THE EFFECTIVENESS OF MOTIVATIONAL, CONTENT-FOCUSED SECURE MESSAGES ON VETERAN OUTCOMES IN THE CHOOSE TO MOVE! WEIGHT MANAGEMENT PROGRAM

By Jamie L. Olsen RD, CD, CDE

Submitted in partial fulfillment of the requirements
for the degree
Master of Science in Dietetics

MOUNT MARY COLLEGE

December 2015

Approved by: _____
Tara LaRowe, PhD, RD
Director, Graduate Program in Dietetics

Approved by: _____
Megan Baumler, PhD, RD

THE EFFECTIVENESS OF MOTIVATIONAL, CONTENT-FOCUSED SECURE MESSAGES ON VETERAN OUTCOMES IN THE CHOOSE TO MOVE! WEIGHT MANAGEMENT PROGRAM

December, 2015

ABSTRACT

***Introduction*:** Web-based patient portals are engaging patients in the management of their health care, improving patient satisfaction, increasing communication between providers and patients, and helping manage chronic diseases including diabetes, hypertension and cardiovascular disease.

Objective: To determine if motivational, content-focused secure messages(SM) improve weight loss-related outcomes including weight loss, body fat, BMI, and waist circumference in Veterans enrolled in the Choose to MOVE! Weight Management program at the Milwaukee, Green Bay and Appleton, Wisconsin Veteran Affairs Clinics.

Methods: Eight motivational-content focused SMs were sent over a six month period to 22 participants who were identified in the Computerized Patient Record System (CPRS) as My Health*e*Vet (MHV) users. Using the read receipt feature, messages were tracked to determine if the messages were read or not. Paired t-tests were used to analyze percent changes in weight, BMI, waist circumference, body fat, glucose, Hemoglobin A1c, total cholesterol, LDL, HDL, triglycerides, and ALT levels between the intervention and the control group. Mean $\pm$ standard deviations and *p* values were calculated for each percent change. A post-class questionnaire was given to all participants to self-assess their use of SMs and to obtain demographic information.

Results: The mean percent weight change and absolute weight change was not significantly different in the intervention group compared to the control group (-4.33% vs -4.15%, p=.91). Similarly, the absolute and percent changes in BMI, body fat and waist circumference were also not significantly different between the intervention group and the control group. However, the mean percent total cholesterol change among the participants in the intervention group that read the SMs compared to the control group (-10.68% vs. -6.98%, respectively, p=.60) and the mean percent triglyceride change among the participants in the intervention group who read the SMs compared to the control group (-16.18% vs. -9.17% respectively, p= .64) suggested that better outcomes were achieved in the intervention group among those who read the SMs, although not statistically significant.

Conclusions: SMs did not produce better weight loss-related outcomes including weight loss, BMI, body fat or waist circumference. A slight improvement in total cholesterol and triglyceride levels, however, was observed.

ACKNOWLEDGEMENTS

I would like to thank my husband, Greg, and my three children, Taylor, Emily and Evan, for all of the sacrifices that they made over the past three years while I spent many hours sitting at the kitchen table completing homework for the dietetics graduate program. Without their patience and understanding, I would not have been able to achieve my lifelong dream of earning my Master's Degree.

I would also like to thank Mount Mary University, all of the instructors in the dietetic graduate program and, especially, Dr. Tara LaRowe. Tara's support and encouragement throughout the past year have helped me grow both personally and professionally. She has been instrumental in increasing my ability to critically analyze research articles. Tara also provided reassurances when I encountered several setbacks waiting for my research project to be approved by the VA and in the end, when the results of my research project were limited.

Finally, I would like to thank Kristen Bertram, Registered Dietitian and MOVE! Coordinator at the Milwaukee VA Medical Center. The knowledge and guidance that Kristen provided me while I developed my research project was invaluable. I appreciate Kristen's support and assistance which she provided to me throughout my entire research project.

TABLE OF CONTENTS

Chapter

LIST OF TABLES

CHAPTER 1: INTRODUCTION

Rising health care costs have driven the industry to explore ways to deliver their services in a more efficient and effective manner. According to Forbes Magazine, the United States (US) spent almost three trillion dollars on health care costs alone in 2012 (Forbes Magazine, 2012). The obesity epidemic has been a main contributor to the current health care crisis. In 2008 alone, more than $147 billion was spent on direct and indirect costs associated with obesity (Center for Disease Control and Prevention, 2014). The implementation of technology, including electronic medical records (EMR) and web-based patient portals, has revolutionized the health care industry by allowing coordination of care, measuring quality and reducing medical errors. Web-based portals are seen as a potential means to managing chronic diseases, including obesity. Research shows that patient portals have engaged patients in the management of their health care, improved patient satisfaction, increased communication between providers and patients, and have helped manage some chronic diseases including diabetes, hypertension and cardiovascular disease (Zhou, Kanter, Wang, Garrido 2010, Bredfeldt, Compton-Phillips, Snyder 2011, Shimada et al. 2013, and Greenwood et al. 2014), but not obesity.

On Veteran's Day, in 2003, the Department of Veterans Affairs (VA) rolled out their web-based patient portal known as My Health*e*Vet. Veterans who enrolled and were authenticated in My Health*e*Vet gained secure access to information in their VA patient health care records. Some of the My Health*e*Vet features include secure messaging (SM), refilling prescriptions, scheduling future appointments, and reviewing laboratory values (Veteran Health Administration, 2014).

In 2013, there were 8.92 million Veterans receiving health care through the Veterans Health Administration (VHA) (Veterans Health Administration, 2014). According to the Office of Research & Development, more than 70% of Veterans who receive VA care are classified as either overweight or obese -- with a body mass index (BMI) greater than 25 (Office of Research & Development, 2015) which is higher than the general US population. Today, more than one-third or 79 million adults in the US are considered obese (Centers for Disease Control and Prevention, 2014). Furthermore, obesity is the leading cause of preventable deaths and is often associated with Type 2 diabetes, stroke, heart disease, and high blood pressure (Centers for Disease Control and Prevention, 2014).

In 2006, the VA launched its weight management program known as MOVE! to help Veterans lose weight, keep it off and improve their overall health (Veterans Health Administration, 2014). Today, the MOVE! program is the largest clinically-based weight management program throughout the US (Veterans Health Administration, 2014).

This research project aims to incorporate motivational, content-focused SMs into the Choose to MOVE! Weight Management Programs at the Milwaukee VA Medical Center and two of its surrounding Community Based Outpatient Clinics (CBOCs) in Appleton and Green Bay, Wisconsin. The Choose to MOVE! Weight Management Program is one of several MOVE! programs offered within the Milwaukee VA and its surrounding outpatient clinics. Weight loss-related outcomes including weight loss, BMI, body fat, and waist circumference will be used to measure the effectiveness of motivational, content-focused SMs. The overall purpose of this research project is to determine if motivational, content-focused SMs will improve weight loss-related

outcomes in the Choose to MOVE! Weight Management program by reducing obesity and managing co-morbid conditions related to obesity including diabetes, hyperlipidemia and fatty liver disease within the Veteran population.

Rationale

Currently, there is limited research that explores the effectiveness of SMs and weight loss-related outcomes. Several studies, however, have compared the effects of SMs and health-related outcomes such as Hemoglobin A1c, LDL-cholesterol, and blood pressure levels (Zhou, Kanter, Wang, Garrido 2010, Bredfeldt, Compton-Phillips, Snyder 2011, Shimada et al. 2013, and Greenwood et al. 2014). These studies have shown promising results following SM implementation.

The implementation of SM into weight management programs may also result in similar, positive outcomes such as weight loss and improvements in BMI, body fat, and waist circumference. Additionally, increased patient satisfaction, improved relationships between Veterans and their weight-management team, increased motivational levels, and decreased attrition rates may result with the implementation of SMs into the Choose to MOVE! Weight Management Program as well. Although the MOVE! program has been successfully helping Veterans lose weight and keep it off; the addition of motivational, content-focused SMs may help to achieve even better results. Ultimately, the goal is to improve the weight loss-related outcomes of the Choose to MOVE! Weight Management Program by reducing obesity within the Veteran population and by helping to manage co-morbidities including Type 2 diabetes, hyperlipidemia and fatty liver disease.

Significance

Almost three quarters of the Veteran population is considered overweight or obese and one quarter has diabetes (Veterans Health Administration, 2014). The implementation of SM has the potential to improve weight loss-related outcomes, help manage chronic diseases and reduce health care costs in a large overweight and obese population group. Furthermore, almost 98% of the approximate 150 VHA Medical Centers across the country offer a MOVE! program (Weiner, Haynes-Maslow, Kahwati, Kinsinger, Campbell, 2012). The results of this research project would be shared with the MOVE! Coordinators at each of the VA Medical Centers offering a MOVE! program. The implementation of SM would potentially become a new practice in MOVE! programs throughout the VA, if the results of the project are found to be significant.

Research Question

This research project aims to answer the following question: What is the effectiveness of motivational, content-focused SM among Veteran's participating in the Choose to MOVE! Weight Management Program on their weight loss goals, body fat, BMI, and waist circumference?

Sub-problem

Obesity is a leading risk factor for the development of Type 2 diabetes, hyperlipidemia and fatty liver disease. Weight loss programs have the potential to help people lose weight, improve their lipid and blood sugar levels, as well as reduce their risk for developing cardiovascular disease, Type 2 diabetes, and fatty liver disease. The Choose to MOVE! Weight Management Program requires each participant to have labs

drawn prior to attending the first group session. The following labs are obtained: total cholesterol (TC), low density lipoproteins (LDL), high density lipoproteins (HDL), triglycerides (TG), alanine aminotransferase (ALT), glucose, and Hemoglobin A1c levels. These labs are also drawn on each participant who completes all of the sessions of the Choose to MOVE! Weight Management Program.

This research project also has aims at answering the following question related to the sub-problems, hyperlipidemia, fatty liver disease and Type 2 diabetes: What is the effectiveness of motivational, content-focused SM in the Choose to Move! Weight Management Program on Veteran outcomes including lipids, ALTs, blood glucose levels and Hemoglobin A1c levels?

