian, medical assistants, and transportation services. This group of individuals was charged with increasing community research efforts, offering counsel, providing education and training to staff and patients, participating in cross-agency multidisciplinary teams, administering the Protocol for Responding and Assess Patient Assets, Risks, and Experiences (PRAPARE) and the Hypertension Self-Care Activity Level Effects (H-SCALE) screenings, and addressing unmet needs of the community.

Methods

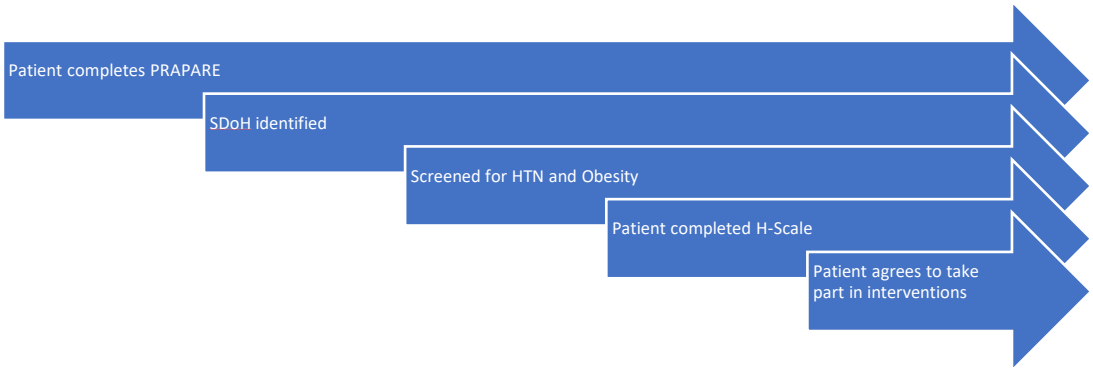
This pilot quality improvement program sought to identify patients with SDoH that may be affecting chronic disease outcomes. The clinic used the PRAPARE tool (Appendix A, Appendix B) to better understand the community's needs and the barriers faced. Patients falling

within the parameters of unmet needs were crossed referenced for hypertension and obesity. The team comprised of a nurse practitioner, medical assistant, hypertension educator, and dietitian designed interventions including home blood pressure monitoring, nutritional education, food label reading, and healthy lifestyle changes to address some of the concerns and implemented some aspects into a patient visit workflow.

SDoH data was identified through the PRAPARE tool (Figure 1), completed by the patient during their check-in process. The PRAPARE screening tools was uploaded into patient charts and reviewed during the patient's appointment. Patients were offered services with the patient advocate, social workers, behavioral health specialists, or other providers. The patient's unmet needs and SDoH were addressed and supported based on the patient's willingness to participate.

Figure 1

Patient Flow for Screening



The provider examined SDoH for each patient and cross-referenced each of the patients with hypertension and obesity. Patients identified with SDoH and hypertension were invited to participate in an initiative to address some of their needs to lower their blood pressure. The H-SCALE (Appendix 2), an assessment of patients' self-reported behaviors, was examined for a

relationship between adherence and better control of blood pressure. The H-scale results were utilized as an aid for providers as a counseling tool for patients with hypertension who sought to lower their blood pressure. The H-SCALE consists of "31 items that assess the six self-care behaviors related to controlling blood pressure" (Warren-Findlow, Reeve, & Racine, 2017, p. 93). The six self-care behaviors include medication usage, diet, physical activity, smoking, weight management, and alcohol consumption (Appendix C). The H-SCALE was completed at the initiation of the intervention and the end to reassess for patient lifestyle changes or behavior modifications.

The project sought to improve patient outcomes through collaboration with community organizations and education. Community resources included wellness programs, housing, and education. Instruction included nutrition and exercise, home blood pressure monitoring, and medication adherence. Through the CCM, the clinic strengthened relationships with and utilize community outreach to support chronic disease self-management. The CCM employed specialty nurses to provide hypertension and obesity education and facilitated access to community resources. The hypertension education nurse educated patients on how to take blood pressure readings at home and how to keep a blood pressure log. The dietitian informed patients about how diet affects their blood pressure, heart-healthy food choices, how to read food labels to determine sodium content, dietary recall logs, and the importance of physical exercise.

Context

Educating patients on dietary changes alone can improve health costs dramatically. A 2016 systematic review examined patients from a wide range of countries and determined that reducing sodium intake was cost-effective and cost-saving (Hope, Webster, Trieu, Pillay, Ieremia, Bell, Snowdon, Neal & Moodie, 2017). Cost-effectiveness included decreased

myocardial infarctions and mortality. Cost savings include nutritional costs, medication costs, and healthcare costs.

When considering the budget at the chosen clinic, there were no extra costs for implementing the program. The clinic already employed a patient advocate, behavioral health clinicians, referral coordinators, a registered dietitian, blood pressure monitors for home use, and hypertension educators. The goal was to collaborate all these interventions in one visit to reduce the patient's cost of getting to the clinic, copays, and other additional charges, including missing work for the appointment. Cost savings for patients included reducing the number of visits for hypertension management, medication cost, and potentially food costs.

