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IMPROVING NUTRITION IN OVERWEIGHT AND OBESE ADULTS WITH PHYSICAL
DISABILITIES

by

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A Capstone

Submitted to the University of North Dakota

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for the degree of

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This capstone titled “Improving Nutrition Habits in Overweight and Obese Adults with Physical Disabilities”, is submitted by Michelle Ullery in partial fulfillment of the requirements for the Degree of Doctor of Nursing Practice from the University of North Dakota, has been read by the Faculty Advisory Committee under whom the work has been done and is hereby approved.

Chris Harsell, Chairperson

Date

Maridee Shogren, Committee Member

Date

This capstone is being submitted by the appointed advisory committee as having met all of the requirements of the University of North Dakota and is hereby approved.

Gayle Roux
Dean, College of Nursing and Professional Discipline

Date

PERMISSION

Title Improving Nutrition in Overweight and Obese Adults with Physical Disabilities

Department Nursing

Degree Doctor of Nursing Practice

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Michelle Ullery

July 22nd, 2015

Abstract

This capstone explored whether nutrition habits in overweight and obese adults with physical disabilities improved with the integration of a registered dietitian (RD) intervention into the health care home model of primary care. Data included pre- and post-24 hour diet recalls, demographic survey, and an end of study interview. Improvement in nutrition habits were seen in 100% of subjects as evidenced by decreased caloric intake, decrease in grams of total fat, decrease in grams of saturated fat, decrease in grams of sugar, decrease in milligrams of sodium, decrease in milligrams of cholesterol, increase in total cups of fruits, and/or increase in total cups of vegetables. Although these findings were not statistically significant, the results are clinically relevant. When subjects were asked if they had met or made progress towards their nutrition goal, 100% answered affirmatively. Incorporation of RD intervention into the health care home model of care improves nutrition habits in overweight and obese adults with physical disabilities.

Introduction

Problem Statement

Obesity is an epidemic in the United States (US). One-third of the U.S. adult population is obese and the national cost of obese adults is approximately \$147 billion per year (Leachman Slawson, Fitzgerald, & Morgan, 2013). Being overweight or obese is associated with the development of multiple chronic conditions such as type II diabetes, strokes, cancers, and metabolic syndrome (Froehlich-Grobe, Jaehoon, & Washburn, 2013).

People with physical disabilities who are obese are at an even higher risk of developing chronic health conditions than the general obese population due to increase in body fat and decrease lean muscle mass (Froehlich-Grobe et al., 2013). As people with disabilities gain weight, they develop more limitations in mobility and increased disability (Altman & Bernstein, 2008). In addition to physical health, obesity also affects the mental health of people with disabilities, especially as they age. Sirtori et al. (2012) found more severe disability and older age correlated with lower quality of life in obese patients with disabilities. The far-reaching impact of obesity on individuals with disabilities is evident; it is important to consider current recommendations to address it. In Minnesota, the rate of obesity in people with disabilities is more than 10% higher than adults without disabilities, 34% vs 23.2% respectively (CDC, 2011).

The 2013 American Heart Association (AHA)/American College of Cardiology (ACC) Guidelines for Management of Overweight and Obesity in Adults recommend collection of height, weight, and calculation of body mass index (BMI) at annual visits or more frequently (Jensen et al., 2013). Annual preventative visits performed in primary care are the ideal setting for obesity screening. Once a patient has been diagnosed as obese, the United States Preventative Service Task Force (USPSTF) (2012) recommends a comprehensive approach to guide interventions through addressing behavioral management, diet and physical activity, barriers to

change, self-monitoring, and maintaining lifestyle changes. Both recommendations by the AHA/ACC and USPSTF are a starting point, however additional guidance from research is needed to implement successful obesity interventions in the clinical setting.

While the USPSTF (2012) currently recommends that primary care providers should screen for, diagnose, and work with patients to create a plan of care to address obesity, there are several barriers related to this. These include lack of training in nutrition counseling and limited time during clinic visits to provide nutrition counseling for weight loss. Optimally (and especially with an at risk population such as adults with disabilities), additional resources beyond primary care providers visits would be included to create a successful intervention to treat obesity in adults with disabilities. Registered Dietitians (RD) are among the “most qualified professional to offer nutrition counseling” (Academy of Nutrition and Dietetics, 2014); thus, it is essential to integrate the expertise of RDs to guide obesity interventions in primary care - especially in the context of a health care home setting. A health care home is a coordinated approach to primary care to improve the health of people with chronic health conditions and disabilities (Minnesota Department of Health, 2015).

Literature Review

A literature review was performed in order to synthesize existing evidence about weight loss interventions in people with physical disabilities as well as best practices for incorporating a dietitian into primary care visits.

Literature was gathered from PubMed and CINHALL electronic databases. Mesh terms searched included “primary health care” [Mesh] AND “obesity” [Mesh] resulting in 833 results; key word search results included varying combinations of “nutritionist” AND “primary care” AND “weight loss”. Search terms used included “disabled persons”, “physical disability”,

“disability”, “functional mobility”, “impaired mobility”, “nutrition”, “obesity”, “over-weight” “adult”, “weight-loss”, “primary care health”, “medical home”, “health care home”, “patient care team”, and “patient-centered care”. To generate more research disease specific terms were used to describe common conditions that result in long-term physical disability including “spinal cord injury”, “stroke”, “amputation”, “cerebral palsy”, “multiple sclerosis”, “arthritis”, “spina bifida”, “diabetes”, and “arthritis”. The search was further limited to articles published within the last five years, study participants 18 years of age and older, people with physical disability or diagnoses resulting in impaired mobility, and a nutrition component in the intervention.

After a review of the evidence, four themes emerged including: RDs should be a part of weight loss interventions in primary care; effective RD weight loss interventions includes more than nutrition counseling; long term, less intense support may be the most successful; and the impact of weight loss interventions should be measured for months after the intervention is complete.

Registered Dietitians

Seven studies surrounding weight loss interventions in the primary care setting were reviewed. Conclusions can be drawn that a variety of health care workers can provide nutrition counseling but the evidence is strongest for RDs to provide the nutrition education. Tsai, Wadden, Rogers, Day, Moore, and Islam (2010) trained certified medical assistant (CMA)s to do brief counseling with primary care patients in addition to their primary care provider visit; Yardley et al. (2014) used a combination of web-based intervention, basic nurse support, and regular nurse support; Jarl, Tolentino, James, Clark, and Ryan (2014) carried out group based patient education classes with the support of individual phone counseling; and Haas, Moore, Kaplan, and Lazorick (2012) evaluated a medical weight loss program administered by

physicians compared to outcomes from a weight loss clinic. Volger et al. (2013) and Wadden et al. (2011) used the same intervention for obesity treatment, comparing two different forms of lifestyle counseling administered by life coaches to that of usual care. Tol et al. (2014) explored RD nutrition counseling.

Three of the studies reported weight changes of study participants at twelve months (Tsai et al., 2010; Volger et al., 2013; and Yardley et al., 2014). When the weight changes are compared between studies a rough correlation emerges: the higher the education of the person administering the intervention the larger the weight loss. At 12 months Tsai et al.'s (2010) intervention group that received brief counseling from CMA resulted in 2.3 ± 0.9 kg weight loss ($2.6\% \pm 0.9\%$), at 12 months Volger et al. (2013) intervention group that received enhanced brief lifestyle counseling from life coaches resulted in 4.6 ± 0.7 kg, and at 12 months; Yardley et al's (2014) intervention group that received web-based intervention with basic nursing support resulted in an average weight loss of 4.31kg.

Tol et al. (2014) researched a RD in the primary care setting and found an average decrease in patient BMI 0.94 kg/m^2 after dietitian treatment, a statistically significant change. BMI is a different measurement than a measurement of weight loss in kilograms, as described in the preceding articles, thus it cannot be directly compared. Tol et al. (2014) was a large, prospective study however there was no control over the dietitian intervention. As a result the duration of the weight-loss intervention varied widely from zero to six months to greater than 1.5 years and the dietetic treatment varied. A leading strength of this study is that there were greater than 32 different dietitians treating over 8,000 participants indicating the consistency in effectiveness of weight-loss interventions administered by RDs.