Limitations

A few limitations have been identified for this research project. First, the exact number of Veterans that will complete the Choose MOVE! Weight Management program cannot be predicted. Typically, each Choose to MOVE! class enrolls between 15 and18 Veterans. However, it is common for approximately 50% of the enrolled Veterans to drop out and not complete the entire twelve session program. Research power and statistical significance may not be achieved if a sample size of at least 100 Veterans is not attained. Next, although My Health*e*Vet is available to all Veterans, not all Veterans opt to enroll or become authenticated. The number of Veterans who participate in the Choose to MOVE! Weight Management Program and are also My Health*e*Vet users will vary. In addition, those Veterans who are enrolled in My Health*e*Vet may not be authenticated, meaning they do not have the ability to send or receive SMs. Next,

Veterans who complete the Choose to MOVE! Weight Management Program and are My Health*e*Vet users will be asked to complete a self-reported questionnaire. The questionnaire will ask Veterans about the effectiveness of SM, the motivational benefits of receiving SMs, and the frequency in which they read the SMs. It is well known that self-reported information is subject to participant bias. Most information that is self-reported is either an over-estimation or an under-estimation of what actually occurred. Finally, this research project will not be able to determine the exact causality between SM and weight loss-related outcomes. There are several confounding variables that will affect overall weight loss outcomes. Although the same information is provided at each location, the classes will be taught by different MOVE! instructors. In addition, individual motivational levels will determine whether someone will be able to make dietary changes or not. Someone who is highly self-motivated may be able to lose weight regardless of receiving SMs. Furthermore, some Veterans may have physical limitations which can have an effect on their ability to exercise, and therefore, may not be able to lose weight at the rate of someone who is able to exercise, despite being highly motivated.

Delimitations

This research project will only include Veterans, a narrow segment of the US population as a whole. Although there are several VA MOVE! classes available, the Choose to MOVE! Weight Management group is the only weight management class in which SMs will be sent to My Health*e*Vet users. Next, current literature that does not use SM as an intervention will not be included in this research study. Finally, with the exception of noting whether a Veteran is a My Health*e*Vet user, all outcome data that had

been previously collected in the Choose to MOVE! Weight Management Program will continue to be collected using standard operating procedures.

Assumptions

This research project assumes that Veterans who receive motivational, content-focused SMs will have better weight loss-related outcomes including weight loss, body fat, waist circumference, BMI, lipids, ALTs, glucose, and Hemoglobin A1c levels when compared to those who did not receive SMs in the Choose to MOVE! Weight Management Program. An additional assumption is that Veterans who have chosen to participate in the MOVE! program will be more motivated, in general, to lose weight.

LIST OF TERMS

Alanine Aminotransferase (ALT): An enzyme normally present in liver and heart cells that is released into the bloodstream when the liver or heart is damaged. The blood ALT levels are elevated with liver damage (for example, from viral hepatitis) or with an insult to the heart (for example, from a heart attack). Some medications can also raise ALT levels. (MedicineNet.com, 2015).

American Diabetes Association: An organization that was developed with a mission to prevent and cure diabetes and to improve the lives of all people affected by diabetes. (Diabetes.org, 2015).

American Recovery and Reinvestment Act of 2009: It is commonly referred to as the Stimulus or The Recovery Act. It was a stimulus package enacted by the 111th United States Congress in February 2009 and signed into law on February 17, 2009, by President Barack Obama. (Wikipedia.org, 2015).
Attrition: A reduction or decrease in numbers, size and strength. (Dictionary.com, 2015).

Auto Aggressive Integrated Moving Average Models: Is a generalization of an autoregressive moving average (ARMA) model. These models are fitted to time series data either to better understand the data or to predict future points in the series (forecasting). They are applied in some cases where data show evidence of non-stationarity, where an initial differencing step (corresponding to the "integrated" part of the model) can be applied to reduce the non-stationarity. (Wikipedia.org, 2015).

Auto Regressive Correlation: A stochastic process used in statistical calculations in which future values are estimated based on a weighted sum of past values. An autoregressive process operates under the premise that past values have an effect on current values. A process considered AR(1) is the first order process, meaning that the current value is based on the immediately preceding value. An AR(2) process has the current value based on the previous two values. (Wikipedia.org, 2015).

Biovariate Linear Regression Models: A statistical analysis of two variables (often denoted as *X*, *Y*), for the purpose of determining the empirical relationship between them. A bivariate analysis can be helpful in testing simple hypotheses of association, however, by itself, it cannot determine causality. Bivariate analysis can help determine to what extent it becomes easier to know and predict a value for one variable (possibly a dependent variable) if we know the value of the other variable (possibly the independent variable) (see also correlation and simple linear regression). (Wikipedia.org, 2015).

Body Fat Analyzer: A method of body composition analysis useful in measuring the total body water and other components. BIA relies on the changes in electrical

current as it travels through body fluids and tissues. The results obtained may vary with ambient temperature and humidity, the subject's hydration, and other variables. (Thefreedictionary.com, 2015).

Body Mass Index (BMI): A value derived from the weight and height of an individual. To calculate, the body weight is divided by the square of the body height and is expressed in units of kg/m^2. It is an attempt to quantify the amount of tissue mass (muscle, fat and bone) in an individual and then categorize that person as underweight, normal weight, overweight, or obese based on that value. (Wikipedia.com, 2015).

Cardiovascular disease: Disease affecting the heart or blood vessels. Cardiovascular diseases include arteriosclerosis, coronary artery disease, heart valve disease, arrhythmia, heart failure, hypertension, orthostatic hypotension, shock, endocarditis, diseases of the aorta and its branches, disorders of the peripheral vascular system, and congenital heart disease. (nlm.nih.gov, 2015).

Causality: The relationship between something that happens or exists and the thing that causes it. (Merriam-Webster.com, 2015).

Centers for Disease Control and Prevention (CDC): is the leading national public health institute of the United States. The CDC is a federal agency under the Department of Health and Human Services and is headquartered in unincorporated DeKalb County, Georgia, a few miles northeast of the Atlanta city limits. (Wikipedia.org, 2015).

Certified Diabetes Educator (CDE®): A health professional that possesses comprehensive knowledge of and experience in prediabetes, diabetes prevention, and management. The CDE® educates and supports people affected by diabetes to understand and manage the condition. (ncbde.org, 2015).

Committee on the Quality of Health Care in America: In 1996, the Institute of Medicine launched a concerted, ongoing effort focused on assessing and improving the nation's quality of care. The Committee on Quality of Health Care in America laid out a vision for how the health care system and related policy environment must be radically transformed in order to close the chasm between what we know to be good quality care and what actually exists in practice. (iom.nationalacademies.org, 2015).

Co-morbid conditions: The presence of one or more additional disorders (or diseases) co-occurring with a primary disease or disorder; or the effect of such additional disorders or diseases. (Wikipedia.com, 2015)

Confounding Variables: An extraneous variable whose presence affects the variables being studied so that the results you get do not reflect the actual relationship between the variables under investigation. When conducting an

experiment, the basic question that any experimenter is asking is: "How does A affect B?" where A is the probable cause, and B is the effect. Any manipulation of A is expected to result in a change in the effect. (Alleydog.com, 2015).

Congestive Heart Failure: Inability of the heart to keep up with the demands on it, with failure of the heart to pump blood with normal efficiency. When this occurs, the heart is unable to provide adequate blood flow to other organs, such as the brain, liver, and kidneys. Abbreviated CHF. CHF may be due to failure of the right or left ventricle, or both. The symptoms can include shortness of breath (dyspnea), asthma due to the heart (cardiac asthma), pooling of blood (stasis) in the general body (systemic) circulation or in the liver's (portal) circulation, swelling (edema), blueness or duskiness (cyanosis), and enlargement (hypertrophy) of the heart. The many causes of CHF include coronary artery disease leading to heart attacks and heart muscle (myocardium) weakness; primary heart muscle weakness from viral infections or toxins, such as prolonged alcohol exposure; heart valve disease causing heart muscle weakness due to too much leaking of blood or causing heart muscle stiffness from a blocked valve; hyperthyroidism; and high blood pressure. (MedicineNet.com, 2015).

Coronary Heart Disease (CHD): A narrowing of the small blood vessels that supply blood and oxygen to the heart. CHD is also called coronary artery disease. (nlm.nih.gov, 2015).

Demographics: Demographics are defined as statistical data about the characteristics of a population, such as the age, gender and income of the people within the population (Yourdictionary.com, 2015).

Degenerative Joint Disease: Also known as osteoarthritis, this type of arthritis is caused by inflammation, breakdown and eventual loss of the cartilage of the joints. Among the over 100 different types of arthritis conditions, osteoarthritis is the most common, affecting usually the hands, feet, spine, and large weight-bearing joints, such as the hips and knees. Also called degenerative arthritis. (MedicineNet.com, 2015).

Descriptive statistics: A set of brief descriptive coefficients that summarizes a given data set, which can either be a representation of the entire population or a sample. The measures used to describe the data set are measures of central tendency and measures of variability or dispersion. (Investopedia.com, 2015).
Diabetes: A serious disease in which the body cannot properly control the amount of sugar in the blood because it does not have enough insulin. (Merriam-Webster, 2015).

Diabetes Recognition Program (DRP): A program that was developed to provide clinicians with tools to support the delivery and recognition of consistent high quality care. This voluntary program is designed to recognize clinicians who use

evidence-based measures and provide excellent care to their patients with diabetes. (ncqa.org, 2015).

Diabetes Self-Management Education (DSME): The ongoing process of facilitating the knowledge, skill, and ability necessary for diabetes self-care. This process incorporates the needs, goals, and life experiences of the person with diabetes and is guided by evidence-based standards. The overall objectives of DSME are to support informed decision-making, self-care behaviors, problem-solving and active collaboration with the health care team and to improve clinical outcomes, health status, and quality of life. (DiabetesCare.com, 2010).

Diastolic: The minimum arterial pressure during relaxation and dilatation of the ventricles of the heart when the ventricles fill with blood. In a blood pressure reading, the diastolic pressure is typically the second number recorded. (Medicine.Net.com, 2015).

Dickey Fuller Root Test: In statistics and econometrics, an augmented Dickey–Fuller test (ADF) is a test for a unit root in a time series sample. It is an augmented version of the Dickey–Fuller test for a larger and more complicated set of time series models. The augmented Dickey–Fuller (ADF) statistic, used in the test, is a negative number. (Wikipedia.org, 2015).

Dubin-Watson: A number that tests for autocorrelation in the residuals from a statistical regression analysis. The Durbin-Watson statistic is always between 0 and 4. A value of 2 means that there is no autocorrelation in the sample. Values approaching 0 indicate positive autocorrelation and values toward 4 indicate negative autocorrelation. (Investopedia.com, 2015).

Dyslipidemia: A disorder of lipoprotein metabolism, including lipoprotein overproduction or deficiency. Dyslipidemias may be manifested by elevation of the total cholesterol, the "bad" low-density lipoprotein (LDL) cholesterol and the triglyceride concentrations, and a decrease in the "good" high-density lipoprotein (HDL) cholesterol concentration in the blood. Dyslipidemia comes under : consideration in many situations including diabetes, a common cause of lipidemia. For adults with diabetes, it has been recommended that the levels of LDL, HDL, and total cholesterol, and triglyceride be measured every year. (MedicineNet.com, 2015).