The PRAPARE portion of the quality improvement process was funded through a federal grant that aims to reduce health disparities (Table 4).

Table 4

Cost/Benefit Analysis

Project Name	Impact of Health Literacy on Hypertension
Date	April 2022
Initial Project Cost Estimate	$0
Annual Project Maintenance	$0
Project Impact and Benefit	• Federal grant to enable the clinic to continue addressing social determinants of health and reduce health disparities • Community collaboration

Interventions

Interventions included bi-weekly hypertension support groups, education on causes of hypertension, alcohol reduction, dietary education, physical activity, and home blood pressure monitoring. The team involved in the initiative was the healthcare provider, patient advocate, medical assistants, a dietitian, nurse educators, quality improvement nurse specialists, and community resources such as transportation. The hypertension nurse educator provided education on hypertension management, medication adherence, obtaining home blood pressure readings, and keeping a blood pressure log. The dietitian educated patients on recognizing food labels, healthy food choices, dietary recall logs, and the importance of a low-sodium, low-fat diet, and exercise. A collaborate was established with a local grocery stores to label foods throughout the stores as heart-healthy and low sodium, noting what was appropriate for hypertension patients.

Study of the Interventions

To measure the effectiveness of the interventions in addressing SDoH in patients with hypertension, a comparison was made between starting blood pressure readings and weights and blood pressure readings and weights after eight weeks of the intervention process. A chart review was conducted to graph progress of the changes in patient's weight at pre-and post-intervention.

Pre-evaluation and post-evaluation of the H-SCALE tool (Appendix D) was completed to assess the patients understanding of their chronic condition and how their behavior or lifestyle affects their condition. Evaluations of home blood pressure monitoring were attempted every week and were addressed when patients were struggling with aspects of the interventions.

Measures

The goal was to improve outcomes by addressing unmet needs and measuring the effectiveness of interventions in lowering the blood pressure of a specific patient population. The study was comprised of patients ages 18 and older who had unmet needs due to SDoH and had hypertension and overweight/obesity as a diagnosis. The chosen clinic had 438 patients with at least one social determinant of health diagnosis documented. Of those patients, 85 also had pre-hypertension or hypertension as a diagnosis in their history. Of those patients diagnosed with pre-hypertension or hypertension, 49 also had obesity/overweight as a diagnosis.

The tools utilized consisted of the PRAPARE questionnaire to assess demographic characteristics and patient's health-related data and the Hypertension Self-Care Activity Level Effects (H-SCALE). The H-SCALE assessed patients' self-care practices related to their cardiovascular health (Warren-Findlow & Seymour, 2011). The H-SCALE tool enabled the healthcare provider a better insight into their patient's lifestyles to counsel based on responses. Warren-Findlow & Seymour (2011) noted that the H-SCALE is a valid and reliable tool in assessing hypertension self-care in patient populations (Appendix B).

Analysis

The analysis compared initial PRAPARE results and initial H-SCALE results to post-intervention results. Interventions included education related to hypertension, dietary changes, community resources, and self-management (Table 5).

The PRAPARE tool enabled the organization to identify patients with SDoH. Once those patients were identified and their hypertension and obesity diagnosis were confirmed, the H-SCALE assessed their self-care activities such as adherence to medication, weight control, diet, physical exercise, and alcohol intake. This tool was evaluated pre-and post-intervention to assess health literacy regarding how self-care activities affect their hypertension and weight.

The hypertension educator evaluated the patient's home blood pressure logs throughout the quality improvement initiative. The dietitian regularly evaluated diet recall with sodium levels throughout the quality improvement initiative. Patients presented bi-weekly, when able, for blood pressure readings and weight checks. Education with the hypertension educator and dietitian was combined on the days the patients presented for readings.

Table 5

Pre-Intervention Screenings, Interventions, and Post-Intervention Screenings

Pre-Intervention	Intervention	Post-Intervention
PRAPARE: to determine patient SDoH	Initiation of the PRAPARE screening tool on each patient to be filled out by the patient and reviewed by the medical assistant and the provider Patient Care Coordination on community resources to assist with SDoH such as housing, finances, and food security	PRAPARE: Re-evaluate patient SDoH after intervention
H-SCALE: to determine the patient's knowledge related to hypertension management	Education by the hypertension nurse educator, provider, and dietician on understanding hypertension, medication usage, low-salt diet, and diet logging.	H-SCALE: to determine changes in patient's knowledge after interventions

Blood Pressure: baseline	Patient education on home blood pressure readings and logging blood pressures. The patients were given a blood pressure cuff and instructed on the use Education by a dietitian on heart-healthy, low-sodium, low-fat diet, dietary recall logs Collaboration with local grocery stores to flag appropriate foods for hypertension	Blood Pressure Readings: to determine changes in blood pressure during and after interventions
Weight: baseline	Weights were monitored when patients present for education. Dietitian education on healthy, low-sodium, low-fat diet, dietary recall logs, and exercise Collaboration with local grocery stores to flag appropriate foods for hypertension and obesity	Weight: changes in weight during and after interventions

Ethical Considerations

Studies have found that people with low socioeconomic status are at risk for misconduct in the quality improvement initiative (Boutin-Foster, Scott, Melendez, Rodriguez, Ramos, Kanna & Michelen, 2013). Special care was taken when interviewing, assessing for understanding, respecting autonomy, and presenting clear inclusion/exclusion criteria without bias. Every effort was made to get as broad and diverse a sampling of respondents as possible, including race,

ethnicity, gender identity, age, and experience. Appropriate follow-up with leadership was available for critical issues if presented or that would have been revealed in the data.