Effective Weight Loss Intervention

Effective RD weight-loss intervention includes counseling beyond nutrition education. Literature supports the incorporation of a behavioral intervention and/or a lifestyle component with nutrition education.

When the intervention only included nutrition counseling there was no resulting weight loss. Al-Shookri, Khor, Chan, Loke, & Al-Maskari (2012) incorporated nutrition counseling based on practice guidelines and compared it to usual care; results indicated no statistically significant change in weight or BMI for either group. Similarly, Randolph, Edirisinghe, Masoni, Kappagoda, & Burton Freeman (2014) only incorporated dietary intervention and no significant differences in weight change were seen between their study groups.

Puhkala et al. (2014) and Kim, Cho, Kang, Choi & Parks (2012) incorporated an exercise component in addition to nutrition. Puhkala et al. (2014) focused on lifestyle counseling over 12 months with six, 60-minute face-to-face sessions followed by seven 30-minute telephone sessions but did not have a statistically significant change in anthropometric measurements after 24 months. Kim et al.'s (2012) intervention centered around five 30 to 40 minute one-on-one counseling sessions over twelve weeks focused on nutrition and exercise. Kim et al.'s (2012) intervention did have statistically significant results on weight, BMI, and body fat.

Leibbrandt, Kiefte-de Jong, Hongenlst, Snoek, & Weijs. (2010) focused on a behavioral component in their six RD interventions, utilizing an established PRO-active Interdisciplinary Self-Management (PRISMA) program. It is based in four psychological models of patient empowerment structured in two daily sessions of 3.5 hours over two weeks with optional individual follow-up care. Leibbrandt et al. (2010) results on weight loss were not statistically significant. Although Leibbrandt et al. (2010) concluded this is because most participants did not

choose follow-up care. An additional consideration is that their intervention did not include physical a lifestyle component.

Williams, Hollis, Collins, and Morgan (2014), Nakade et al. (2012), Perri et al. (2014), Miller (2010), and Anderson, Raymond Reynolds, Bush, Rinsky, and Washnock (2011) intervention all incorporated nutrition and lifestyle counseling, as well as a behavioral component. Williams et al. (2014) incorporated motivational interviewing techniques in both the 60-minute individual sessions with a RD and 60-minute individual sessions with an exercise physiologist. The study was successful in preventing weight gain or resulting in weight loss. Nakade et al. (2012) intervention used a behavior lifestyle approach, incorporating thirty minute counseling on individual lifestyle habits in addition to twenty minutes of group exercise at baseline, one, three, six, and nine months. Nakade et al. (2012) found statistically significant results in change in weight, BMI, body, fat, waist circumference, and visceral fat. Perri et al. (2014) counseled on low calorie diets, increases in physical activity, and behavioral modification training. Phase one included weekly sessions for 8, 16, or 24 weeks, while phase two focused on maintaining behavior change. Results indicated success even in the shorter, 8-session program. Miller (2010) incorporated a behavior therapy component of nutrition sessions, structured exercise, and meal replacements over six months. Statistically significant decrease in body mass, body composition, and percent body fat resulted. Lastly Anderson et al.'s (2011) intervention incorporated behavioral interventions with meal replacements and increases in physical activity in the intervention group. Significant weight loss was seen at 8, 16, and 24 weeks in the intervention group compared to the control group, who just received nutrition counseling. The five research studies that incorporated nutrition, lifestyle, and behavioral components were all

randomized, controlled trials. The theme of incorporating lifestyle counseling and behavior modification into nutrition education was carried into the dietitian's intervention.

Long Term, Less Intense Support

A common theme carried through the research is the need for long-term, less intense support to have sustained impact on weight-loss in people with physical disabilities (Reichard et al., 2014; Rimmer, Wang, Pellegrini, Lullo, & Gerber, 2013; Horner-Johnson, Drum, & Abdullah, 2011; Messier et al., 2013). The five studies were all high quality; randomized, controlled trials.

The authors varied in their definition of disability based on severity and underlying cause of disability. It is important to exercise caution in generalizing research findings in people with disabilities because of many variables affecting the individual subjects. Horner-Johnson et al. (2011) researched adults with a variety of self-reported types of disability including physical, sensory, cognitive/intellectual, and mental health. Over half of the subjects reported physical disability; however because the study included all forms of disability, it limits the ability to generalize the research to people with physical disabilities only. Reichard et al. (2014) studied people with self-reported mobility limitations and Rimmer et al. (2013) studied people with lower extremity disability; thus these two studies are a best match for the population of people with physical disabilities studied in this capstone. Rejeski et al. (2012) studied overweight and obese adults with diabetes and Messier et al. (2013) studied overweight and obese adults with osteoarthritis of the knee. The ability to generalize the results of these two studies is more limited because the study participants all had a common underlying disease.

The purpose between studies varied widely and as a result weight loss was an outcome that was measured and analyzed in four out of the five studies. Reichard et al. (2014) compared portion controlled-meals, the Stop Light Diet (SLDm diet) and education compared with the

usual care diet as recommended by the United States Department of Agriculture (USDA). Results found that portion controlled diet was more effective than usual care. In addition continuing education and monthly support meetings led to more weight loss.

The purpose of Rejeski et al. (2012) research was to determine if intentional weight loss would reduce morbidity and mortality from cardiovascular disease. Their intervention evaluated whether or not an intensive lifestyle intervention or support-and-education program for diabetics was more effective over four years. In the lifestyle-intervention group weight loss and improved fitness had significant effects on slowing the loss of mobility, weight loss to a greater degree. The length of this study indicates the need for long term intervention and support for patients.

Rimmer et al. (2013) used a unique, low-cost approach by studying three groups using telephone coaching over nine months. One group received physical activity, one received physical activity plus nutrition, and a third group served as a control. Interestingly, only the physical activity intervention group sustained a reduction in body weight and BMI. Although this was a small, homogenous sample of patients with lower extremity mobility limitations, this may indicate that face to face contact is necessary for nutrition counseling.

The purpose of the study by Horner-Johnson et al. (2011) is broad; nutrition was a sub score measured among other health behaviors including health responsibility, physical activity, stress management, interpersonal relationships, and spiritual growth. The length of the study was ten months, similar to Rimmer et al. (2013), and in both studies the intervention was more intense in the beginning and then provided sustained support on a monthly basis. To measure healthy behavior, the Health Promoting Lifestyle Profile II was used and found the nutrition score increased significantly over time. Unfortunately, no objective measures were taken so data

is not available to determine if it had an effect on weight for those participants that were overweight or obese.

Messier et al. (2013) compared the effect of diet-induced weight loss plus exercise, diet-induced weight loss alone, and exercise alone. The results of the clinical outcomes that were measured found that diet alone and diet and exercise resulted in significantly more weight loss than exercise alone. Both groups that included the diet intervention had less total fat mass and more lean mass compared to the exercise only group. This study supports that exercise and diet are both important components in treating weight loss. Diet alone has more effect than exercise alone. This study was continued for 18 months, like Horner-Johnson et al. (2011) and Rimmer et al. (2013), this study further supports the idea that sustainability of intervention is necessary to maintain weight loss in people with disabilities and disabling conditions.

Additionally studies reviewed earlier support that more intense and supportive interventions do not necessarily result in more weight loss (Volger et al., 2013; Yardley et al., 2014, Tsai et al., 2010; & Wadden et al., 2011). Yardley et al. (2014), where the web-based intervention with basic nurse support had a better outcome on weight loss as compared to a more intense web-based intervention with regular nursing support. In addition, Haas et al. (2012) found that the medical weight loss program administered by physicians in primary care was equally effective when compared to a more supportive program in a specialty weight loss clinic.

Measurement of Weight Loss Outcomes

In order to measure the sustained success of a weight loss program, the outcomes should be measured for months after the intervention is complete. Six studies conducted in primary care settings included weight as an objective measurement and all six had statistically significant results indicating all the interventions had a positive effect on weight loss. Jarl et al. (2014) only

measured outcomes pre and post-intervention over two months. The results of the two surveys Jarl et al. (2014) used to evaluate diet and lifestyle and measurement of BMI were statistically significant, yet the long-term effects of the intervention is unknown. Tsai et al. (2014) found that brief counseling by CMAs had a significant effect on weight loss as compared to usual care at the completion of the intervention at six months. However, follow-up data was collected at 12 months which found that the patients had regained the weight they lost.