Fischer's Exact Test: A statistical significance test used in the analysis of contingency tables. Although in practice it is employed when sample sizes are small, it is valid for all sample sizes. (Wikipedia.org, 2015).

Generalized Estimating Equations: In statistics, a generalized estimating equation (GEE) is used to estimate the parameters of a generalized linear model with a possible unknown correlation between outcomes. Parameter estimates from the

GEE are consistent even when the covariance structure is misspecified, under mild regularity conditions. (Wikipedia.org, 2015).

Glucose: The main sugar that the body makes from the food in the diet. Glucose is carried through the bloodstream to provide energy to all cells in the body. Cells cannot use glucose without the help of insulin. Glucose is a simple sugar (a monosaccharide). The body produces it from protein, fat and, in largest part, carbohydrate. Ingested glucose is absorbed directly into the blood from the intestine and results in a rapid increase in blood glucose. Glucose is also known as dextrose. (Medicinenet.com, 2015).

Glycemic control: A medical term referring to the typical levels of blood sugar (glucose) in a person with diabetes mellitus. (Wikipedia.org, 2015).

Health Care Effectiveness Data and Information Set (HEDIS): A widely used set of performance measures in the managed care industry, developed and maintained by the National Committee for Quality Assurance (NCQA). HEDIS was designed to allow consumers to compare health plan performance to other plans and to national or regional benchmarks. An incentive for many health plans to collect HEDIS data is a Centers for Medicare and Medicaid Services (CMS) requirement that health maintenance organizations (HMOs) submit Medicare HEDIS data in order to provide HMO services for Medicare enrollees under a program called Medicare Advantage. (Wikipedia.org, 2015).

Hemoglobin A1c: A common blood test used to diagnose type 1 and type 2 diabetes and then to gauge how well people are managing their diabetes. The A1C test goes by many other names, including glycated hemoglobin, glycosylated hemoglobin, hemoglobin A1C and HbA1c. The A1C test result reflects the average blood sugar level for the past two to three months. Specifically, the A1C test measures what percentage of the hemoglobin — a protein in red blood cells that carries oxygen — is coated with sugar (glycated). The higher the A1C level, the poorer the blood sugar control and the higher the risk of diabetes complications. (MayoClinic.org, 2015).

Heterogeneous: Consisting of elements that are not of the same kind or nature. (vocabulary.com, 2015).

High Density Lipoprotein (HDL): Is considered “good” cholesterol because it helps remove LDL cholesterol from the arteries. Experts believe HDL acts as a scavenger, carrying LDL cholesterol away from the arteries and back to the liver, where it is broken down and passed from the body. One-fourth to one-third of blood cholesterol is carried by HDL. A healthy level of HDL cholesterol may also protect against heart attack and stroke, while low levels of HDL cholesterol have been shown to increase the risk of heart disease. (Heart.org, 2015).

Hyperlipidemia: Elevated lipid (fat) levels in the blood. Hyperlipidemia can be inherited and increases the risk of disease of the blood vessels leading to stroke and heart disease. (nih.gov, 2015).

Hypertension: A serious medical condition present when blood flows through the blood vessels with a force greater than normal. (nih.gov, 2015).

Hypoglycemic Medications: Agents used to decrease the level of glucose in the blood and for the treatment of diabetes mellitus. (thefreeddictionary.com, 2015).

Iliac Crest: The thick curved upper border of the ilium, the most prominent bone on the pelvis. The iliac crest can be felt by pushing your hands on your sides at your waist, feeling for the bone and following it down and to the front. (sportsmedicine.about.com, 2015).

2012 Indian Health Service's National Patient Information Reporting System: It is the national repository for all IHS health care data and includes information on patient registration and visit encounters. Data are derived from various government (mostly the Resource Patient Management System) and commercial health care information systems. These are largely transaction-based systems used to support patient care. (archive.ahrq.gov, 2015).

Institutes of Medicine: An American non-profit, non-governmental organization founded in 1970, under the congressional charter of the National Academy of Sciences. Its purpose is to provide national advice on issues relating to biomedical science, medicine, and health, and its mission to serve as adviser to the nation to improve health. It works outside the framework of the U.S. federal government to provide independent guidance and analysis and relies on a volunteer workforce of scientists and other experts, operating under a formal peer-review system. The academy aims to provide unbiased, evidence-based, and authoritative information and advice concerning health and science policy to policy-makers, professionals, leaders in every sector of society, and the public at large. (Wikipedia.org, 2015).

Interdisciplinary: Involving two or more disciplines or fields. (Thefreeddictionary.com, 2015).

INTERSALT study: An observational study that showed an association between dietary salt, measured by urinary excretion, and blood pressure. The study was based on a sample of 10,079 men and women age 20-59 sampled from 52 populations spread across the world. (Wikipedia.com, 2015).

Linear Regression: An approach for modeling the relationship between a scalar dependent variable y and one or more explanatory variables (or independent variables) denoted X. The case of one explanatory variable is called simple linear regression. (Wikipedia.org, 2015).

Lipids: Another word for "fat." A lipid is chemically defined as a substance that is insoluble in water and soluble in alcohol, ether, and chloroform. Lipids are an important component of living cells. Together with carbohydrates and proteins, lipids are the main constituents of plant and animal cells. (MedicineNet.com, 2015).

Log linear study: A technique used in statistics to examine the relationship between more than two categorical variables. The technique is used for both hypothesis testing and model building. In both these uses, models are tested to find the most parsimonious (i.e., least complex) model that best accounts for the variance in the observed frequencies. (Wikipedia.org, 2015).

Low Density Lipoprotein (LDL): Is considered "bad" cholesterol because it contributes to plaque, a thick, hard deposit that can clog arteries and make them less flexible. This condition is known as atherosclerosis. If a clot forms and blocks a narrowed artery, heart attack or stroke can result. Another condition called peripheral artery disease can develop when plaque buildup narrows an artery supplying blood to the legs. (Heart.org, 2015).

Mann-Whitney U Test: A nonparametric test of the null hypothesis that two samples come from the same population against an alternative hypothesis, especially that a particular population tends to have larger values than the other. It can be applied on unknown distributions contrary to *t*-test which has to be applied only on normal distributions, and it is nearly as efficient as the *t*-test on normal distributions. (Wikipedia.org, 2015).

Match-control Analysis: A comparison between groups in which each subject is matched by a comparable subject in terms of age and all other measurable parameters. (Thefreeddictionary.com, 2015).

MOVE!: A weight management health promotion program designed to improve the lives of Veterans. The goals are to annually screen every Veteran who receives care at VA facilities for obesity, refer individuals to weight management services, and make available different treatment options that fit the needs and preferences of our Veterans. This makes MOVE! the largest and most comprehensive weight management program associated with a medical care system in the United States. Encouraging healthy eating behavior, increasing physical activity, and promoting even small weight losses can reduce health risks, prevent or reverse certain diseases, and improve quality-of-life and longevity. (move.va.gov, 2015).

National Ambulatory Medical Care Survey (NAMCS): Is a national survey designed to meet the need for objective, reliable information about the provision and use of ambulatory medical care services in the United States. Findings are based on a sample of visits to non-federal employed office-based physicians who are primarily engaged in direct patient care. Data is also collected on the

utilization and provision of ambulatory care services in hospital emergency and outpatient departments. Findings are based on a national sample of visits to the emergency departments and outpatient departments of non-institutional general and short-stay hospitals. (CDC.gov, 2015).

National Health and Nutrition Examination Survey (NHANES): A program of studies designed to assess the health and nutritional status of adults and children in the United States. The survey is unique in that it combines interviews and physical examinations (CDC.gov, 2015).

National Health Interview Survey: Monitored the health of the nation since 1957. NHIS data on a broad range of health topics are collected through personal household interviews. For over 50 years, the U.S. Census Bureau has been the data collection agent for the National Health Interview Survey. Survey results have been instrumental in providing data to track health status, health care access, and progress toward achieving national health objectives. (CDC.gov, 2015).

Neuropathy: A result of damage to the peripheral nerves often causing weakness, numbness and pain, usually in the hands and feet. It can also affect other areas of the body. One of the most common causes is diabetes mellitus. People with peripheral neuropathy generally describe the pain as stabbing or burning. Often, there's tingling. In many cases, symptoms improve, especially if caused by a treatable underlying condition. Medications can reduce the pain of peripheral neuropathy. (MayoClinic.org, 2015).

Obesity: A condition characterized by the excess accumulation and storage of fat in the body. (Merriam-Webster.com, 2015).

Office of Research and Development: The Office of Scientific Research and Development (OSRD) was an agency of the United States federal government created to coordinate scientific research for military purposes during World War II. Arrangements were made for its creation during May 1941, and it was created formally by Executive Order 8807 on June 28, 1941. It superseded the work of the National Defense Research Committee (NDRC), was given almost unlimited access to funding and resources, and was directed by Vannevar Bush, who reported only to President Franklin Delano Roosevelt. (Wikipedia.org, 2015).

Osteoarthritis (OA): Is also known as osteoarthrosis or degenerative joint disease (DJD), is a progressive disorder of the joints caused by gradual loss of cartilage and resulting in the development of bony spurs and cysts at the margins of the joints. The name osteoarthritis comes from three Greek words meaning bone, joint, and inflammation. (Thefreeddictionary.com, 2015).

p-values: The level of marginal significance within a statistical hypothesis test, representing the probability of the occurrence of a given event. The p-value is used as an alternative to rejection points to provide the smallest level of

significance at which the null hypothesis would be rejected. (investopedia.com, 2015).

Paired t-test: Used to compare two population means where you have two samples in which observations in one sample can be paired with observations in the other sample. (lboro.ac.uk.com, 2015).

Patient portals: Health care-related applications that allow patients to interact and communicate with their healthcare providers, such as physicians and hospitals. Portal services are typically web-based and interface with electronic medical records which can be accessed at all hours of the day and night. (Wikipedia.com, 2015).

Prevalence: The proportion of individuals in a population having a disease or characteristic. Prevalence is a statistical concept referring to the number of cases of a disease that are present in a particular population at a given time, whereas incidence refers to the number of new cases that develop in a given period of time. (MedicineNet.com, 2015).