Results

The pilot study began with SDoH screenings on all patients that presented for a scheduled appointment to identify patients needing interventions in the future. This action maintains compliance for implementing full SDoH screening across the board as required by the Primary Care Maternal Child Health grant.

The chosen patient list, created based on SDoH of illiteracy and the diagnosis of obesity and hypertension, was sent to the dietitian and the hypertension coordinator to contact patients and invite them into the pilot study. Patients that were reached and agreed to participate were scheduled with the dietitian either through telehealth or in-person for baseline dietary habit screening. The patients were instructed to maintain dietary recall logs. Initial logs revealed high sodium foods, prepackaged foods, red meats, sugary foods and drinks, processed meats, canned foods, heavy condiments, and high amounts of alcohol.

The participating patients were also placed on the hypertension coordinator's schedule for H-SCALE completion, baseline blood pressure readings, baseline weights, and education on home blood pressure monitoring. The hypertension coordinator reached out to patients via telephone thereafter for the home blood pressure reading logs. Blood pressures were screened by the provider to determine if interventions were needed.

Table 6

Number of Patients with Social Determinants of Health

ICD-10 Code	Patients Pre-Screened	Patients Post- Screening
Z55: Problems related to education and literacy	22	24
Z56: Problems related to employment or unemployment	4	4
Z57: Occupational exposure to risk factors	1	1
Z58: Adequate drinking supply	0	0
Z59: Problems related to housing and economic circumstances	117	164
Z60: Problems related to a social environment	12	14
Z61: Altered family relationships in childhood/ removal from the home	0	0
Z62: Problems related to upbringing	60	57
Z63: Other problems related to a primary support group, including family circumstances	161	152
Z64: Problems related to certain psychosocial circumstances	0	0
Z65: Problems related to other psychosocial circumstances	61	58
Total	**438**	**474**

Table 7

Initial H-Scale Results

Medication Usage *How many of the past 7 days did you:*	Number of Days
Take your blood pressure pills?	8 patients reported 7 days 2 patients reported 6 days 1 patient reported 5 days
Take your blood pressure pills at the same time everyday?	3 patients reported 7 days 2 patients reported 6 days 6 patients reported 5 days
Take the recommended number of blood pressure pills?	All 11 patients reported they did this all 7 days
Diet How many of the past 7 days did you:	Number of Days
Eat nuts or peanut butter?	7 patients reported 4 days 2 patients reported 2 days 1 patient reported 1 day 1 patient reported 0 days
Eat pickles, olives, or other vegetables in brine?	4 patients reported 5 days 2 patients reported 4 days 3 patients reported 3 days 1 patient reported 2 days 1 patient reported 1 day
Eat more than one serving of fruit (fresh, frozen, canned or fruit juice)?	1 patient reported 6 days 2 patients reported 5 days 3 patients reported 4 days 5 patients reported 3 days
Eat apples, bananas, oranges, melon or raisins?	6 patients reported 5 days 3 patients reported 4 days

	2 patients reported 2 days				
Eat whole grain breads, cereals, grits, oatmeal, or brown rice?	5 patients reported 5 days 4 patients reported 3 days 2 patients reported 2 days				
Physical Activity How many of the past 7 days did you:	Number of Days				
Do at least 30 minutes total of physical activity?	2 patients reported 3 days 5 patients reported 2 days 4 patients reported 1 day				
Do a specific exercise activity other than what you do around the house or as part of your work?	2 patients reported 2 days 5 patients reported 1 day 4 patients reported 0 days				
Engage in weightlifting or strength training	1 patient reported 2 days 2 patients reported 1 day 8 patients reported 0 days				
Weight management In order to lose weight or maintain my weight.	Strongly Disagree	Disagree	Not Sure	Agree	Strongly Disagree
I am careful about what I eat.	0	2	6	2	1
I read food labels when I grocery shop.	0	8	1	2	0
I exercise in order to lose or maintain weight.	0	1	3	7	0
I have cut out drinking sugary sodas and sweet tea.	0	6	2	2	1
I eat smaller portions or eat fewer portions.	0	7	2	2	0

I have stopped buying or bringing unhealthy foods into my home.	0	3	3	3	2
I have cut out or limit some foods that I like but that are not good for me.	1	4	2	2	2
I eat at restaurants or fast-food places less often.	0	6	1	3	1
I substitute healthier foods for things that I used to eat.	0	4	4	3	0
I have modified my recipes when I cook.	0	9	2	0	0

The next three questions are about alcohol consumption. A drink of alcohol is defined as: One, 12 oz. can or bottle of beer; One, 4 ounce glass of wine; One, 12 oz. can or bottle of wine cooler; One mixed drink or cocktail; Or 1 shot of hard liquor.