In conclusion, there is extensive literature exploring weight loss interventions by a variety of professionals, using different interventions, in varied settings, with specific populations. After a review of the existing literature, there is evidence to support that RDs should be a part of a primary care intervention to treat overweight and obese adults. In addition, for optimal outcomes, nutrition intervention should extend beyond nutrition counseling and include behavior and/or a lifestyle component. These evidence base principles served as the foundation for the capstone.

Project Purpose

The purpose of this capstone was to determine whether or not nutrition habits improve in adults with physical disabilities after dietitian intervention in the context of a health care home setting. The overall goal of this project was to improve patient outcomes by improving nutrition habits among adults with physical disabilities who are overweight or obese. The goal was accomplished by incorporating dietitian services into the health care home model for adults with physical disabilities. Behavioral components were integrated into the capstone in the RD intervention and the support offered by the health care home team. The health care home team consisted of primary care providers and registered nurse care coordinators. This is addressed in detail later. The need for long-term, less intense interventions to treat obesity helped to formulate

the protocol of RD visits to occur on a monthly basis for three months. The data collection period of this capstone was limited to a three month period; however the weight loss intervention continues post data measurement.

The long-term goal was for adults with disabilities to reach a higher level of health and wellness. Possible secondary, long-term gains for adults with disabilities includes weight loss, lower rates of obesity, fewer chronic conditions, higher level of functioning, improvement in the quality of life, and fewer health care associated expenses. At an organizational level these data can be used to help support the need for organizations to invest in innovative primary care models such as the health care home model with inclusion of RD services. On a national level, these data can be used to inform system level solutions. The data may also create a case to expand public and private insurance coverage for dietitian visits or to help guide the development of a reimbursement system based on quality of care provided rather than the current fee-for-service. Ultimately, the implications of this capstone reach far beyond the subjects studied.

Project Outcomes

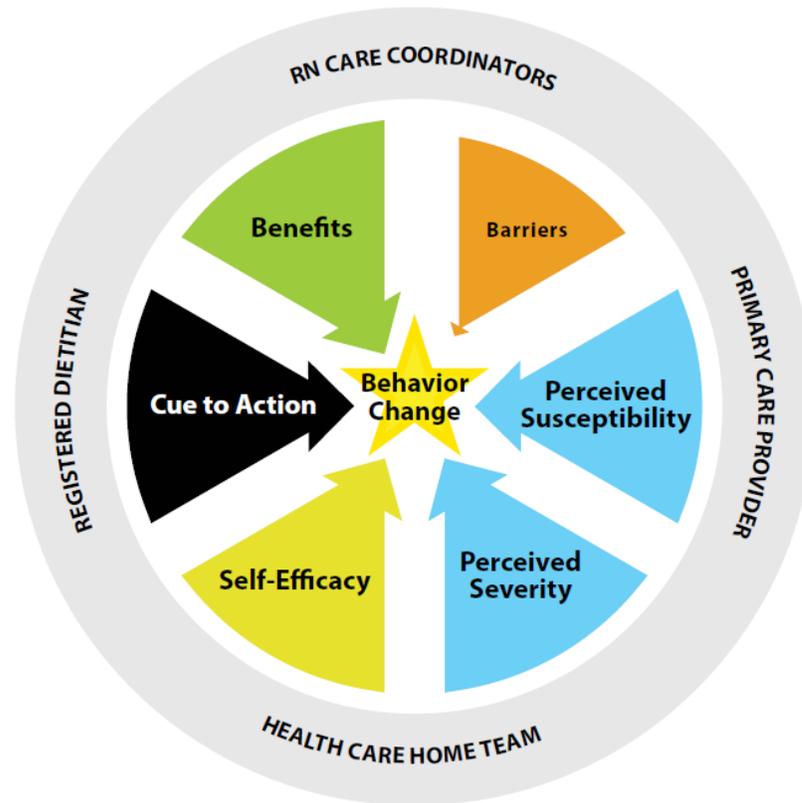
1. By May 20th, 2015, at least 90% of participants will have improved nutrition habits as evidenced by one of the following using an online 24-hour diet recall tool: decreased caloric intake, decrease in grams of total fat, decrease in grams of saturated fat, decrease in grams of sugar, decrease in milligrams of sodium, decrease in milligrams of cholesterol, increase in total cups of fruits, or increase in total cups of vegetables.
2. By May 20th, 2015, at least 90% of subjects will verbalize they have met or made progress towards their nutrition goals as evidenced by question #2 (yes/no) on the end of study interview.

Theoretical Foundation

The Healthcare Belief Model (HBM) was a grounding theoretical framework for the project, *Improving Nutrition Habits in People who are Overweight and Obese with Disabilities*. Butts and Rich (2011) describe the HBM as one of the most widely recognized theories of health behavior in the field. The six main constructs that form the theory explain people's decisions about whether to take action to prevent, screen for, and control an illness. According to the model, people are ready to act if the following six constructs have been met: perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cue to action, and self-efficacy (Butts & Rich, 2011).

During the capstone, the registered nurse care coordinators (RN CC) and primary care providers (PCP) assessed the patients' understanding of their susceptibility of obesity and the seriousness of the consequences associated with being obese. If there was a lack of understanding surrounding the obesity and consequences of obesity, the RN CCs and PCPs provided education. The RN CCs and PCPs assessed the patients' perception of the benefits versus the barriers to weight loss for obese and overweight patients. The cue to action was when the RN CC and PCPs offered a referral to the patient for dietitian services or the patient saw the recruitment flyers in the exam rooms. During the RD visits the patient set short and long term goals, contributing to the patient's self-efficacy. The coordinated approach to care in the clinic further supported the patient's self-efficacy because the RD was working in tandem with the patient's health care team. When all the constructs were met and maintained during the nutrition intervention of the HBM, the result was improvement in nutrition habits. Figure 1 provides a visual representation of the capstone and its relationship with the HBM.

Figure 1. Healthcare Belief Model and Improving Nutrition Habits in Overweight and Obese Adults with Physical Disabilities. Adapted from *Philosophies and Theories for Advanced Nursing Practice* (p. 250-252), by J. B. Butts & K.L. Rich, 2011, Massachusetts: Jones and Barlett Learning.



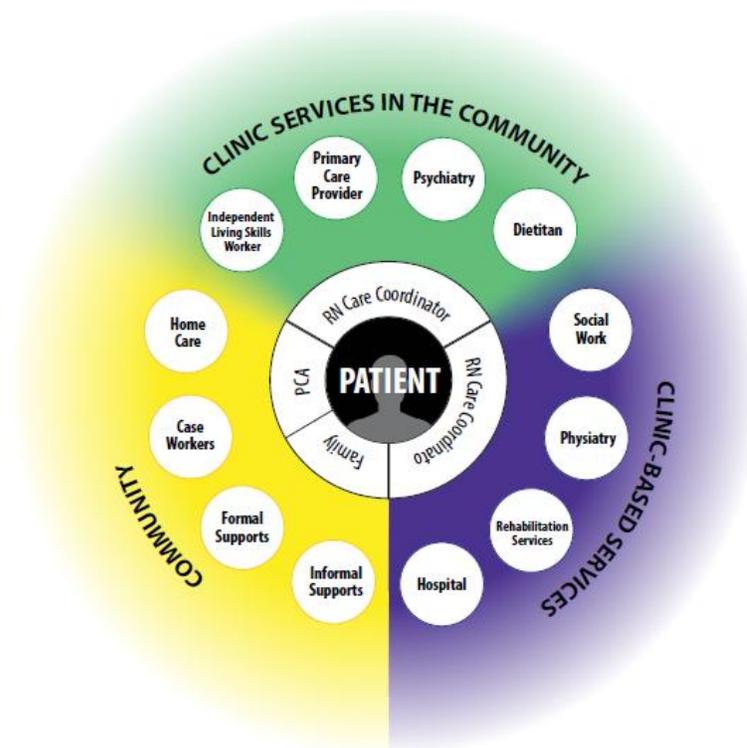
Design and Methods

Setting

The capstone was implemented as a pilot project at a small primary care clinic in a large metropolitan area in the Midwest region of the US. Approximately three hundred patients with disabilities and complex, chronic medical needs were served in the clinic. The clinic followed the health care home model of care using a coordinated, team approach to patient care. There were

four PCPs, one RD, and four RN CCs. The RD had a total of eight hours per week over three days to see primary care patients with any nutrition related concerns. This allowed for four, one-hour new patients and eight, half-hour revisits per week. The RDs role in primary care was new; she began to see patients in primary care three months prior to the start of capstone data collection period. Although the clinic was small, it was part of a larger service line within a large non-profit organization. The service line was focused on serving patients with medically complex rehabilitation needs. The service line and primary care clinic worked within a health care home model to offer clinic-based services and services in the community. Within this model, the clinic worked with both the patient and the patient's community supports to provide continuity of care (see Figure 2). The larger organization was dedicated to using innovative approaches to provide quality and cost-effective care to patients. Because of their mission and vision, this was an appropriate site to implement this capstone.