Prospective Longitudinal Quasi Experiment: An empirical study used to estimate the causal impact of an intervention on its target population. Quasi-experimental research shares similarities with the traditional experimental design or randomized controlled trial, but they specifically lack the element of random assignment to treatment or control. Instead, quasi-experimental designs typically allow the researcher to control the assignment to the treatment condition, but using some criterion other than random assignment (e.g., an eligibility cutoff mark). With quasi-experimental studies, it may not be possible to convincingly demonstrate a causal link between the treatment condition and observed outcomes. This is particularly true if there are confounding variables that cannot be controlled or accounted for. (Wikipedia.org, 2015).

Qualitative: Typically descriptive data and as such is harder to analyze than quantitative data. Qualitative research is useful for studies at the individual level, and to find out, in depth, the ways in which people think or feel (e.g. case studies). (Simplypsychology.org, 2015).

Quantitative: Data expressing a certain quantity, amount or range. Usually, there are measurement units associated with the data, e.g. meters, in the case of the height of a person. It makes sense to set boundary limits to such data, and it is also meaningful to apply arithmetic operations to the data. (stats.oecd.org, 2015).

Randomized Control Study: A type of scientific (often medical) experiment, where the people being studied are randomly allocated one or other of the different treatments under study. The RCT is often considered the gold standard for a clinical trial. (Wikipedia.org, 2015).

Regression Analysis: A statistical process for estimating the relationships among variables. It includes many techniques for modeling and analyzing several variables, when the focus is on the relationship between a dependent variable and one or more independent variables (or 'predictors'). (Wikipedia.org, 2015).

Retinopathy: A diabetes complication that affects eyes. It's caused by damage to the blood vessels of the light-sensitive tissue at the back of the eye (retina). At first, diabetic retinopathy may cause no symptoms or only mild vision problems. Eventually, it can cause blindness. The condition can develop in anyone who has type 1 or type 2 diabetes. The longer someone has diabetes and the less controlled the blood sugar is, the more likely the person is to develop this eye complication. (MayoClinic.org, 2015).

Retrospective Cohort Study: All the events - exposure, latent period, and subsequent outcome (ex. development of disease) have already occurred in the past. Data is collected now, and risk of developing a disease is established if exposed to a particular risk factor. (Wikipedia.org, 2015).

Secure Messaging: A server-based approach to protect sensitive data sent when beyond the corporate borders and provides compliance with industry regulations such as Health Insurance Portability and Accountability Act (HIPPA). (Wikipedia.com, 2015).

Sleep Apnea: A potentially serious sleep disorder in which breathing repeatedly stops and starts. (Mayoclinic.org, 2015).

Spearman's Correlation Co-efficient: Denoted by the Greek letter ρ(rho) or as r_s is a nonparametric measure of statistical dependence between two variables. It assesses how well the relationship between two variables can be described using a monotonic function. If there are no repeated data values, a perfect Spearman correlation of +1 or −1 occurs when each of the variables is a perfect monotone function of the other. (Wikipedia.org, 2015).

Standard Deviation: The measure used to quantify the amount of variation or dispersion of a set of data values. A standard deviation close to 0 indicates that the data points tend to be very close to the mean (also called the expected value) of the set, while a high standard deviation indicates that the data points are spread out over a wider range of values. (Wikipedia.com, 2015).

Systolic: The blood pressure when the heart is contracting. It is specifically the maximum arterial pressure during contraction of the left ventricle of the heart. The time at which ventricular contraction occurs is called systole. (MedicineNet.com, 2015).

Total Cholesterol: A direct cholesterol measurement that measures all cholesterol molecules in the blood, including low density lipoproteins (LDL), high density

lipoproteins (HDL), and very low density lipoproteins (VLDL). A total cholesterol measurement is the most common type of measurement used in a lipid profile, including home cholesterol tests and cholesterol tests performed in a healthcare provider's office. (About.com, 2015).

Triglycerides: Another type of fat, and they're used to store excess energy from the diet. High levels of triglycerides in the blood are associated with atherosclerosis. Elevated triglycerides can be caused by overweight and obesity, physical inactivity, cigarette smoking, excess alcohol consumption and a diet very high in carbohydrates (more than 60 percent of total calories). Underlying diseases or genetic disorders are sometimes the cause of high triglycerides. People with high triglycerides often have a high total cholesterol level, including a high LDL cholesterol (bad) level and a low HDL cholesterol (good) level. Many people with heart disease or diabetes also have high triglyceride levels. (Heart.org, 2015).

Type 2 Diabetes: Once known as adult-onset or noninsulin-dependent diabetes, is a chronic condition that affects the way the body metabolizes sugar (glucose), the body's important source of fuel. With type 2 diabetes, the body either resists the effects of insulin — a hormone that regulates the movement of sugar into the cells — or doesn't produce enough insulin to maintain a normal glucose level. (MedicineNet.com, 2015).

VA Corporate Data Warehouse: A repository for patient-level data aggregated from across the VHA's national health system. (Healthaffairs.org, 2015).

VHA National Center for Health Promotion and Disease Prevention: A field-based national program office of the VHA Office of Patient Care Services that strives to improve the quality of life for Veterans by providing VA clinicians with evidence-based health promotion and disease prevention practices. (prevention.va.gov, 2015).

Waist Circumference: a numerical measurement of the waist. Women with a waist measurement of more than 35 inches or men with a waist measurement of more than 40 inches may have a higher disease risk than people with smaller waist measurements. Those with a high-waist circumference have a greater risk of developing obesity-related health problems, such as diabetes, high blood pressure. (Wikipedia.org, 2015).

CHAPTER 2: REVIEW OF THE LITERATURE

The implementation of web-based patient portals has been helping to engage and empower patients to achieve better health-related outcomes and reduce health care costs (Otte-Trojel, deBont, Rundall, & Klundert, 2014). The increased use of secure patient-provider messaging with an electronic health record (EHR) is the result of a 2013 objective in The American Recovery and Reinvestment Act of 2009, which has been providing incentives to health care providers for the meaningful use of EHR (Centers for Medicare and Medicaid, 2009). Today, web-based portals are changing the way health care is delivered by improving clinic access and refining the quality of the care provided.

Currently, there is little research that supports the effectiveness of SM and weight loss-related outcomes. However, there is evidence that SM has helped patients manage chronic health conditions such as hypertension (HTN), Type 2 diabetes and hyperlipidemia (Zhou, Kanter, Wang & Garrido, 2010). Research has also shown that SM has reduced the number of urgent care (UC) visits (Shimada et al., 2013). The purpose of this literature review is to critically analyze the evidence on the effectiveness of SM and health-related outcomes.

Background

Background on diabetes, hypertension, hyperlipidemia and the growing obesity epidemic will be discussed. Then, the implementation of patient portals into health care delivery systems will be reviewed.

Diabetes

In 2012, the Center for Disease Control and Prevention (CDC) estimated that 29.1 million people, or 9.3% of the US population, had diabetes. Of those 29 million, however, 21 million were diagnosed with diabetes while eight million went undiagnosed. Furthermore, it is estimated that there were approximately two million new cases of diabetes in the US in 2012 alone (Centers for Disease Control and Prevention, Diabetes, 2014).

Certain age groups and ethnic backgrounds are linked to the prevalence of diabetes. Twenty-six percent of adults aged 65 years or older have diabetes, making this the largest age group with this disease (Centers for Disease Control and Prevention, Diabetes, 2014). According to the 2010-2012 National Health Interview Survey and the 2012 Indian Health Service's National Patient Information Reporting System, American Indians and Alaska Natives have the highest prevalence of diabetes at 15.9%, followed by non-Hispanic blacks at 13.2% and Hispanics at 12.8% (Centers for Disease Control and Prevention, Diabetes, 2014). Another segment of the population known to have diabetes is our US Veterans. Today, nearly one quarter of the nine million Veterans receiving VA health care have diabetes (US Department of Veterans Affairs, 2013).

Diabetes is the seventh leading cause of death in the US (Centers for Disease Control and Prevention, Diabetes, 2014). In addition, diabetes is the leading cause of kidney disease, new cases of blindness, and non-traumatic lower limb amputations (Centers for Disease Control and Prevention, Diabetes, 2014). Diabetes is also a leading

cause of heart disease and stroke (Centers for Disease Control and Prevention, Diabetes, 2014).

Medical expenses for people with diabetes are twice as high as those without diabetes (Centers for Disease Control and Prevention, Diabetes, 2014). In 2012, the total estimated costs for people diagnosed with diabetes were $245 billion (Centers for Disease Control and Prevention, Diabetes, 2014). In 2007, the total estimated federal health care costs of diabetes, including direct and non-direct costs, were $174 billion (Centers for Disease Control and Prevention, Diabetes, 2014).

Eating a healthy diet, losing weight or maintaining a healthy weight, following a regular exercise plan, and taking oral hypoglycemic medications or insulin are typical treatments involved in diabetes management. Diabetes Self-Management Education (DSME) programs were developed by the American Diabetes Association (ADA) to teach patients how to effectively manage their diabetes. These education programs aim to help people self-manage their diabetes and reduce their risks for diabetes-related complications (Funnel et al., 2011).

Hypertension

Hypertension is a leading cause of heart disease and stroke (Go et al., 2013). According to data from the National Health and Nutrition Examination Survey, nearly one-third of US adults aged 18 years or older were affected by hypertension (NHANES, 2010-2011). Furthermore, the prevalence of hypertension increased with age, with 7.3% among 18 to 29 year olds to 65% in adults over the age of 65 (Go et al., 2013). Projections suggest that by 2030, hypertension will increase by 7.2% (Go et al., 2013).

Hypertension was found to be especially prevalent in non-Hispanic black adults (42%) compared to non-Hispanic white adults (28%) (Nwankwo, Yoon, Burt & Gu, 2013). A higher percentage of men age 45 years old or younger have hypertension, whereas, a higher percentage of women age 60 years or older have hypertension (Go et al., 2013).

Hypertension is costly. The CDC estimates it costs the nation $47.5 billion each year to treat hypertension. These costs include direct and indirect costs such as health care services, medications and missed days from work (Go et al., 2013). According to the National Hospital Ambulatory Medical Care Survey (2010), there were almost four million visits to hospital outpatient clinics for the treatment of essential hypertension. In 2011, there were 27,853 deaths related to essential hypertension and hypertensive renal disease (Centers for Disease Control and Prevention, Hypertension, 2014). People with elevated blood pressure, >140/90 mm Hg, are at greater risk for having a heart attack, stroke or congestive heart failure (Centers for Disease Control and Prevention, Hypertension, 2014).

Approximately 70% of the US population with hypertension is using medication to control their blood pressure (Centers for Disease Control and Prevention, 2014). Effective treatment strategies also include a healthy diet, a limited sodium intake (<2300 mg/day), weight loss (if necessary), stress reduction, and regular physical activity (Dietary Guidelines for Americans, 2010). If these guidelines were followed, it is projected that there would be 11 million fewer cases of hypertension and a healthcare savings of $18 billion (Centers for Disease Control and Prevention, 2014).