On average, how many days per week do you drink alcohol?	1 patient reported drinking all 7 days 4 patients reported they sometimes drink 2 days a week 6 patients reported that they do not drink at all
On a typical day that you drink alcohol, how many drinks do you have?	1 patient reported 18 beers per day 3 patients reported 2 drinks 1 reported 1 drink per day when they consume alcohol
What is the largest number of drinks that you've had on any given day within the last month?	Only one patient answered higher than the above answer stating they have consumed up to 24 beers in one day in the last month

The results of the H-SCALE survey were used to tailor dietary education for each participating patient. Initial H-SCALE results from the patient survey revealed inconsistent pill taking, high sodium food intake, poor physical exercise, and high alcohol use. Education included decreased sodium intake, decreased alcohol intake, exercise importance, and food label reading. One local grocery store was selected and flags were placed around the store that reinforced some of the education that was taught during visits with the dietitian. The flags encouraged patients to choose foods found to be lower in sodium and helpful in lowering blood pressure.

Some of the participating patients were able to present for blood pressure monitoring and reinforcement at the halfway point, giving the opportunity to check in and provide additional education and motivation for patients to continue working towards improving their health. The remaining patients presented for initial readings, received their education, and presented at the end of the study for reevaluation of their blood pressures and weights. The hypertension educator called the patients for their blood pressure and weight readings. She sent notes to the healthcare provider for next steps, whether that be continuing as is, changing interventions, or requiring an appointment for follow-up with the healthcare provider. Revaluation of the H-SCALE revealed decreased sodium intake, decreased sugary beverages, more consistent pill-taking, increased physical activity and decreased alcohol intake.

Table 8

Medication Usage *How many of the past 7 days did you:*	Number of Days
Take your blood pressure pills?	11 patients reported 7 days
Take your blood pressure pills at the same time everyday?	9 patients reported 7 days 2 patients reported 6 days
Take the recommended number of blood pressure pills?	All 11 patients reported they did this all 7 days
Diet How many of the past 7 days did you:	Number of Days
Eat nuts or peanut butter?	6 patients reported 2 days 1 patient reported 1 day 4 patient reported 0 days
Eat pickles, olives, or other vegetables in brine?	8 patients reported 3 days 1 patient reported 2 days 1 patient reported 1 day 1 patient reported 0 days
Eat more than one serving of fruit (fresh, frozen, canned or fruit juice)?	2 patients reported 7 days 8 patients reported 6 days 1 patient reported 5 days
Eat apples, bananas, oranges, melon or raisins?	6 patients reported 5 days 5 patients reported 4 days
Eat whole grain breads, cereals, grits, oatmeal or brown rice?	5 patients reported 3 days 4 patients reported 2 days 2 patients reported 2 days
Physical Activity How many of the past 7 days did you:	Number of Days

Do at least 30 minutes total of physical activity?	2 patients reported 7 days 5 patients reported 6 days 4 patients reported 5 days 1 patient reported 0 days				
Do a specific exercise activity other than what you do around the house or as part of your work?	7 patients reported 5 days 3 patients reported 4 days 1 patient reported 0 days				
Engage in weightlifting or strength training	4 patients reported 4 days 5 patients reported 1 day 2 patients reported 0 days				
Weight management In order to lose weight or maintain my weight…	Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree
I am careful about what I eat.	0	0	1	8	2
I read food labels when I grocery shop.	0	1	0	2	8
I exercise in order to lose or maintain weight.	0	1	0	10	0
I have cut out drinking sugary sodas and sweet tea.	0	1	2	7	1
I eat smaller portions or eat fewer portions.	0	1	0	3	7
I have stopped buying or bringing unhealthy foods into my home.	0	1	3	6	1
I have cut out or limit some foods that I like but that are not good for me.	1	0	1	9	0
I eat at restaurants or fast-food places less often.	0	1	0	9	1

I substitute healthier foods for things that I used to eat.	0	1	1	7	2
I have modified my recipes when I cook.	0	3	2	6	0
The next three questions are about alcohol consumption. A drink of alcohol is defined as: One, 12 oz. can or bottle of beer; One, 4 ounce glass of wine; One, 12 oz. can or bottle of wine cooler; One mixed drink or cocktail; Or 1 shot of hard liquor.					
On average, how many days per week do you drink alcohol?	1 patient reported drinking all 7 days 2 patients reported they sometimes drink 2 days a week 8 patients reported that they do not drink at all				
On a typical day that you drink alcohol, how many drinks do you have?	1 patient reported 8 beers per day 2 patients reported 2 drinks				
What is the largest number of drinks that you've had on any given day within the last month?	Only one patient answered higher than the above answer stating they have consumed up to 18 beers in one day in the last month				

Summary

Results varied across the patient population based on self-motivation and compliance. The final blood pressure reading revealed considerable improvement post-interventions. Final weights varied from weight gain to no change, to considerable improvement post-interventions.

The patient's active participation in the interventions impacted change in both blood pressure and weight. Maintained logs were a visual aid in encouraging the patient's progress to remain motivated in the process. The Dietary, blood pressure, and weight log management enabled patients to remain active in the process to lower blood pressure and weight.