Figure 2. Health Care Home Model



Recruitment

After obtaining exempt status from the Institutional Review Boards (IRB) of the health care organization to which the clinic belonged and the University of North Dakota, convenience sampling was used to recruit patients for the capstone. Recruitment occurred in one of two ways: potential subjects were recruited by their RN CC or their PCP for weight loss and through recruitment flyers posted in the clinic exam rooms. RN CCs and PCPs had copies of the study information sheet that was given to patients who were referred to the RD for nutrition counseling.

Participants

Inclusion criteria for subjects' participation in the capstone were: an established patient at the primary care clinic, 18 years of age or older, RD referral for weight-loss, self-reported mobility impairment or physical disability, and self-reported BMI greater than 25. Exclusion criteria included: diagnoses of impaired cognition, evidence of cognitive impairment during initial contact with potential subject, or medical contraindication for weight loss.

Study Design, Measures, and Data Sources

The capstone was a pilot study using a one group pre- and post- test design. All data collected was obtained through survey and interview of subjects. Three different tools were used to collect data: the demographic information survey (Appendix A), the Automated Self-Administered 24-Hour Diet Recall (ASA24) collected pre- and post-RD intervention, and the end of study interview (Appendix B). Data were collected at four different points. The two points of data collection pre-RD intervention included the demographic information and pre-intervention ASA24. The two points of data collection post-RD intervention included the post-ASA24 and end of study interview.

The first survey tool was a demographic information survey. This was a structured survey of fourteen closed-ended questions related to demographic information and healthy habits such as exercise.

The second tool was the ASA24, this survey instrument was used twice. Data were collected once before the intervention, and a second time at the end of the intervention. The ASA24 survey asked a series of passes, questions, and probes modified from the United States Department of Agriculture's (USDA) Automated Multiple-Pass Method (AMPM) to collect subjects' twenty-four hour diet recall (National Cancer Institute, 2014). The ASA24 was a web-based survey that had the capability to analyze very specific data related to subjects' nutrition including nutrition estimates based on the Food and Nutrient Database for Dietary Studies (FNDDS) and food group estimates based on the USDA's My Pyramid Equivalent Database (MPED) (National Cancer Institute, 2014). This survey was used to collect data to address the primary goal of the study: to determine if there was improvement in subjects' nutrition habits. Analyses done on the ASA24 data included total kilocaloric intake, grams (g) of protein, g of total fat, g of carbohydrates, g of sugar, milligrams (mg) of sodium, mg of cholesterol, g of saturated fat, total cups of fruits (F_Total), and total cups of vegetables (V_Total). Individual subjects data were analyzed individually and as aggregate data.

The last data point was collected through direct interview using an open-ended end of study interview. The end of study interview was a series of seven open-ended questions and three quantitative yes/no questions that were asked of the subject via telephone interview. This survey information was clinically useful as themes were found among subjects' responses. The survey information provides insight into subjects' success, challenges, and satisfaction with the dietitian intervention within the context of the health care home setting. The qualitative information

helped to provide meaning to the quantitative data and propel the dietitian intervention forward after the capstone was complete (Terry, 2014).

Procedure for Implementation

If verbal consent was received from patients, the doctor of nursing practice (DNP) student initiated contact with the potential subject. If the subject chose not to release his/her information, then the recruitment flyer was given to the patient with basic information about the study and the DNP student's contact information so the subject could initiate contact with the student if they chose.

Initial contact between potential subjects and the DNP student occurred over the telephone. The student researcher determined patient eligibility for the study, reviewed the content of the patient information sheet, and collected demographic information from the participant. Subjects' participation in the surveys implied their consent. If the subject had internet access at home, log-in, and password were given to the ASA24. The first dietitian visit was scheduled after the subject was referred to the dietitian following standard clinic procedure. The subject was asked to enter their 24-hour diet recall into the system prior to their first dietitian visit. If the patient was unable to complete it prior to the visit, the ASA24 was completed at their first visit with the dietitian. The cost of the dietitian visits were covered by a grant funding the clinic and were provided to patients at no cost.

The dietitian met with the subjects for one-on-one nutrition counseling over four visits. The initial dietitian visit was one hour in length. During the first visit questions regarding the study information sheet and participation in the capstone were answered, the ASA24 was completed and/or reviewed with the patient, and a \$10 Cub Foods incentive gift card was given to the subject. The dietitian intervention during the first visit included a complete nutrition

assessment, establishment of long and short term goals, and identification of appropriate interventions. The two subsequent visits were scheduled one and two months after the initial visit, either in the clinic or via telemedicine. The dietitian intervention during the second and third visit focused on evaluating the effectiveness of the intervention and progress towards goals. The fourth (and final) dietitian visit was completed in the clinic. The ASA24 was completed online with the subject at the last visit. Changes and improvements in dietary habits were assessed, further long-term goals were identified, and the subjects were given additional education and resources. One week following the final dietitian visits the DNP student contacted the subject by telephone to complete the end of study interview, thank them for participation in the capstone, and mail out the second \$10 Cub Foods incentive gift card.

Data Analysis and Interpretation

Quantitative data was collected in numerical format using an Excel spreadsheet. Patients were assigned a study code and demographic data such as age, gender, and ethnicity were recorded. Descriptive statistics (means, range, standard deviations, and frequencies) were used to describe the population in terms of gender, age, ethnicity, primary disabling diagnosis, chronic medical conditions, use of assistance devices, and support received from others. In addition descriptive data were used to describe and assess the patients' perception of progress and their satisfaction with the dietitian intervention.

Data drawn from the ASA24 pre-test and post-test included kilocalories, g of protein, g of total fats, g of carbohydrates, g of sugar, mg of sodium, mg of cholesterol, g of saturated fat, total number of cup equivalent from the vegetable food group, and total number of cup equivalent from the fruit food group. Shapiro-Wilk significance statistic was used as a test for normalcy of quantitative ASA24 pre-test and post-test data. For normal data, paired sample *t*-tests were used

to compare pre-test and post-test data findings. For non-normal data Wilcoxon Signed Ranked test was used to compare pre-test and post-test data findings.

Demographic Data

Thirteen potential subjects were referred for the capstone; nine of these subjects qualified and agreed to participate. Of the five that did not qualify, one was referred to the dietitian for a reason other than weight-loss, one had a medical contraindication for weight loss, one was cognitively impaired, one decided not to pursue the dietitian referral due personal time constraints, and one was not a health care home patient. Of the nine patients who agreed to participate and initiated data collection, seven completed the intervention.

One subject was recruited through recruitment flyers, the remaining subjects were recruited through referral to the dietitian from the RN CC or PCP. Two subjects completed the pre-ASA24 prior to their dietitian visit; the remaining subjects completed it with the dietitian at the initial visit. All subjects completed the post-ASA24 with the dietitian at the final visit. Only one subject utilized telemedicine for the follow-up visits; the remaining subjects were followed up with face-to-face clinic visits.

Capstone subjects' demographic information was interpreted from the demographic information survey. Subjects' ages range 42 – 58 years of age, with a mean age of 52. Six participants were white and one was African American. Four capstone subjects were males and three were females. Body mass index (BMI) data were collected using self-report and it ranged from 25.7 to 41.8 ($M = 34.9$ with $SD = 6.26$). Based on BMI data, one subject was overweight; the remaining six subjects were obese.