Cardiovascular Disease

Cardiovascular disease is the leading cause of death in the US, killing more than 375,000 people yearly (Mozzafarian et al., 2014). Cardiovascular disease claims the lives of more people than all types of cancers combined (Mozzafarian et al., 2014). More than 2,000 deaths from cardiovascular disease occur daily, or one death every 40 seconds (Mozzafarian et al., 2014).

Cardiovascular disease is also the leading cause of death throughout the world. More than 17 million or one in every three people dies from cardiovascular-related deaths each year (Mozzafarian et al, 2014). Unfortunately, this number is projected to grow to almost 24 million by the year 2030 (Mozzafarian et al, 2014). In 2008, one-third of all global deaths were the result of cardiovascular disease. Furthermore, 80% of those deaths occurred in low- to middle-income countries. More than $300 billion is spent on direct and indirect costs for the treatment of cardiovascular disease. These costs included health care expenses as well as lost productivity (Mozzafarian et al, 2014).

Elevated cholesterol or triglyceride levels, smoking, obesity, elevated blood sugars, and hypertension are the main causes of cardiovascular disease (Mozzafarian et al, 2014). The CDC estimates that nearly 71 million US adults have elevated LDL cholesterol. Unfortunately, less than half of those adults seek treatment (Centers for Disease Control and Prevention, Hyperlipidemia, 2014). Among Americans age 20 years or older, Mexican-American men had the highest rate (39.9%) of elevated LDL cholesterol --130 mg/dL or higher-- followed by non-Hispanic black men (33.1%) and then non-Hispanic black women (31.2%) (Mozzafarian et al, 2014).

Approximately 43% of Americans have total cholesterol levels higher than 200 mg/dL. Although anyone can develop high cholesterol, non-Hispanic white women age 20 and older had the highest rate (45.8%) of elevated total blood cholesterol levels of 240 mg/dL or higher, whereas, non-Hispanic black men age 20 or older had the lowest rate (10.8%) among all other groups (Mozzafarian et al, 2014). The CDC notes that between 1999 and 2010, the percentage of US adults with elevated total cholesterol decreased from 18.3% to 13.4%. People who have high total cholesterol levels are twice as likely to develop heart disease compared to people with optimal cholesterol levels (Centers for Disease Control and Prevention, Hyperlipidemia, 2013).

Obesity Epidemic

According to the National Health and Nutrition Examination Survey, 2009-2010, and the National Health Interview Survey, more than one in three adults age 20 or older in the US are classified as obese (Flegal, Carroll, Kit & Ogden, 2012). Since 1960, obesity among that same age group has more than doubled, increasing from 13.4% to 35.7% (Flegal, Carroll, Kit & Ogden, 2012). Furthermore, more than two in three adults are considered overweight or obese and more than one in 20 adults are considered to have extreme obesity (Flegal, Carroll, Kit & Ogden, 2012).

Obesity has become more prevalent throughout the US and prevalence differs by region, ethnicity and age. The South has the highest obesity rate at 30.2% followed by the Midwest at 30.1% then the East at 26.5% and finally the West at 24.9% (Centers for Disease Control and Prevention, Obesity, 2013). Among Hispanic, black and white adults age 20 or older, overweight and obesity affects more than three in four Hispanics

and blacks compared to two in three white adults (Flegal, Carroll, Kit & Ogden, 2012). Non-Hispanic black males have the highest age adjusted rates of obesity at 47.8%. Approximately 49.5% of blacks, 39.1% of Hispanics and 34.3% of whites are considered to be obese and 13.1% of blacks, 5.7% of whites and 5% of Hispanics are considered extremely obese (Flegal, Carroll, Kit & Ogden, 2012). Today, obesity is highest among middle-aged adults, 40-59 years old, with an obesity rate of 39.5% (Centers for Disease Control and Prevention, Obesity, 2014).

The costs associated with obesity have skyrocketed. In 2008 alone, $147 billion was spent on direct and indirect expenses (Centers for Disease Control and Prevention, Obesity, 2014). Obesity is known to be a major health factor associated with heart disease, stroke, Type 2 diabetes, and certain types of cancers. The costs associated with managing those chronic diseases contribute to the overall expense towards the treatment of obesity.

Obesity is currently the second leading cause of preventable deaths behind smoking (Center for Disease Control and Prevention, Obesity, 2014). Higher morbidity is associated with obesity and hypertension (HTN), Type 2 diabetes, coronary heart disease (CHD), stroke, gallbladder disease, osteoarthritis, sleep apnea, respiratory problems and certain types of cancers (NHANES). The INTERSALT study (Centers for Disease Control and Prevention, Obesity, 2014) reported that a 10 kg higher body weight is associated with 3.0 mm Hg higher systolic and a 2.3 mm Hg higher diastolic blood pressure. Consequently, these elevations in blood pressure correlate to an estimated 12 percent increased risk in developing CHD and a 24 percent increased risk for developing a stroke (NHANES). Furthermore, in both obese men and women with BMI levels

greater than 25, there is an association with higher levels of total serum cholesterol and lower levels of HDL-cholesterol (NHANES). Also, several prospective studies have linked obesity with an increased risk for Type 2 diabetes.

Technology to Manage Patient Care and Chronic Diseases

The implementation of technology into health care systems has not only benefited electronic medical records but also the management of chronic health conditions. These creative solutions have expanded how health care is delivered to patients today.

MOVE!

Due to the increase in prevalence of chronic diseases, all segments of the US population are affected, including Veterans. Veterans' comprise a narrow segment of the total US population. In 2013, there were 8.92 million Veterans enrolled in the VA Healthcare System. According to the Office of Research & Development, more than 70% of all US Veterans who receive VA care are either overweight or obese (Littman, Boyko, McConnell & Fihn, 2012). The Veteran population has higher rates of overweight and obesity compared to the general population (Nelson, 2006). Data obtained from the VA Corporate Data Warehouse showed a significant increase in Veteran obesity between 2002 and 2014. In 2002, 13 of the 21 VA networks had Veterans with a Body Mass Index (BMI) of 35-39%. However, by 2014, most of the 23 networks had Veterans with a BMI greater than 40 (US Department of Veterans Affairs, Health Promotion, 2015). In 2006, to address the growing obesity issue in the Veteran population, the VA launched a weight management program known as MOVE! and hired MOVE! Coordinators to

oversee the program and its goals (US Department of Veterans Affairs, Health Promotion, 2015).

Each facility's MOVE! program may differ; however, the majority of the MOVE! groups have curriculums that offer 12 sessions spread over a six-month period of time. The MOVE! program uses an interdisciplinary team approach including a registered dietitian (RD), a behavioral health specialist, and a pharmacist (PharmD). For specific topics such as physical activity, a physical therapist, occupational therapist or a kinesiotherpist lead those classes. Nutrition basics such as portion sizes, label reading, and meal planning, as well as behavioral modification and the importance of regular exercise are the main themes of MOVE! Recently, healthy teaching kitchens (HTK) have been incorporated into MOVE! to help Veterans learn how to prepare healthy, yet inexpensive, foods. The HTK is an interactive way to teach Veterans how to change their current eating habits by making wiser food selections and preparing healthier meals. The HTK resembles a home style kitchen which allows Veterans to learn how to prepare healthy foods, in a familiar type of environment.

In addition to MOVE! groups, weight management is also available in one-on-one counseling sessions with a RD or by means of TeleMOVE! which uses telecommunication technology. In-person visits are typically one hour appointments with a dietitian who is trained in weight management. TeleMOVE! is a program that can help Veterans manage their weight in the comfort of their own homes using messaging devices. TeleMOVE! provides daily education and motivation to help Veterans stay on track with their weight loss programs. In addition, TeleMOVE! holds Veterans accountable and provides support for weight loss maintenance. Several different types of

in-home messaging devices allow Veterans to communicate with a RD. SM is currently not being incorporated into the MOVE! program. Therefore, the implementation of SM may provide additional motivation and weight management support to help participants achieve the MOVE! Program's mission and objectives.

Patient Portals

Medical science and technology advanced much more rapidly than did the health care delivery system. Because of this, health care systems were failing to provide consistent, high-quality care (Institute of Medicine, 2001). As early as 1991, efforts were made to automate the health care system. Due to privacy and confidentiality concerns, however, progress had been slow. In June of 1998, The Committee on the Quality of Health Care in America was created to develop a strategy that would substantially improve the quality of health care over the next decade (Institutes of Medicine, 2001). The committee felt that information technology would play a vital role in the transformation of the health care delivery system in the 21st century.

Today, technology is indeed revolutionizing the health care delivery industry. In 2009, the health care industry received an additional boost when the American Recovery and Reinvestment Act was passed by Congress and President Obama. This Act included incentives for the meaningful use of EHR. Implementing a secure, electronic means of communication between patients and providers was an objective of the law in 2013 (Centers for Medicare and Medicaid, 2009). As a result, patient portals have gained popularity in many health care delivery systems, allowing patients to access their EHR records 24-hours a day, order prescription refills, schedule future appointments, review

laboratory values, access patient education materials, and communicate with their providers or health care team via SM.

The implementation of patient portals has had some promising results as predicted by the Institutes of Medicine (2001). Kaiser Permanente, the country's largest not-for-profit integrated health care delivery system, developed a patient portal known as KP HealthConnect. In a recent study completed by Zhou et al. (2010), patients with diabetes and hypertension who used SM with their provider, were more likely to meet each of the nine Healthcare Effectiveness Data and Information Set (HEDIS) measures when compared to similarly-matched control groups. In another study, patient portals were positively associated with improvements in clinical outcomes and patient behaviors and experiences (Otte-Trojel, De Bont, Rundall, Klundert, 2014).

My HealtheVet

In 2006, the US Department of Veterans Affairs (VA) was presented with the prestigious Innovation in American Government award by the Ash Institute of the John F. Kennedy School of Government at Harvard University for its development of the VistA electronic medical records system and My Health*e*Vet. My Health*e*Vet is the VA's web-based patient portal that offers Veterans secure access to information in their personal VA health care records anytime and anywhere. As outlined earlier, My Health*e*Vet allows Veterans to become active partners in their health care. On November 11, 2003, My Health*e*Vet was launched within the VA. In 2010, My Health*e*Vet was rolled out nationally across all of the VAs (US Department of Veterans Affairs, 2014).