Table 8

Impact of Intervention on Blood Pressure Readings

Patients	Initial Blood Pressure	Final Blood Pressure	Change
Patient 1	179/67	155/60	-24/-7
Patient 2	145/87	124/77	-21/-10
Patient 3	175/79	149/79	-26/-0
Patient 4	168/90	146/82	-22/-8
Patient 5	154/84	132/85	-22/+1
Patient 6	140/90	114/72	-26/-18
Patient 7	147/92	133/82	-14/-10
Patient 8	150/100	115/82	-35/-18
Patient 9	146/90	145/83	-1/-7
Patient 10	152/76	137/77	-15/+1
Patient 11	150/88	127/85	-23/-3

Table 9

Impact of Intervention on Patient Weight

Patients	Initial Weight	Final Weight	Change
Patient 1	185	183.6	-1.4
Patient 2	187.6	192	+5.4
Patient 3	252	247	-5
Patient 4	218	210	-8
Patient 5	160	158.6	-1.4
Patient 6	226	225.3	-0.7
Patient 7	199	196	-3
Patient 8	175	169.6	-5.4
Patient 9	249	249	0
Patient 10	194	191.2	-2.4
Patient 11	356	348.7	-7.3

Interpretation

Many of the changes made surrounded dietary habits. Patient 8 reported high alcohol consumption consuming eighteen beers per day. By the end of the study, the patient decreased his intact to eight beers per day. The patient's blood pressure also had considerable improvement in his blood pressure and over 5-pound weight loss. Some of the patients were strict with their dietary changes while others made minor changes. The patients that made only minor changes were found to have less noticeable differences in their blood pressures and weights. Patient 9, for example, chose to only take his home blood pressure and consume more fresh foods. The patient's results revealed no weight loss but one point difference in his systolic blood pressure.

Limitations

Limitations are due to the pilot study only including a small patient population. Internal validity relies heavily on consistent and accurate blood pressure monitors and scales. In an effort to minimize this, the central scale was utilized, patients were encouraged to wear to exact same clothing each visit, and the same blood pressure monitor was used for all screenings. Before sending home blood pressure cuffs with the patients, they were calibrated to match the blood pressure monitor used in the clinic.

Conclusions

The study was useful in identifying processes to improve outcomes for patients. The SDoH screening aspect of this study will continue, starting with expanding the screenings to the patients of two providers until it is utilized across the board to maintain compliance for the grant, Primary Care Maternal Child Health. Rattermann, et al. (2021), noted if social determinants are addressed in the early years, the population is more likely to have better health outcomes in the

long term. The two pediatric providers will be adding the SDoH screenings to their populations, giving the clinic the opportunity to address needs in the patient's early years.

The potential to spread into other contexts of care is great. Other diagnoses such as diabetes and hyperlipidemia can be targeted and improved in the same manner that was utilized for hypertension and obesity. The next steps include continuing with H-SCALE screening for hypertensive patients, dietary and exercise education, and improving home blood pressure monitoring capabilities. Due to the results of this pilot study, additional staff members will begin SHoH screenings, expanding to additional providers and pediatric providers. From the screenings and additional diagnoses, interventions can be targeted to address SDoH to improve patient outcomes.

Funding

Funding for certain aspects of the study was provided through grants. The BCCP program provided automatic blood pressure cuffs for patients to take home to keep logs of their daily blood pressure readings. The SDoH screening is being implemented as part of a requirement under the Primary Care Maternal Child Health (MCH) grant through the State of New Hampshire. No other costs were incurred during the study process.

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Appendices

Appendix A

PRAPARE: Protocol for Responding to and Assessing Patient Assets, Risks, and Experiences

PRAPARE®: Protocol for Responding to and Assessing Patient Assets, Risks, and Experiences Paper Version of PRAPARE® for Implementation as of September 2, 2016

Personal Characteristics

1. Are you Hispanic or Latino?

	Yes		No		I choose not to answer this question.

2. Which race(s) are you? Check all that apply

	Asian		Native Hawaiian
	Pacific Islander		Black/African American
	White		American Indian/Alaskan Native
	Other (please write):		
	I choose not to answer this question.		

3. At any point in the past 2 years, has season or migrant farm work been your or your family's main source of income?

	Yes		No		I choose not to answer this question

4. arg ed from the armed forces of

Have you been disch the United States?

	Yes		No		I choose not to answer this question

5. What language are you most comfortable speaking?

Family & Home

6. How many family members, including yourself, do you currently live with? _____

	I choose not to answer this question

7. What is your housing situation today?

	I have housing
	I do not have housing (staying with others, in a hotel, in a shelter, living outside on the street, on a beach, in a car, or in a park)
	I choose not to answer this question

8. Are you worried about losing your housing?

	Yes		No		I choose not to answer this question

9. What address do you live at?
Street: _____
City, State, Zip code: _____

Money & Resources

10. What is the highest level of school that you have finished?

	Less than high school degree		High school diploma or GED
	More than high school		I choose not to answer this question

11. What is your current work situation?

	Unemployed		Part-time or temporary work		Full-time work
	Otherwise unemployed but not seeking work (ex: student, retired, disabled, unpaid primary care giver) Please write:				
	I choose not to answer this question				

12. What is your main insurance?

	None/uninsured		Medicaid
	CHIP Medicaid		Medicare
	Other public insurance (not CHIP)		Other Public Insurance (CHIP)
	Private Insurance		

13. During the past year, what was the total combined income for you and the family members you live with? This information will help us determine if you are eligible for any benefits.