The most common disabling diagnosis among participants was hemiparesis and impaired balance (see Figure 3). All subjects used an assistive device including power wheel chair, cane

and/or walker. The number of additional self-reported medical conditions affecting subjects ranged from one to ten, with a mean of five additional medical conditions. Figure 4 outlines the most commonly reported additional medical conditions affecting capstone subjects.

Figure 3. Subjects' Primary Disabling Diagnosis

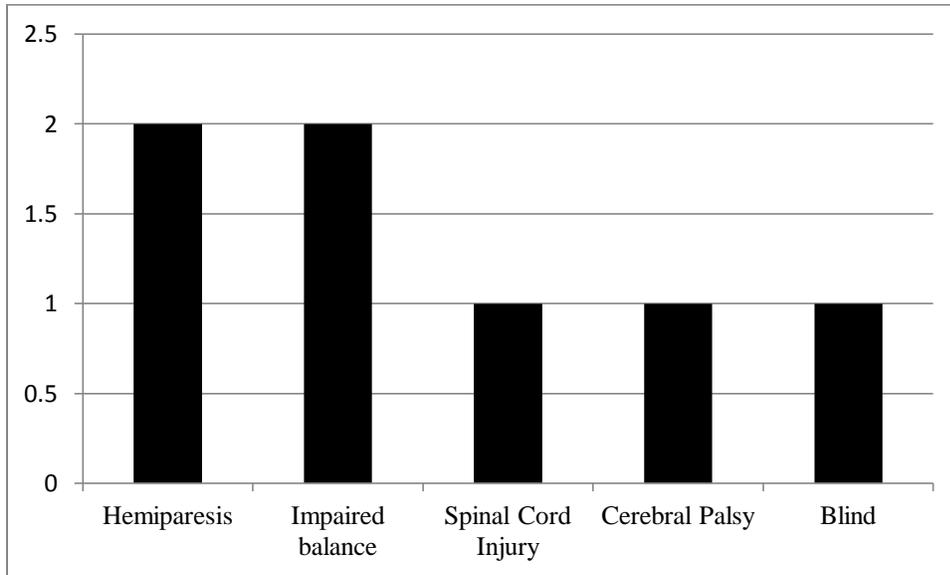
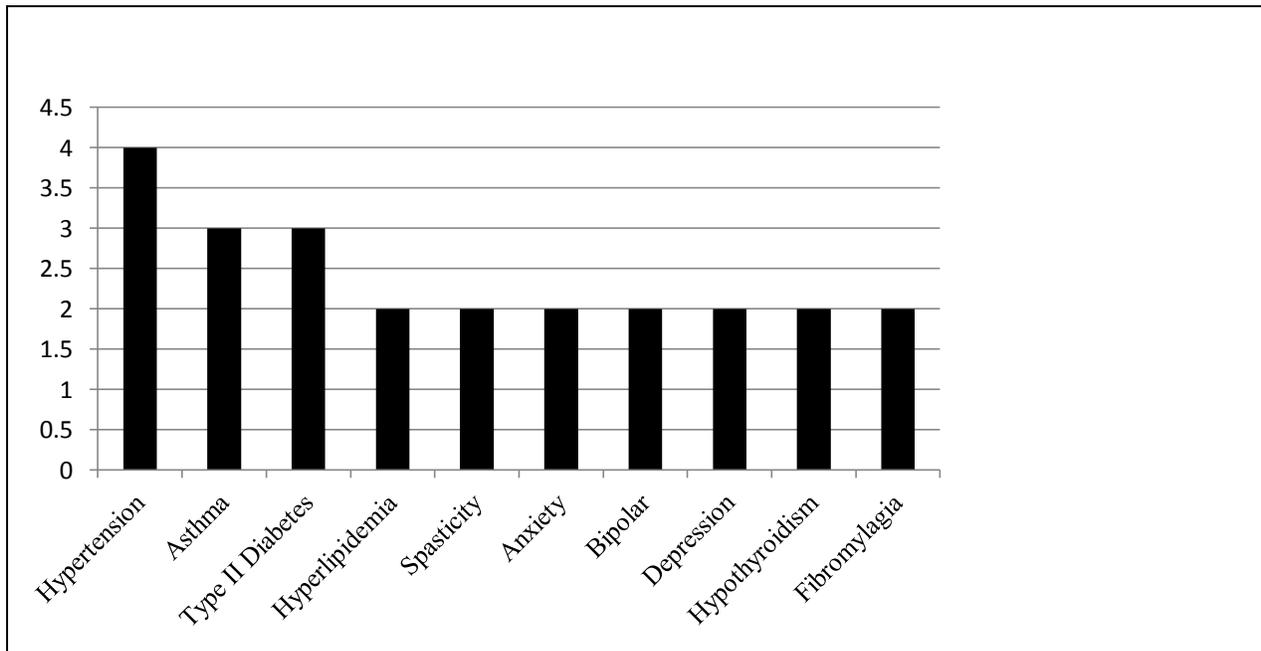


Figure 4. Additional Medical Conditions Affecting Subjects



Four subjects lived alone and the remaining subjects lived with one or more people. Only one subject was employed part-time and the remaining subjects were unemployed. The highest level of education level varied from graduating from high school to some college completed. Four of the subjects were involved in purchasing their food; the remaining three subjects were not involved in purchasing food. Similarly, four were involved in preparing their food; the remaining three subjects were not involved in preparing food. Most subjects (five) reported no exercise, one reported exercising one-two days per week and one reported exercising three or more days per week.

Results and Interpretation

Using the Shapiro-Wilk significance test for normality, the ten pre-test and post-test measurement data were analyzed for normality: kilocalories, protein, sodium, cholesterol, and saturated fats were non-significant ($p > .05$), indicating normality. Data for total fats, carbohydrates, sugar, total cups of vegetables (V_Total) and total cups of fruit total (F_Total) were significant ($p < .05$), indicating non-normality.

For the five measurements that met the test-of-normality (kilocalories, protein, sodium, cholesterol, and saturated fats), pre-test and post-test data were compared using the paired-samples t -test, and Cohen's d as an indication of effect size. All paired-sampled t -test were not statistically significant. Paired-sample t -test pre- and post-test means that support improvement in nutrition include an increase in protein, a decrease in sodium, and a decrease in saturated fat. Protein consumption increased by an average of $M = 9.714$ grams ($SD = 28.371$ grams; $ES = 0.342$), a medium effect size. Sodium consumption decreased by an average of $M = 33.286$ mg ($SD = 755.651$ mg; $ES =$

0.044). This was also a medium effect size. Saturated fat decreased by an average of $M = 0.571$ grams ($SD = 10.533$ grams; $ES = 0.054$), a small effect size.

Paired-sample t -test pre- and post-test means that supported a decline in nutrition habits included an increase in kilocalories and increase in cholesterol. Kilocalories consumed increased by an average of $M = 87.714$ kcal ($SD = 567.797$ kcal; $ES = 0.154$), a small effect size.

Cholesterol levels increased by an average of $M = 61.000$ mg ($SD = 175.558$ mg; $ES = 0.347$), a medium effect size.

Figures 5, 6 and 7 show the average consumption for nutrients measured pre-test compared to post-test for normal data.