SM and health related outcomes

Several studies have been conducted to evaluate the effectiveness of SM and health-related outcomes. In 2010, researchers at Kaiser Permanente conducted a retrospective longitudinal and observational study to determine if patient-provider SMs resulted in improved quality as evidenced by Healthcare Effectiveness Data and Information Set (HEDIS) measures for diabetes and hypertension (Zhou et al, 2010). The following HEDIS measures were assessed in patients with diabetes and patients with diabetes and hypertension: Hemoglobin A1c screening, Hemoglobin A1c control, low density lipoprotein cholesterol (LDL-C) screening, LDL-C control, retinopathy screening, nephropathy screening and two blood pressure measures: 1) less than 140/90 mm Hg and 2) less than 130/80 mm Hg. For patients with only hypertension, HEDIS criteria for blood pressure control were assessed.

Researchers compared the effectiveness of SM to HEDIS measures in 35,423 adults who had used secure patient-provider e-mail between February 2005 and December 2008. A generalized log-linear model was used to examine the relationship between HEDIS outcomes and the use of SM. A matched-control analysis was completed to control for variations and self-selection bias. Those who used SM were matched to those who did not. For each case-controlled pair, a paired t-test was used to measure statistical significance of the rate at which the nine HEDIS measures were met within two months after patients began using SM. Following a regression analysis, results showed that patients who used SM had improved HEDIS measures. In the match-control analysis, SM use was associated with a 2.4 to 6.5 percent improvement in performance ($p<0.0001$) in Hemoglobin A1c screening and control, LDL-C cholesterol

screening and control, retinopathy screening, and nephropathy screening. In addition, SM use was associated with improved performance in blood pressure control in patients with diabetes as well as patients with hypertension. Patients with hypertension only, however, had similar HEDIS measures among SM users and non-users.

This study controlled for confounding variables such as age, sex, baseline HEDIS measures, primary care provider, and disease state. However, the type of people who use SM likely differed in ethnicity, economic status or educational level from those who did not use SM. Although a randomized control study, the gold standard of research, was not used, this study did use a matched-control design with a large, heterogeneous population sample consisting of more than 35,000 people with diabetes, hypertension or both diseases. The large sample size reduced participant bias and provider practice styles. Although the study was not able to assess the effect of SM independent of other portal features such as appointment reminders, lab results or other patient support, a modest, positive association between SM and HEDIS measures was observed.

Despite some limitations, the use of SM in combination with an EHR was positively associated with performance on HEDIS measures. Patients with diabetes, hypertension or both disease states, had improved HEDIS measures including Hemoglobin A1c, LDL-C, nephropathy, retinopathy, and blood pressure.

In another study, Bredfeldt, Compton-Phillips and Snyder (2011) conducted a retrospective study at Kaiser Permanente Mid-Atlantic States. The purpose of the study was to compare the use of SM and phone calls to scores calculated for accreditation in the Diabetes Recognition Program (DRP). DRP scores ranged between 20 and 100. The

higher the DRP score, the better the diabetes care provided. One hundred seventy-four primary care providers (PCPs) were evaluated for the study. According to the DRP requirements, providers included in the study had to have at least 25 patients with diabetes on their provider panel during the time in which the data collection occurred.

Patients with diabetes were identified through Kaiser Permanente's population management database and those who met inclusion criteria were included in the study. DRP scores were calculated based on health related data obtained from electronic medical records (EMR) which included the most recent recorded Hemoglobin A1c, LDL and blood pressure (BP) levels. The proportion of values above or below the desired range was calculated. In addition, the study included whether a patient had a foot examination, an eye examination, a nephrology assessment, or smoking cessation counseling.

Descriptive statistics were used to determine the characteristics of physicians and their patients. Linear regression models identified the relationship between the use of SM, phone and DRP scores while controlling for confounding variables. Generalized estimating equations (GEE model) were used to account for clustering of physicians and their patients.

The study indicated that physician panels with predominantly white or mixed race panels were more likely to communicate with their patients between office visits using both phone ($P<0.01$) and SM ($P<0.01$). Consequently, physician DRP scores were higher (80 ± 12, 1 SD) as well. Physicians with predominantly black or Hispanic patient panels cared for significantly more patients with diabetes (152 vs. 108, $P<0.01$) but, had lower

overall DRP scores (51 $\pm$ 19, 1 SD). Even in this group, however, if providers did use SM, their DRP scores tended to be higher. The researchers also evaluated whether the use of SM and phone had an effect on outcome measures. The use of SM was strongly associated with improvement in outcome scores ($P<0.01$). However, health outcomes measured by DRP scores were not statistically associated with the use of the phone.

This study has two major limitations. The first limitation is that the cross-sectional design of the research project limited the ability to determine causality based on the current results. Providers who used SM previously, may have been more likely to use SM during the study, resulting in improved DRP scores. Another major limitation of the study was that it lacked a content analysis of the SM and phone interactions. The phone, for example, may have been used by physicians or patients for more administrative purposes such as scheduling appointments, whereas, SM may have been used to communicate more clinical-related information.

Although there were a few limitations, this study was able to demonstrate a positive association between SM use and DRP scores. The use of SM and to a lesser extent, the telephone, is associated with higher DRP scores and improved quality of care. These associations suggest that provider-patient interaction using SM can improve care for patients with diabetes. Furthermore, this study was able to identify that minority groups, specifically blacks and Hispanics, are less likely to communicate with their physicians between office visits. Due to these results, it would be advantageous for physicians with predominantly black or Hispanic patients to promote the use of patient portals which could ultimately lead to higher DRP scores in high risk population and vulnerable ethnic groups.

SM use and health outcomes

In 2013, Wade-Vuturo, Mayberry and Osborn conducted a prospective study at the Vanderbilt University Medical Center (VUMC) exploring the relationship between self-reported SM use and glycemic control. The objectives of the study were to understand why some patients with Type 2 diabetes used SM and why others did not. The researchers also aimed to explore the relationship between self-reported SM use and glycemic control.

The researchers recruited adults from a primary care waiting room at the VUMC with Type 2 diabetes who were prescribed antihyperglycemic medications. Subjects were then divided into two groups; one group attended a focus group and completed a survey while the other group only completed a survey. The survey asked participants to self-report their use of MyHealthAtVanderbilt (MHAV). Results were used to stratify participants into one of 11focus groups. Two non-user groups were excluded from the study. Altogether, nine focus group transcripts and 54 individually completed participant surveys were analyzed.

Qualitative and quantitative analyses were conducted to understand why and how participants with Type 2 diabetes use SM and to determine if using SM resulted in better glycemic control. The qualitative analysis consisted of identifying general themes from the focus group transcripts, generating a list of terms, using NVivo 9 to complete a word search, and reading 1490 references to identify quotes that were relevant to SM. The researchers identified the following benefits: enhanced patient satisfaction, enhanced efficiency and quality of face-to-face visits and access to clinical care outside traditional

face to face visits. The analysis also identified a few barriers, including preconceived beliefs or rules about SM and prior negative experiences with SM.

Fischer's exact tests and Mann-Whitney U tests were used to quantitatively analyze the differences between focus groups and survey-only participants on demographic and diabetes characteristics such as Hemoglobin A1c values. Spearman's correlation coefficients were used to identify relationships between participants reported use and actual use of each portal feature, as well as their Hemoglobin A1c values. Finally, Mann-Whitney U tests and Spearman's correlation coefficients were used to determine if demographic differences in the use of MHAV features were significantly associated with Hemoglobin A1c values. Participants who used MHAV more frequently to SM their provider were marginally associated with lower Hemoglobin A1c levels ($r=-0.26$, $p=0.07$). Additionally, participants who used MHAV more frequently to schedule an appointment were significantly associated with lower Hemoglobin A1c value ($r=-0.29$, $p=0.04$).

The generalizability of the study findings is considered to be a limitation. There were no differences noted in SM use among gender, age, race, income or education levels of the participants which may have been the result of the limited variability in the selected sample. Also, only English-speaking participants were included in the study; therefore, English proficiency was not measured. Furthermore, self-reported frequency of MHAV might not have accurately reflected actual portal use. Finally, the small sample size was not large enough to identify potential confounding variables between SM use and glycemic control.

Despite several limitations, the researchers concluded that greater use of SM was associated with glycemic control which was consistent with a large cohort study of adults with diabetes completed by Harris et al. in 2009. Both studies found that greater SM use was associated with positive clinical outcomes, especially glycemic control. In addition, SM facilitated access, improved delivery of care, and enhanced patient satisfaction. Overall, the study showed that patient initiated communication of health information does engage patients in their health care.

SM and utilization outcomes

A retrospective cohort study of 132 VA facilities was conducted on the implementation of SM and urgent care (UC) visits (Shimada et al., 2013). The purpose of the study was to identify facility characteristics related to higher rates of SM adaptation and to understand the relationship of SM and UC utilization rates. Data was collected between July 2010 and June 2012 from 132 VA facilities that had implemented SM for the first time using My Health*e*Vet (MHV) Coordinator survey results and the Patient Aligned Care Team (PACT) Compass data.

Data was analyzed using facility level factors associated with SM opt-in rate as the dependent variable and facility factors (MHV coordinator time spent helping Veterans register or authenticate, number of computers available for Veteran use, having a dedicated MHV room, and organizational leadership support) as the independent variables. Significance was determined using bivariate linear regression models and 2-sided *t* tests. Association of increases in SM use with changes in UC visits were obtained using regression analyses by dividing the number of UC visits for PC patients at that

facility during the month by the total number of unique PC patients on provider panels. Segmented linear regression models were used to study trends of utilization pre-SM and post-SM. The Durbin-Watson test was used for observations and the Dickery-Fuller Root test was used for seasonality. Based on those results, the autoregressive integrated moving-average models (ARIMA) were used to evaluate trends. To estimate the association of UC and SM use, a Generalized Estimating Equations (GEE) model with an autoregressive correlation structure was applied to acknowledge repeated measures by each month.

Results from the study showed that facilities with MHV Coordinators who assisted Veterans with MHV had higher SM opt-in rates (2.13%) than other facilities (1.52%, $t_{116.01}$=-2.81, P=0.0058). Additionally, facilities that had computers available for Veterans to use for enrollment were significantly associated with SM opt-in rates (P=0.0076). Finally, at the 22 facilities that had a designated MHV room, the mean SM opt-in rate was significantly higher (2.54%) compared to facilities (1.69%, $t_{25.30}$= -2.29, P=0.031) that did not have a designated MHV room. After controlling for region, facility size, staffing ratios, the degree of PACT implementation, and the volume of PC telephone encounters at the facility, a significant association was determined between higher levels of SM use and lower rates of UC (incidence rate ratio (IRR) = 0.9988, P=0.0012).