_____

	I choose not to answer this question

14. In the past year, have you or any family members you live with been **unable** to get any of the following when it was **really needed**? Check all that apply.

17. Stress is when someone feels tense, nervous, anxious, or can't sleep at night because their mind is troubled. How stressed are you?

Yes	No	Food	Yes	No	Clothing
Yes	No	Utilities	Yes	No	Child Care
Yes	No	Medicine or Any Health Care (Medical, Dental, Mental Health, Vision)			
Yes	No	Phone	Yes	No	Other (please write):
	I choose not to answer this question				

15. Has lack of transportation kept you from medical appointments, meetings, work, or from getting things needed for daily living? Check all that apply.

	Yes, it has kept me from medical appointments or
	Yes, it has kept me from non- medical meetings, appointments, work, or from getting things that I need
	No
	I choose not to answer this question

Social and Emotional Health

16. How often do you see or talk to people that you care about and feel close to? (For example: talking to friends on the phone, visiting friends or family, going to church or club meetings)

	Less than once a		1 or 2 times a week
	3 to 5 times a week		5 or more times a
	I choose not to answer this question		

	Not at all		A little bit
	Somewhat		Quite a bit
	Very much		I choose not to answer this question

Optional Additional Questions

18. In the past year, have you spent more than 2 nights in a row in a jail, prison, detention center, or juvenile correctional facility?

	Yes		No		I choose not to answer this

19. Are you a refugee?

	Yes		No		I choose not to answer this

20. Do you feel physically and emotionally safe where you currently live?

	Yes		No		Unsure
	I choose not to answer this question				

21. In the past year, have you been afraid of your partner or ex-partner?

	Yes		No		Unsure
	I have not had a partner in the past year				
	I choose not to answer this question				

Appendix B

Permission to Utilize Copy of Written H-Scale

Jan Warren-Findlow <jwarren1@uncc.edu>

Thu 5/5/2022 7:53 AM

To: Stephanie Penney

Hi Stephanie,

Thank you for your interest in using the H-SCALE in your project. I'm happy to chat about it's development at any time. You have my permission to use the scale in your project data collection. Please let me know if you also need the Spanish version.

The self-administered form of the H-SCALE is attached as a word document along with the scoring instructions. NOTE: This version is slightly different than what was published in the original JNMA article. Please read the attached scoring instructions carefully so that you understand how to score the scales and their limitations.

If you are planning on collecting the H-SCALE data in an online survey such as with a software tool like Qualtrics or Survey Monkey, that is permitted. However, permission does not include embedding the survey questions and the scoring into any kind of mobile app or mHealth application that you may be developing without my prior permission in writing. The H-SCALE is my intellectual property and is copyrighted. The H-SCALE is not available for commercial use.

The *Journal of the National Medical Association* article (Warren-Findlow & Seymour) best describes the original development of the H-SCALE. The *Journal of Clinical Hypertension* article describes the original subscales and their correlations with blood pressure. The article published in the *Journal of Nutrition Education and Behavior* describes the revised diet scale (the DASH-Q) and its validation. The most recent publication (2019) in the *Western Journal of Nursing Research* presents the current subscales and their correlations with blood pressure as well as adherence to the subscales and their association with control of blood pressure. Please cite the appropriate publication (with the correct spelling of my name "Warren-Findlow"). I understand that in some areas of the world this is not common practice to reference other works, but this is a condition of your being able to use the H-SCALE. Please indicate that you have the researcher's permission to use the scale.

Keep me informed of how your work progresses. I am always interested in hearing what others are doing in relation to hypertension self-care and blood pressure.
Please confirm that you understand and agree to the above restrictions in an email response. Let me know if you have any questions.

Sincerely, Jan Warren-Findlow

Jan Warren-Findlow, PhD @DrJanWF
Pronouns: she/her/herself
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Jan's Zoom Room

Appendix C

Hypertension Self-Care Activity Level Effects

The following questions ask about your hypertension (high blood pressure) self-care activities during the past 7 days. For each question, circle the number of days that you performed that activity.	
Medication Usage ***How many of the past 7 days did you:***	**Number of Days**
1. Take your blood pressure pills?	0 1 2 3 4 5 6 7 ☐ I have not been prescribed blood pressure pills.
2. Take your blood pressure pills at the same time everyday?	0 1 2 3 4 5 6 7 ☐ I have not been prescribed blood pressure pills.
3. Take the recommended number of blood pressure pills?	0 1 2 3 4 5 6 7 ☐ I have not been prescribed blood pressure pills.
Diet ***How many of the past 7 days did you:***	**Number of Days**
4. Eat nuts or peanut butter?	0 1 2 3 4 5 6 7 ☐ I am allergic to nuts.
5. Eat beans, peas, or lentils?	0 1 2 3 4 5 6 7
6. Eat eggs?	0 1 2 3 4 5 6 7
7. Eat pickles, olives, or other vegetables in brine?	0 1 2 3 4 5 6 7
8. Eat five or more servings of fruits and vegetables?	0 1 2 3 4 5 6 7
9. Eat more than one serving of fruit (fresh, frozen, canned or fruit juice)?	0 1 2 3 4 5 6 7