Figure 5. Average Kilocalories (Kcal) Pre-Test and Post-Test

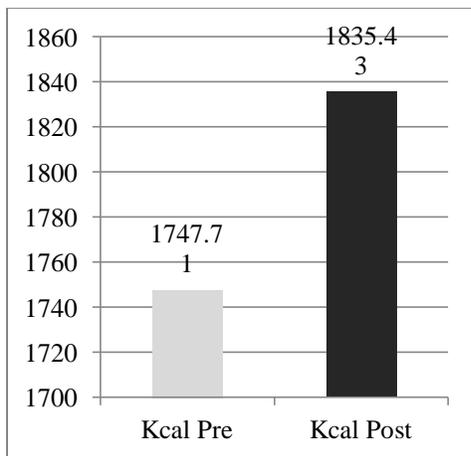


Figure 6. Average Milligrams of Sodium and Cholesterol Pre-Test and Post-Test

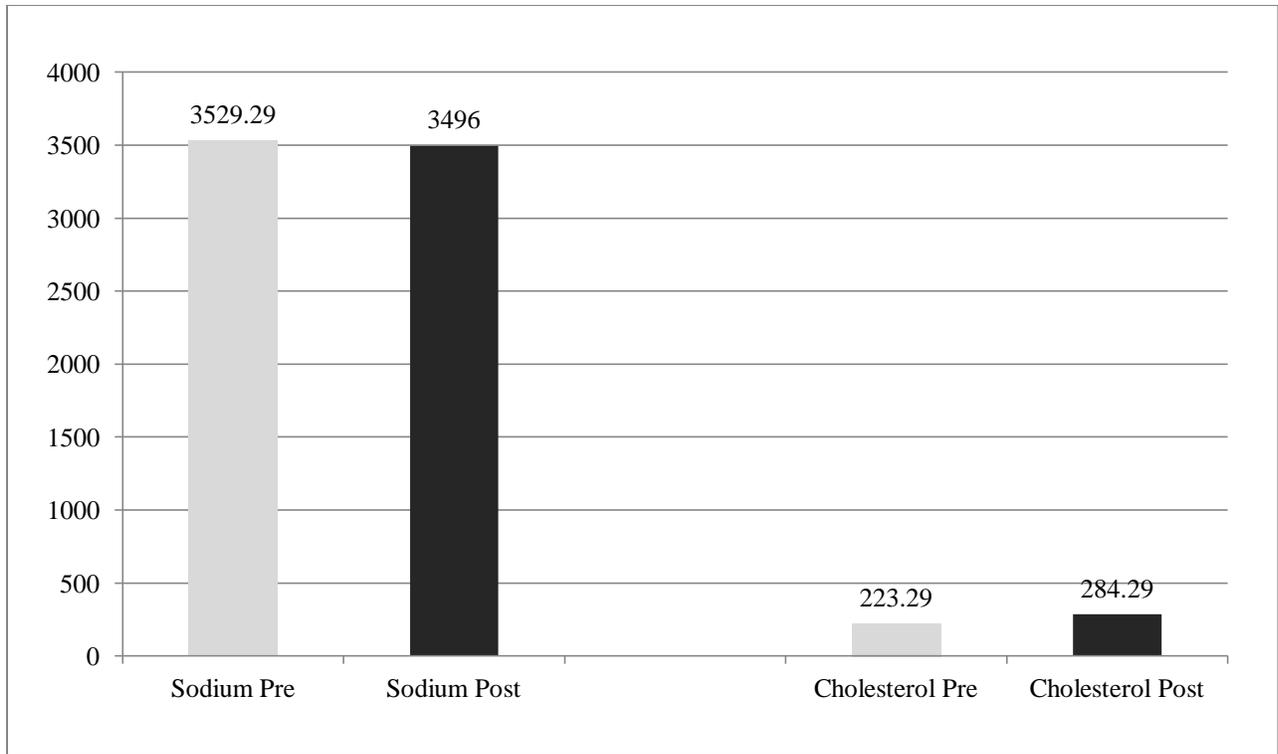
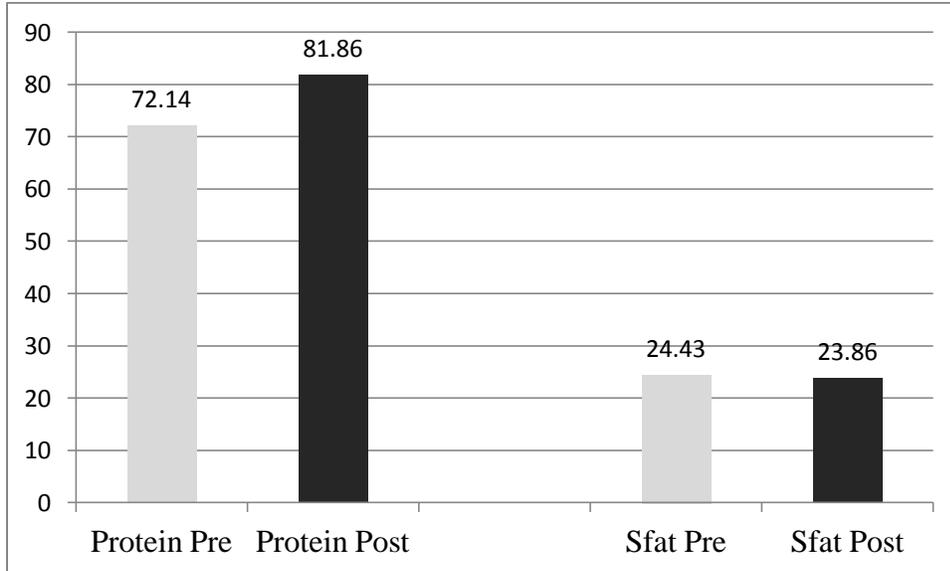


Figure 7. Average Grams of Protein and Saturated Fat (SFat) Pre-Test and Post-Test



The five measurements for which the data were not normal, the Wilcoxon Signed-Ranked test was used to compare pre-test and post-test data. Wilcoxon Signed-Ranked tests were not

statistically significant. Wilcoxon Signed-Ranked medians that supported improvement in nutrition included increase in consumption of vegetables (small effect size) and increased consumption of fruit (large effect size). Consumption of vegetables measured in cups increased, from pre-test ($Md = 0.86$) to post-test ($Md = 1.46$) ($T = 13.0$, $p = .866$, $r = -.494$, $ES = .064$). Consumption of vegetables measured in cups increased, from pre-test ($Md = 0.05$) to post-test ($Md = 1.86$) ($T = 23.5$, $p = .108$, $r = .452$, $ES = .608$). Figure 8 and 9 outline the comparison of vegetable consumption and fruit consumption pre to post intervention.

Figure 8. Median equivalent total cups of vegetables (V_Total) consumed pre- and post intervention

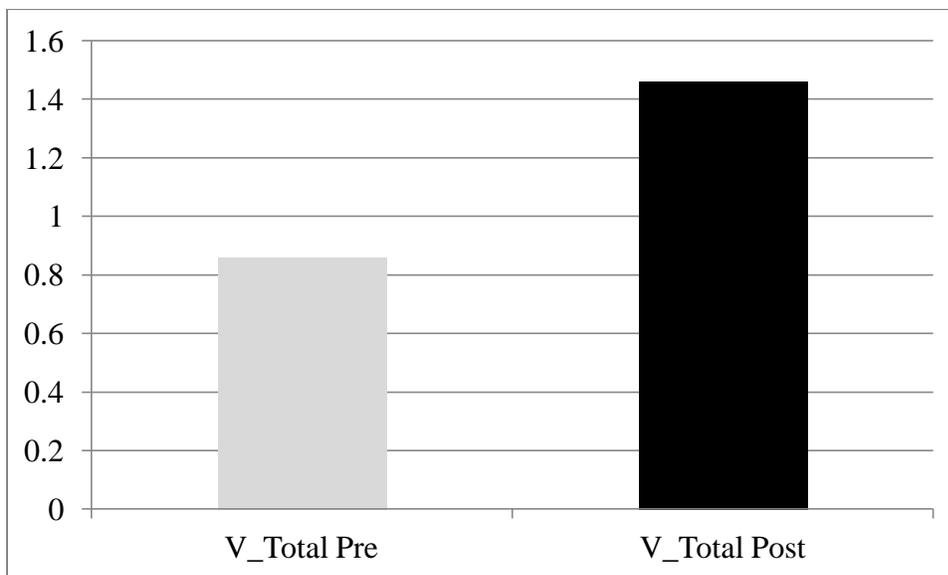
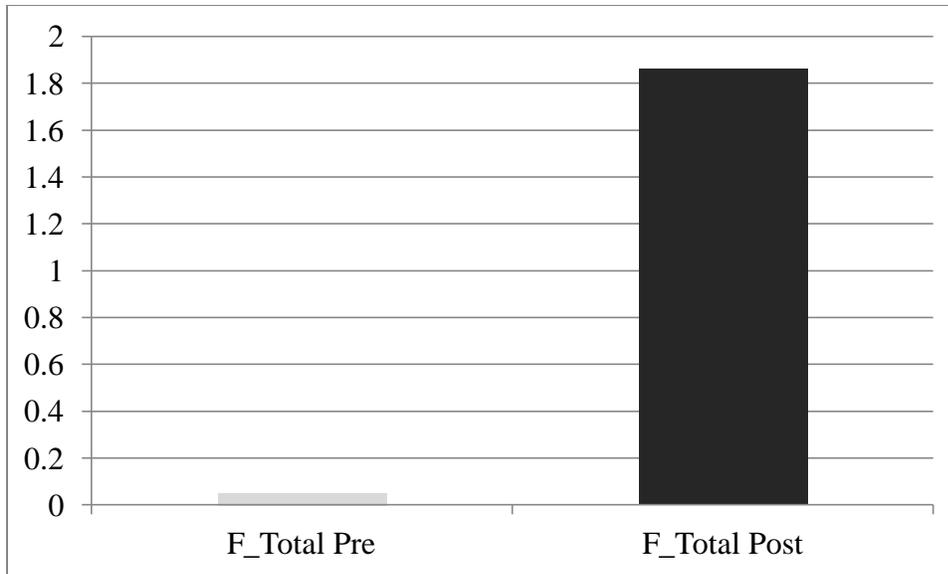