A limitation of this study, as with any observational study, is that complete causality could not be determined. It is likely that SM use is a marker for another underlying process. An additional study limitation was the deadline for adopting SM into primary care for all VA hospitals. Not all VAs adopted SM and late adopting facilities did not have much experience with using SM. Additionally, a performance measure was

established, aiming for 15% SM opt-in by September 2012. The performance measure, however, was not tied to an incentive for reducing UC rates. Furthermore, the research team did not have access to facility-level information on quality improvement initiatives or measures. As such, there may have been efforts to improve continuity of care within primary care.

Although this study had a few limitations, the results were consistent with previous reports from research conducted by Kaiser Permanente (Zhou, Kanter, Wang, Garrido, 2010). Both study results showed an improvement in continuous care by reducing in-person visits and increasing virtual patient contacts. The researchers discovered a positive association between SM and UC utilization. Furthermore, VA facilities that were early adopters of SM were able to reduce in-person visits by building stronger patient-provider relationships. Ultimately, a higher use of SM allowed an increasing number of patients to take a more active role in their healthcare decisions.

SM and DSME outcomes

To reduce complications associated with diabetes, on-going education and support from diabetes educators is crucial. In a prospective, longitudinal, quasi-experimental study conducted by Greenwood et al. (2014), the feasibility of providing diabetes self-management support (DSMS) via telephone or SM was compared to Hemoglobin A1c and LDL levels, behavioral achievement, and health maintenance task completion. All participants were English-speaking patients at least 18 years of age with Type 2 diabetes who completed an in-person DSME class. The goal was to include 50 participants in each group.

At the conclusion of the DSME class, participants were asked to choose their preferred method of follow-up/support by a certified diabetes educator (CDE). Participants could select a one-time in-person visit, a telephone appointment, or SM via a patient portal. The in-person group met with a CDE three to six months after the completion of the DSME class. Participants worked on new goals and completed annual health maintenance tasks. The telephone group received a scheduled follow up phone appointment, approximately 15-20 minutes in length with a CDE at three, six, and nine months following completion of the DSME program. All telephone scripts focused on evaluation of behavior change goal achievement and reminders for completion of health maintenance tasks. The CDE used MI techniques to identify barriers to achieving goals, opportunities for success, and evaluation of goal achievement. Participants in the SM group received schedule follow up messages from a CDE electronically through My Health Online at three, six and nine months. One SM diabetes self-management support encounter consisted of a series of three messages delivered to the participant, an initial message followed by two structured reply messages, for a total of three opportunities for the educator to reply each period. All templates focused on evaluation of behavior change goal achievement and reminders for completion of health maintenance tasks. Educators responded with one or two follow-up messages to address questions, encourage problem solving, and provide feedback.

The study assessed behavioral goals, feasibility, and physiologic measures. Participants were asked to self-evaluate the following goals on a scale of one to ten: healthy eating, being active, monitoring, taking medications, problem solving, reducing risks, and healthy coping. A self-rating of greater than or equal to seven was considered

to be successful. Next, feasibility was determined by the number of attempted contacts, the number of completed contacts and the duration of the contacts. The number of contacts divided by the number of attempts determined the success rate. Patient satisfaction, behavioral goal achievement and health maintenance task completion were evaluated through an online survey. Finally, physiologic data including pre- and post-Hemoglobin A1c levels and LDL cholesterol data were obtained. The researchers concluded that there were no significant differences among the groups in any measure. Both telephone and SM were feasible methods for providing ongoing support in patients with type 2 diabetes. Total mean Hemoglobin A1c levels decreased significantly by -0.88% ($P<.05$) from baseline to nine months; however, mean change in LDL was not significant. Additionally, mean goal achievement improved ($P<.05$) from three to nine months.

Educators found it challenging to keep patients engaged despite self-selecting their preferred follow group. However, both telephone and SM are considered feasible methods for providing on-going diabetes support when patients are allowed to choose the method of intervention. Unfortunately, technical issues such as remembering passwords and logging into the system discouraged many people from participating and several people didn't respond to the SM that they were sent and as a result received a telephone call. Researchers used a self-reported survey related to healthy eating, being active, monitoring, taking medications, problem solving, reducing risks, and healthy coping. The self-reported survey provided subjective information and was likely not 100% accurate or reproducible but did provide valuable information on diabetes self-care information.

Despite these limitations, the study showed that changing the way in which health care is delivered through the use of the telephone and SM resulted in similar outcomes to a traditional in-person visit. Hemoglobin A1c levels significantly decreased and behavioral goals were successfully achieved. Furthermore, the ideology that DSME and DSMS reduce Hemoglobin A1c levels after an intervention has been implemented was supported in the study findings as well.

Conclusion/Summary

Diabetes, hypertension and hyperlipidemia are chronic diseases that affect large segments of the US population. Their associated health care costs are a burden to the US health care system. However, the implementation of technology into the health care delivery system is changing the way health care is delivered while engaging and empowering patients to become more involved in their health care. As a result, better health-related outcomes are being achieved and lower healthcare costs are being realized.

Overall, the research articles showed a positive association between SM use and health-related outcomes. Despite using different methods to obtain sample populations and different study designs, four of the research studies achieved a positive statistical significance between SM use and Hemoglobin A1c levels. Furthermore, the two studies conducted by researchers at Kaiser Permanente also discovered a statistically significant association between SM use and improved LDL and blood pressure levels. Finally, an improvement in continuous care by reducing in-person visits, increasing virtual patient contacts, and building stronger patient-provider relationships were results discovered in two of the research studies (Zhou et al. and Shimada et al.).

These studies have showed promising results following the implementation of SM in the management of chronic diseases. It may be hypothesized that implementation of SM into weight management programs would result in similar, positive outcomes; however, research is lacking in this area.

The overall purpose of this research project is to improve the outcomes of the Choose to MOVE! Weight Management Program by reducing obesity within the Veteran population and by helping manage co-morbid conditions related to obesity such as diabetes, hyperlipidemia and high blood pressure. By sending motivational, content-focused SMs, better weight-related outcomes such as weight loss, body fat, BMI levels, and reduced waist circumference will hopefully be achieved.

CHAPTER 3: METHODOLOGY

In 2006, the rising prevalence of obesity in the Veteran population prompted the VHA National Center for Health Promotion and Disease Prevention (NCP) to launch a standardized format for weight management throughout the VA known as MOVE! (US Department of Veterans Affairs, 2015). The MOVE! program was developed to help Veterans lose weight, keep it off, and improve their overall health. The program was designed using evidenced-based obesity treatment guidelines and employed a comprehensive, multidisciplinary team approach for weight management (US Department of Veterans Affairs, 2015). In 2003, VHA launched MOVE! as a pilot program at several VA locations. In July of 2005, Milwaukee began its first MOVE! program. Appleton followed in 2006, and Green Bay in 2012.

For this prospective, quasi-experimental study, participants were recruited from the Milwaukee, Appleton, and Green Bay VA sites. The VA Internal Review Board (IRB) deemed this study to be a quality management project and therefore, did not require full IRB approval.

Population and Sampling

A total of 90 Veterans enrolled in the Choose to MOVE! Weight Management Program between January 2015 and September 2015 at the Clement J. Zablocki Milwaukee VA Medical Center, the John H. Bradley Appleton VA Community Based Outpatient Clinic and the Milo C. Huempfner Health Care Center in Green Bay, Wisconsin. Participants who met the following MOVE! inclusion criteria were enrolled: a body mass index (BMI) greater than or equal to 30 or a BMI greater than 25 but less than

30 with an obesity-related co-morbidity, such as diabetes mellitus, hypertension, dyslipidemia or degenerative joint disease.

Study Design

Prior to the start of each Choose to MOVE! group, a class roster was obtained from the MOVE! Coordinator. Each patient's medical record was then reviewed for the acronym "MVH" which identified patients enrolled in the My Health*e*Vet portal. Patients with "MHV" in their medical chart were placed into the intervention group and patients without "MHV" were placed into the control group.

MOVE! Program

Each Choose to MOVE! Weight Management Program provided 12 on-site group education classes. Due to space limitations, the classes varied in size, but, followed a similar core curriculum (Appendix A). Each MOVE! session focused on nutrition, physical activity and behavioral health components. The classes were taught by a multidisciplinary team including a registered dietitian (RD), a behavioral health specialist, a pharmacist (pharmD), and a physical therapist (PT) or occupational therapist (OT). Both Appleton and Green Bay also had a nurse practitioner (NP) on their interdisciplinary team. Each group session was scheduled for two hours bi-monthly and utilized a variety of teaching modalities including short lessons, hands-on activities and discussion sessions (Appendix B). Participants were required to keep a food and exercise journal. The journals were reviewed by the RD during the class and then returned to each participant with feedback.

SM Intervention

Among those in the intervention group, SMs were sent on a predetermined day during the week that an in-person MOVE! class was not scheduled to meet. The first SM was sent the week after the fourth Choose to MOVE! group session and the last SM was sent the week after the eleventh session. The first SM was sent approximately eight weeks after the start of the program when, in general, people begin to lose interest or motivation in losing weight. A total of eight motivational SMs were sent over a period of six months or the duration of the Choose to MOVE! program (Appendix C).

Together, the study coordinator and the MOVE! Coordinator created the eight SMs. The SMs were intended to be brief, motivational, and content-focused. The SMs highlighted on three key content areas: eating healthy, exercising regularly and changing behaviors. Using the read receipt feature, each SM sent was then tracked to determine if the recipient read the message or not.

Measures and Tools

A variety of instruments and tools were used to measure participant outcomes in the Choose to MOVE! Weight Management Program. Each measure is defined in detail below.

Physical Measures

Change in weight was the primary endpoint of this study. A calibrated digital scale was used to weigh each participant at the start of each class. Participants were weighed with their shoes on as well as light clothing to comply with privacy and

sanitation requirements. BMI was calculated once the weight was entered into the vitals package within the Computerized Patient Record System (CPRS). Secondary measures included percent body fat and waist circumference. A body fat analyzer (Omro) and a tape measure (Nasco) were used to calculate percent body fat and waist circumference, respectively, prior to the first session and again at the last session. When measuring waist circumference, the instructors used the iliac crest as the point of reference on participants with a BMI less than 35 whereas, the belly button was used on participants with a BMI greater than 35.

Biochemical Measures

Participants were scheduled to have the following baseline fasting labs drawn prior to the start of the first class and were repeated prior to the last class: total cholesterol (TC), low density lipoproteins (LDL), high density lipoproteins (HDL), triglycerides (TG), glucose, Hemoglobin A1c, and alanine aminotransferase (ALT). All labs were processed at the Milwaukee and Green Bay VA laboratories.