10. Eat more than one serving of vegetables?	0	1	2	3	4	5	6	7
Diet How many of the past 7 days did you:	Number of Days							
11. Drink milk (in a glass, with cereal, or in coffee, tea or cocoa)?	0	1	2	3	4	5	6	7
12. Eat broccoli, collard greens, spinach, potatoes, squash or sweet potatoes?	0	1	2	3	4	5	6	7
13. Eat apples, bananas, oranges, melon or raisins?	0	1	2	3	4	5	6	7
14. Eat whole grain breads, cereals, grits, oatmeal or brown rice?	0	1	2	3	4	5	6	7
Physical Activity How many of the past 7 days did you:	Number of Days							
15. Do at least 30 minutes total of physical activity?	0	1	2	3	4	5	6	7
16. Do a specific exercise activity (such as swimming, walking, or biking) other than what you do around the house or as part of your work?	0	1	2	3	4	5	6	7
17. Engage in weight lifting or strength training (other than what you do around the house or as part of your work)?	0	1	2	3	4	5	6	7
18. Do any repeated heavy lifting or pushing/pulling of heavy items either for your job or around the house or garden?	0	1	2	3	4	5	6	7
Smoking How many of the past 7 days did you:	Number of Days							
19. Smoke a cigarette, e-cigarette, vape, cigar or hookah, even just one puff?	0	1	2	3	4	5	6	7

20. Stay in a room or ride in an enclosed vehicle while someone was smoking?	0 1 2 3 4 5 6 7

The following questions ask about your efforts to manage your weight during the last 30 days. If you were sick during the past month, please think back to the previous month that you were not sick. Circle the one answer that best describes what you do to lose weight or maintain your weight.

Weight management ***In order to lose weight or maintain my weight…***	**Strongly Disagree**	Disagree	Not Sure	Agree	Strongly Agree
21. I am careful about what I eat.	1	2	3	4	5
22. I read food labels when I grocery shop.	1	2	3	4	5
23. I exercise in order to lose or maintain weight.	1	2	3	4	5
24. I have cut out drinking sugary sodas and sweet tea.	1	2	3	4	5
25. I eat smaller portions or eat fewer portions.	1	2	3	4	5
26. I have stopped buying or bringing unhealthy foods into my home.	1	2	3	4	5
27. I have cut out or limit some foods that I like but that are not good for me.	1	2	3	4	5
28. I eat at restaurants or fast-food places less often.	1	2	3	4	5

29. I substitute healthier foods for things that I used to eat.	1	2	3	4	5
30. I have modified my recipes when I cook.	1	2	3	4	5

The next three questions are about alcohol consumption. A drink of alcohol is defined as:

One, 12 oz. can or bottle of beer;
One, 4 ounce glass of wine;
One, 12 oz. can or bottle of wine cooler;
One mixed drink or cocktail;
Or 1 shot of hard liquor.

31. On average, how many days per week do you drink alcohol?	0 1 2 3 4 5 6 7
32. On a typical day that you drink alcohol, how many drinks do you have?	0 write in # _____
33. What is the largest number of drinks that you've had on any given day within the last month?	0 write in # _____

Appendix D

Hypertension Self-Care Activity Level Effect Scoring Instructions per Dr. Jan Warren-Findlow

"Notes on using the H-SCALE – June 28, 2018

As of June 2014, two studies have been conducted and published examining the validity and reliability of all 6 subscales of the H-SCALE (Warren-Findlow & Seymour, 2011; WarrenFindlow, et al., 2013). Researchers using the H-SCALE should be advised that the full scale has currently only been administered in English to Americans in the Southern United States. Both samples were predominantly Black/African Americans. We strongly encourage you to conduct reliability statistics at a minimum with your study sample.

The most recent study using the full H-SCALE assessed the concurrent validity of the HSCALE subscales against clinical blood pressures in a primary care setting (Warren-Findlow et al., 2013). That sample included both Blacks and Whites. This study also tested the H-SCALE in a self-administered questionnaire format. In the original study (Warren-Findlow & Seymour, 2011), participants were interviewed face-to-face. We are providing you with the self-administered format of the H-SCALE.

More recently, we have translated the H-SCALE into Spanish using a rigorous forward and backward translation process. Pilot data from 124 Hispanic, primary care patients has been collected; findings are published in *Ethnicity and Health*. Please contact me if you are interested in using the Spanish H-SCALE.

Updates to the H-SCALE regarding the diet subscale

Prior to 1/1/15, the diet subscale contained 12 items. This subscale had poor internal consistency based on Cronbach's alphas and better adherence was positively associated with

higher blood pressure (Warren-Findlow, Dulin, et al., 2013); the exact opposite of what we hypothesized. In 2013-2014, we conducted a two-phase study to better understand issues with the diet subscale, make necessary revisions to items, and to conduct further psychometric tests.