Figure 9. Median equivalent total cups of fruit (F_Total) consumed pre- and post intervention



Wilcoxon Signed-Ranked medians that supported decline in nutrition included increase in total fat, increase in carbohydrates, and increase in consumption of sugar. The effect size for each nutritional measurement that declined was small. For total fats, consumption levels increased, from pre-test ($Md = 76$ grams) to post-test ($Md = 83$ grams) ($T = 9.5$, $p = .446$, $r = .013$, $ES = .288$). Carbohydrate consumption levels increased from pre-test ($Md = 176$ grams) to post-test ($Md = 182$ grams) ($T = 18.0$, $p = .499$, $r = .232$, $ES = .256$). Sugar consumption levels increased from pre-test ($Md = 55.00$ grams) to post-test ($Md = 83.00$ grams) ($T = 18.0$, $p = .499$, $r = .103$, $ES = .256$). Cups of vegetables consumption levels decreased from pre-test ($Md = .86$) to post-test ($Md = 1.46$) ($T = 13.0$, $p = .866$, $r = -.494$, $ES = .064$).

Individual participants' pre-data were compared with post-data to determine whether there was an increase or decrease for each nutrient measured. From these data it is evident that all subjects had both an improvement and some areas of decline in the nutritional outcomes measured. The nutritional outcomes with the highest number of subjects reporting improvement from pre-data to post-data (five out of seven) were increase in protein, decrease in total fats, and

increase in cups of fruit. Decline in nutritional habit was most frequently seen with increase in cholesterol intake (five out of seven subjects). Table 1 is a summary of nutrition trends comparing the pre-intervention data to the post-intervention data.

Table 1. Summary of Pre-Intervention Nutrition Trends Compared to Post-Intervention

	#1	#2	#3	#4	#5	#6	#7
KCal	↓	↑	↑	↑	↓	↑	↓
Protein	↑	↑	↑	↓	↓	↑	↑
TFat	↓	↓	↑	↓	↓	↑	↓
Carb	↓	↑	↑	↑	↓	↓	↑
Sugar	↑	↑	↑	↑	↓	↓	↓
Sodium	↓	↓	↑	↓	↓	↑	↑

Chol	↑	↓	↑	↑	↑	↑	↓
SFat	↑	↓	↑	↓	↓	↑	↓
V_Total	↓	↑	↑	↓	↓	↓	↑
F_Total	↑	↑	↑	↑	↓	↑	↓

Key:
 ↑ = Increase from pre-data to post-data; ↓ = Decrease from pre-data to post-data
 Gray box = Improvement in nutrition habits; Black box = Decline in nutrition habits

Outcome Objectives

Two subjects decreased their caloric intake, five increased their grams of protein, three decreased their total fat, three decreased their grams of sugar, four decreased their milligrams of sodium, two decreased their milligrams of cholesterol intake, four decreased their grams of saturated fat, two increased their cups of vegetables, and four increased their cups of fruit. From these data it was concluded that capstone objective #1 was met, 100% percent of participants had a resulting decrease kilocalorie intake, decrease in grams of total fat, decrease in grams of saturated fat, decrease in grams of sugar, decrease in milligrams of sodium, decrease in milligrams of cholesterol, increase in total cups of fruits, and/or increase in total cups of vegetables.

The end of study survey included three objective questions related to the patients’ satisfaction with the nutrition intervention and their perception of progress towards their nutrition goals: question 2, “Do you feel like you met or made progress towards your nutrition goals?”; question 9, “Were you satisfied with the visits you had with the dietitian?”; and question 10, “Would you consider future visits with the dietitian for nutritional counseling?” One-hundred percent of subjects answered “yes” to all three questions. This indicates that capstone objective 2

was met, 100% of subjects will verbalized they have met or made progress towards their nutrition goals.

Discussion

The demographic information collected helped to describe the sample of subjects being studied. Subjects were middle-aged, males and females were represented, and there was some ethnic diversity despite a small same size. Being that six of seven subjects self-identified BMI categorized them as obese and one as over-weight; this supported a strong need for nutrition education. Aggregate pre- and post- findings for nutrients that support improvement in nutrition include an increase in protein, decrease in total fat, decrease in sodium, decrease in saturated fat, increase in vegetables, and increase in fruit. None of these findings were statistically significant due to the small samples size. However the data are clinically relevant because each measure of improvement in nutrition was seen in three to five of the seven subjects.

Information collected in the end of study interview indicated that the most frequent goal that subjects' were working towards was weight loss. This helped to support that patients' perceived weight loss as a benefit, an important concept for change in the HBM. Although five participants identified weight loss as a goal, only two participants decrease total kilocalories pre-intervention compared to post-intervention. Overall, there was a slight increase in mean kilocaloric intake among participants pre-intervention compared to post-intervention although it was not a statistically significant finding. Similarly there was a mean increase in pre- and post-cholesterol. This increase may be explained by the fact that patients identified more than one nutrition goal. Other nutrition goals identified by subjects focused on improving nutrition value of food choices rather than solely decreasing intake. This is supported by the median increase intake in cups of fruits and vegetables.

In addition to their primary disability, capstone subjects live with multiple co-morbid physical and mental conditions. This is supported in the end of study information collected in that some of their self-identified goals and dietary changes disease specific goals rather than obesity focused goals. For example one subject with type II diabetes reported a goal of improving blood sugar control and identified a successful dietary change as choosing lower carbohydrate, higher protein snacks. Furthermore multiple medical conditions may account for the varied results of the quantitative findings from the ASA24 pre-intervention and post-intervention data. The nutrition education likely supported management of their conditions in addition to weight loss. As a result changes in specific nutrients measured varied. The most frequent changes seen among subjects were decreasing milligrams of sodium, decreasing grams of saturated fat, and increasing total cups of fruit. The most common reported additional medical condition reported by subjects was hypertension (four subjects) thus it is fitting that four out of seven participants lowered their sodium intake.

Insight was gained regarding the barriers adults with physical disability faced. All but one subject was unemployed suggesting limited financial resources. This was further supported in the end of study interview when subjects identified barriers to nutrition included financial and transportation limitations. Additional barriers related to self-efficacy included changing habits and staying committed to the changes already made. Two of the seven subjects reported hospitalizations during the period of dietitian intervention as barriers to their success.

More than one goal was identified by all subjects on the end of study interview. One hundred percent of subjects felt that they made progress towards their nutrition goals, so it was evident that subjects interpreted progress towards nutrition goals as reaching beyond a specific nutrient intake. This is evidenced by improvements in other objective findings in the ASA24 as

reported in Table 1. It is also important to remember that patient self-efficacy in another key concept to behavior change in the HBM. Knowing that all subjects felt they made progress set them up for success in behavior change in the future.

Strengths and Limitations

Strengths

The strengths of this capstone included a high rate of subject completion of the dietitian intervention. Seven of nine subjects completed all points of data collection, resulting in a 77% completion rate. The low level of attrition can be attributed to the team approach to care taken home by the health care home model of care. The RN CCs and PCPs referred patients that were appropriate for the RD intervention. The dedication of the scheduler to reschedule all patients' who canceled or missed RD was another key to the success of the capstone.

Although the sample size was small, the primary disabling diagnoses identified by subjects' represented each of the most common primary diagnoses in the clinic population. Subjects' primary diagnoses included hemiparesis (one from stroke and one from traumatic brain injury), impaired balance, spinal cord injury, cerebral palsy, and blindness. Similarly the four most common primary diagnoses within the clinic include brain injury (28%), spinal cord injury (28%), stroke (15%), and cerebral palsy (9%) (N. Flinn, personal communication, July 21st, 2014).

Another strength of the capstone was collaboration among health care professionals. The RD was very willing to collaborate with the DNP student and all professionals in the health care home team. The effectiveness of collaboration was further supported in subjects' high satisfaction with the RD intervention and overwhelmingly positive feedback received during the end of study interview. In addition there was support and collaboration from key administrators

and the medical director for this capstone. Support was received by allocating time at meetings to propose and give project updates and to advertise for recruitment of subjects in the exam rooms.

An additional strength was the opportunity for the DNP student to speak directly with each subject and ask open-ended questions to collect additional feedback. Insightful feedback was obtained from subjects in the end of study interview. When subjects were asked how the RD intervention could be improved ideas included more available time slots for RD visits, longer duration for follow-up visits, more frequent visits, and continued contact with the dietitian after the initial four visits. Subjects also offered valuable feedback about how they would like to be supported after the dietitian visits were complete. Ideas included less frequent check-in visits with the RD, group nutrition education classes, and incorporation of home supports such as smartphone application. These ideas will help guide ongoing nutrition support for the RD intervention.

Limitations

Key limitations in the capstone include small sample size, data points measured, and the scope of the intervention. The sample size of seven was very small and there was no control group. Furthermore, it impacted the statistical significance of data findings and the ability to generalize findings to a larger population of adults with physical disabilities.

Only one RD was utilized in the capstone so the effectiveness of her nutrition counseling cannot be generalized to all RDs. Furthermore the RD has experience working with this unique population, adults with physical disabilities. The RD intervention had a structured nutrition counseling and behavioral component but care was still individualized based on patient needs. The RD intervention may have different results if a different RD was used.

Finally, all of the data collected were based on subjective report. Additional information on nutrition habits was collected with only one tool, a 24-hour diet recall. Although it is a validated tool for measuring nutrition habits, it relies on subject report and assumes their nutrition consumption in the previous 24 hours is similar to their average consumption. One patient who completed the pre-ASA24 at home had a decline in seven of the nutrients measured when compared to his post-ASA24. The RD commented that she did not believe his pre-ASA24 collected at home was accurate. In the future having the subject complete the ASA24 in the clinic with the RD may improve accuracy.

The scope of the capstone intervention was limited to the current health care home model and incorporation of RD services. As indicated in the literature review, nutrition counseling coupled with lifestyle changes results in the largest impact of obesity. The primary care clinic did not have an expert in exercise as a result this intervention did not have a lifestyle component.

Implications and Future Directions

There are many directions to continue moving this capstone forward in practice, research, and policy. On a practice level further analysis could be done using the ASA24 data already collected on the seven subjects. The data collected in the ASA24 analyzed many data points on micro and macro nutrient levels consumed by subjects. The RD's documentation and medical chart could be reviewed to determine if progress was made towards subjects' goals and medical needs. For example, it is recommended that patients with hyperlipidemia have no more than with 5-6% of their calories come from saturated fat (Eckel, 2014). For those subjects with hyperlipidemia, the ASA24 data could be further analyzed to determine if they met the recommended intake of saturated fat.

In terms of further research, the first direction to take this capstone is determining how to continue to support the nutrition habits of subjects and measure their progress. This will be shaped through collaboration with the RD and health care home team. The RD intervention within the health care home modeled interprofessional practice and the clinic seeks to continue to build on this model of care. Repeating the ASA24 at six months and twelve months post RD intervention will determine if nutrition habits are sustained, lost, or further improved. Additional data to collect long-term outcomes beyond nutrition habits on these subjects includes biometric data, development of chronic conditions, severity of disability, quality of life indicators, number of hospitalizations, and overall health care expenses.

People with physical disabilities have complex medical needs and more research is needed to guide best practice in the management of obesity in this vulnerable population. Other future directions for research include incorporating physical activity into the RD intervention. Collaboration can be expanded further with the fitness center on-site at the primary care clinic in conjunction with physical therapists, occupational therapists, and exercise physiologists. Future research directions also include inclusion of patients who are cognitively impaired and primary prevention of obesity in a newly disabled person.

On a systems level this capstone has the potential to impact payer reimbursement for RD services for patients who are overweight or obese. This is a novel project because it looks at the impact of incorporating RD services in the health care home model of care for on overweight or obese adults with physical disabilities. The data presented in this capstone and future data collected on long-term outcomes will continue to measure the impact of the RD as part of a health care home team. If the data analysis and interpretation continue to be positive, this will be valuable information to use in advocating for reimbursement of RD services. If the data

outcomes are not favorable then this will drive further research on what is an effective intervention to treat adults with disabilities who are overweight or obese.

Conclusion

This capstone was inspired after providing care for adults with physical disabilities, observing weight gain despite interventions, and subsequently seeing a decline in their overall health status. This clinical observation drove the underlying goal to improve patient outcomes by improving nutrition habits among adults with physical disabilities who are overweight or obese. The number of patients' touched in this capstone was few, however the results are encouraging. Of the seven subjects who completed the RD intervention 100% had measurable improvement in their nutrition habits. Furthermore, 100% of patients identified that they met or made progress towards their nutrition goal at the end of the RD intervention. These results indicate the objectives for the pilot study were met but more importantly the intervention resulted in a positive impact on patient care. With ongoing refinement of the RD intervention and continued measurement of outcomes the results of this capstone will reach far beyond the seven subjects who participated. It has the potential to guide best practice to improve nutrition habits in the vulnerable population studied. Most importantly, interprofessional care that models collaboration between PCPs, RN CCs, and RDs can only improve the quality of life for patients' with physical disabilities who are overweight or obese.

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Appendices

Appendix A Demographic Information

Study Code # _____

Capstone Project: Weight Loss in Overweight and Obese Adults with Physical Disabilities
Demographic Information

1. Age (write-in):
2. Race (choose one): White, Hispanic or Latino, Black or African American, Native American or American Indian, Asian/Pacific Island, 2+ races, other
3. Hispanic (choose one): yes, no
4. Gender (choose one): male, female, transgender
5. Self-report BMI (write-in):
6. Assistive device(s) (choose all that apply): PWC, manual WC, walker, braces, cane, other: _____
7. Self-report primary disabling condition (write-in):
8. Self-report secondary medical conditions (write-in):
9. Living arrangement (choose one): alone, with 1 other, with > 1 other
10. Employment (choose one): PT, FT, not employed
11. Education (choose one): no schooling completed, to 8th grad, some high school, high school graduate or equivalent, some college, trade/technical/vocational training, associate degree, bachelors degree, masters degree, professional degree, doctorate degree
12. Food buyer (choose one): self, family/friend, paid assistant
13. Food prep (choose one): self, family/friend, paid assistant
14. Average frequency of exercise (choose one): zero days per week, 1-2 days per week, 3 or more days per week

Appendix B
End of Study Interview

Study Code # _____

Capstone Project: Weight Loss in Overweight and Obese Adults with Physical Disabilities
End of Study Interview

1. What nutrition goals did you set with the dietitian?
2. Do you feel like you met or made progress towards your nutrition goals?
3. What changes have you made in your nutrition habits in the last 3 months?
4. What helped in your success working towards your improving your nutrition?
5. What barriers or challenges did you face working towards your improving your nutrition?
6. How well was the dietitian services integrated into the health care home/primary care team?
7. What changes could be made to improve the use of dietitian services in the health care home/primary care team?
8. How would you like your health care home/primary care team to continue to be support you working towards your long term nutrition goals now that dietitian visits are complete?
9. Were you satisfied with the visits you had with the dietitian?
10. Would you consider future visits with the dietitian for nutritional counseling?