The new subscale, which we term "DASH-Q" for DASH-Quality contains 11 items which are solely focused on respondents' frequency of food consumption (Warren-Findlow, Reeve & Racine, *epub* 2016 – *Journal of Nutrition Education & Behavior*). The foods specified are less about high sodium foods and are more based on the nutritional balance outlined in the DASH diet: emphasis on eating fruits and vegetables; consuming alternate forms of protein as opposed to meat-based protein; and increasing consumption of foods with potassium, fiber and whole grains. The attached measure includes the DASH-Q with associated scoring instructions.

The DASH-Q is a more robust self-report measure of diet quality than the previous diet scale embedded in the H-SCALE. Further, because it focuses on specific foods and food sources, it is also easier to translate. We urge H-SCALE users to field this new measure in place of the previous one in all future studies.

Using the H-SCALE

Please reference the relevant articles for the scale and/or subscale in any published articles, presentations or theses/dissertations when using the H-SCALE or the DASH-Q. You must also include a statement indicating that you have the permission of the scale developer (Dr. Jan Warren-Findlow) to use this scale. The primary description of the scale and its development is in the *Journal of the National Medical Association* by Warren-Findlow and Seymour (2011). Correlations between subscale scores and systolic and diastolic blood pressure are reported in the

Journal of Clinical Hypertension. The DASH-Q is available in the *Journal of Nutrition Education & Behavior.* Individuals using the self-efficacy to manage hypertension measures should cite the *Journal of Community Health* article.

Scoring the H-SCALE

The H-SCALE contains items related to six, hypertension self-care activities recommended by the JNC7: taking medication, following a low-salt diet, engaging in physical activity, avoiding tobacco smoke, using strategies to maintain or lose weight, and reducing alcohol consumption. Each of these subscales is scored and then cutpoints are applied to determine the individual's adherence to the activity.

Medication (3 items) – To calculate medication adherence, add the responses for items 1-3 (range 0-21). Participants who score a 21 are considered adherent. Other measures of medication adherence use 80% adherence as the cut point as opposed to 100%. **Note:** some respondents may not have been prescribed anti-hypertensive medications.

DASH-Q (11 items; items 4-14) – These items assess intake of healthy foods associated with the nutritional composition of the DASH diet. Item #7 ("Eat pickles, olives, or other vegetables in brine?") should be reverse coded. Responses for all items are then summed. The range should be 0 to 77. Scores of 32 and below are considered low diet quality; scores between 33 and 51 are medium diet quality; and scores of 52 or greater should be considered adherent. For researchers outside the US, these items will need additional effort to determine the culturally relevant foods. We recommend allowing for 1-2 missing items per respondent. For samples with missing items that exceed 10%, researchers may opt to lower the cut points by 1 point.

Physical Activity (2 items; 15 and 16) – Responses are summed (range 0-14). Participants who score an 8 or better are considered adherent to physical activity recommendations; all others

are non-adherent. This designation was chosen to ensure that participants report some combination of both physical activity and exercise to be considered adherent. There are 2 additional items related to isometric or strength training; these are currently being piloted. No scoring instructions are currently available, but these items should reflect the US Surgeon General's recommendations to do strength training at least 2 days a week.

Smoking (2 items; 19 and 20) – Responses are summed (range 0 to 14). Respondents who score zero would be considered adherent.

Weight Management (10 items; 21-30) – These ten items assess activities undertaken to manage weight through dietary practices such as reducing portion size and making food substitutions as well as exercising to lose weight. Items assessed agreement with weight management activities during the past 30 days. Response categories range from strongly disagree (1) to strongly agree (5). Sum the responses to calculate the score with a range from 10-50. Participants who reported that they agreed or strongly agreed with all 10 items (score ≥ 40) are considered to be adherent to good weight management practices.

Alcohol (3 items; 31-33) - Alcohol intake is assessed using an existing measure, the 3item, National Institute on Alcohol Abuse and Alcoholism (NIAAA) Quantity and Frequency Questionnaire. Originally, adherence was deemed to be alcohol abstinent. The scale was validated using Southern African Americans who were very religious and had a correspondingly high prevalence of alcohol abstinence. Participants who reported not drinking any alcohol in the last 7 days (item #31), or who indicated that they usually did not drink at all, were considered adherent. *Currently, we recommend using one of two methods. For a continuous variable, multiply item #31 by item #32 which would indicate the total number of alcoholic drinks consumed per week* (range from zero to unknown; Warren-Findlow et al., 2013. This form is

useful if you are interested in doing a dose-response analysis of alcohol consumption or trying to determine the prevalence of binge drinking. To determine adherence in the form of a dichotomous variable, we recommend scoring men and women differently. According to JNC7 guidelines, adherence to moderate alcohol consumption among men is considered ≤ 2 drinks/day for men (scores of 14 or less) and ≤ 1 drink/day for women (scores of 7 or less). Categorize the continuous form of the variable into adherent/non-adherent based on the above gender guidelines (14 or less is adherent for men and 7 or less is adherent for women). Our most recent research indicates that these adherences cut points are significantly correlated with systolic and diastolic blood pressure".