Questionnaire

At the final Choose to MOVE! class, each Veteran was given a post-class questionnaire to complete (Appendix D). The purpose of the questionnaire was to evaluate the effectiveness of the SMs based on the participant's self-report and to collect demographic information that may potentially identify correlations between age, gender, race, education, income levels, computer experience and overall use of MHV. The questionnaire was not validated and was expected to have some degree of participant bias associated with the results.

Data Analysis Process

The data collected for each Choose to MOVE! class was entered into an EXCEL spreadsheet and stored on a secure VA drive by a member of the interdisciplinary MOVE! team. The MOVE! Coordinator granted the study coordinator access to the MOVE! data allowing it to be analyzed. Demographic data including first and last names, the last four digits of social security numbers, age, sex, name of referring providers, height, and weight were obtained from each patient's medical record. Weight loss, percent weight change, percent body fat, percent body fat change, waist circumference, percent waist circumference change, initial labs, final labs and the percent lab value change were calculated using formulas built by the MOVE! Coordinator.

Ninety participants were eligible for this study. After exclusions due to attrition, (17 participants in the control group and five participants in the intervention group) the control group consisted of 49 participants and the intervention group consisted of 19 participants. Of the 19 participants in the intervention group, only eight read at least one SM. Five read all eight messages and three read six or less messages.

Statistical Analysis

Descriptive statistics were used to compare the characteristics of SM users to non-users, shown in Table 1. Mean $\pm$ standard deviations and *p* values were calculated for each percent change (Table 2). Change in weight was analyzed using t-tests between the intervention and control groups. Secondary measures of BMI, waist circumference, body fat, glucose, Hemoglobin A1c, total cholesterol, LDL, HDL, triglycerides, and ALT

levels were assessed in a similar procedure. The significance level was set at 0.05, indicating that a *p* value below 0.05 would be considered statistically significant.

CHAPTER 4: RESULTS

Demographics

Ninety participants were recruited for the study (n=66 control group and n=24 intervention group). Forty-nine of the 66 participants in the control group completed the Choose to MOVE! program and 19 of the 24 participants in the intervention group completed the weight management program. Only 36 of the 49 participants in the control group completed a post class questionnaire; whereas all of the participants in the intervention group completed the questionnaire. The majority of the study participants were male (n=62). All 11 of the participants in the intervention group who did not read any SMs were male. Of the eight who read the SMs in the intervention group, one was female and seven were male. Thirty-one of the 36 participants who completed the questionnaire in the control group were male and five were female. The mean age of the subjects in the control group was 62.4($\pm$8.36) years old and the mean age of the subjects in the intervention group was 63.1 ($\pm$7.97) years old. The mean age of those who read the SMs in the intervention group was 61.4 ($\pm$9.41) years old. Seven of the participants who read the SMs were 51-65 years or older, only one participant was 35-50 years old. In the control group, 13 were 51-65 years or older, 21 were 65 years or older and one was 35-50 years old. Of the eight participants in the intervention group who read the SMs, seven were Caucasian and one was African American. Similarly, nearly 92% of the participants in the control group were Caucasian. All eight participants in the intervention group who read the SMs had at least a high school degree; six also had either an associate's or a bachelor's degree. One third of the participants in the control group received a high school degree, however, 16 also obtained an associate's degree, eight

earned a bachelor's degree and one had a master's degree. Four of the eight participants who read the SMs in the intervention group, considered their computer experience to be intermediate, whereas, two considered their experience to be advanced and two considered their experience to be at the beginner level. Nearly 75% of the participants in the control group considered themselves to be intermediate computer users compared to a quarter that felt they were beginners. Fifty percent of the participants in the intervention group who read the SMs had been using MHV for at least one to three years or more. Only three of the participants had been using MHV for less than a year. The majority of the control group participants (69%) indicated that they had used MHV less than 3 months. Table 1 illustrates the demographic data for each group.

Table 1. Demographics of participants in the Choose to MOVE! Weight Management Program who read SMs, those that did not, and the control group.

Characteristics	**SM Readers (n=8)**	**SM Non-Readers (n=11)**	**Control (n=36)***
Age, y	61.4 (±9.41)	63.1 (± 7.97)	62.4(±8.36)
Gender, n %			
Male	7 (87.5)	11(100)	31(86)
Female	1(12.5)	0	5(13.9)
Race/ethnicity, n%			
Caucasian	7 (87.5)	11 (100)	33(91.7)
African American	1(12.5)	0	1 (.03)
Hispanic	0	0	1(.03)
Native American	0	0	1(.03)
Level of education, n%			
High School	2 (25)	11 (100)	11(30.6)
Associates degree	3 (37.5)	0	16 (44)
Bachelor's degree	3 (37.5)	0	8(22)
Master's degree	0	0	1(.03)

Annual income, n%			
<$25,999	2 (25)	4 (36)	8 (22)
$26,000-$40,999	4(50)	3 (27)	11(30.6)
$41,000-$59,999	0	0	6(16.7)
>$60,000	2 (25)	0	5 (13.9)
Prefer not to answer	0	4 (36)	6 (16.7)
Computer experience			
Beginner	2 (25)	4 (36)	9(25)
Intermediate	4 (50)	6 (54.5)	26(72)
Advanced	2(25)	1 (.09)	1(.03)
Enrolled in MHV			
< 3 months	1 (12.5)	7(63.6)	25(69)
3 months -1 year	2 (25)	1(.09)	7(19)
1-3 years	4(50)	2 (18)	2(.06)
>3 years	1(12.5)	1 (.09)	2(.06)

* 36 of 49 participants in the control group completed the post class questionnaire.

Health Outcomes

The mean percent weight change was not significantly different among the eight participants in the intervention group who read the SMs compared to the 49 participants in the control group (-4.33% vs. -4.15%, p=0.91). Similarly, changes in BMI, body fat and waist circumferences were also not significantly different between the intervention and the control group (Table 2). The mean percent change in total cholesterol for the intervention group who read the SMs was lower than the control group (-10.68% vs. -6.98% respectively, p=0.60). Mean percent change in triglycerides also were lower among the intervention group participants who read SMs versus the control group (-16.18% vs. -9.17%, respectively, p=0.64). Although the trends in the data suggest that

better outcomes were achieved among the SM readers in the intervention group compared to the control group, results did not reach statistical significance.

Table 2. Intervention Group vs. Control Group Outcomes displayed as % change

Outcome	**Intervention Group Mean % Change ±SD**	**Control Group Mean % Change ±SD**	***p* value**
Weight	-4.33%±4.15%	4.15%±4.29%	0.91
BMI	-4.24%±4.18	-4.10%±4.30	0.93
Waist circumference	-5.04%±3.62	-6.36%±4.93	0.50
Body Fat	-0.71%±7.84	-7.90%±8.70	0.04*
Glucose	-7.18±21.81	-3.98±18.14	0.65
Hemoglobin A1c	-4.14±6.90	-3.24±6.89	0.73
Total Cholesterol	-10.68±20.03	-6.89±18.76	0.60
LDL	-7.08±33.32	1.11±43.02	0.61
HDL	-2.01±13.14	-1.08±18.48	0.89
Triglycerides	-16.18±36.51	-9.17±38.74	0.64
ALT	-9.33±24.34	-5.91±32.65	0.79

*P <0.05.

T-test used to compare % change between the control group and the intervention group.

The mean change in weight, BMI, waist circumference and body fat was also not statistically significant among the SM readers and non-readers in the intervention group or the participants in the control group; however positive clinical outcomes were achieved among all the groups. The mean weight loss was consistent among SM readers, non-readers and participants in the control group with an approximate weight loss of 4.5kg. Furthermore, the change in mean BMI levels among the readers, non-readers and

the control group participants was similar as well with a reduction in BMI levels by one to two points. Similar positive outcomes were observed among all three groups when comparing waist circumference levels. A mean change of approximately two to three inches was lost among the participants in each group. Finally, a one to three percent change in body fat levels was observed among the SM readers, non-readers and the control group (Table 3).

Table 3. Mean initial weight, BMI, waist circumference, and % body fat compared to mean final values among SM readers, non-readers and control group.

	SM Readers (n=8)	**SM Non-Readers (n=11)**	**Control (n=49)**
Outcomes			
Mean Weight, pounds			
Initial	247.7±38.1	252.3±34.9	248.1±29.5
Final	237.7±41.1	243.6±38.1	238.3±33.8
Mean BMI			
Initial	36.9±4.9	36.5±4.4	36.2±4.4
Final	35.4±5.5	35.2±5.1	34.8±4.9
Mean Waist Circumference, inches			
Initial	48.7±4.0	49.0±3.6	49.2±4.7
Final	45.8±4.5	47.5±4.4	46.0±4.7
Mean Body Fat, %			
Initial	36.4±3.8	35.1±3.5	36.7±4.4
Final	35.7±4.9	32.8±4.6	33.6±5.0

Post-Questionnaire Results

According to the post-class questionnaires, only two of the eight participants who read the SMs recalled reading more than six SMs, yet, according to the read receipt feature in My Health*e*Vet, five participants read more than six SMs. The two participants who recalled reading more than six messages responded that they "always" found the messages to be motivational. Five of the eight participants noted that the SMs "always" helped them stay on track with their diet and physical activity programs, whereas, three participants felt that only "sometimes" the SMs helped them stay on track. Both of the participants who recalled reading more than six messages, had been My Health*e*Vet users for one to three years.

CHAPTER 5: DISCUSSION

Cardiovascular disease is the leading cause of death throughout the world (Mozzarian et al, 2014). Elevated triglyceride and total cholesterol levels are two of the main causes of cardiovascular disease. Furthermore, people with high cholesterol levels are two times more likely to develop heart disease compared to people with optimal cholesterol levels. Participants in the intervention group that read the motivational, content-focused SMs lowered their total cholesterol and triglyceride levels, which lowered their risk for cardiovascular disease. Therefore, motivational, content-focused SMs did provide added value, or benefit in terms of reducing cardiovascular risk.

Like the present study, previous research has shown some positive correlations between SM use and chronic disease management including HTN, Type 2 diabetes and hyperlipidemia (Zhou, Kanter, Wang & Garrido, 2010). In 2010, researchers at Kaiser Permanente concluded that patient-provider SMs improved Healthcare Effectiveness Data and Information Set (HEDIS) measures for diabetes and hypertension (Zhou et al, 2010). Patients with diabetes, hypertension or both disease states, had improved HEDIS measures including Hemoglobin A1c, LDL-C, nephropathy, retinopathy, and blood pressure. In another study, (Bredfeldt, Compton-Phillips and Snyder, 2011) researchers concluded that the use of patient-provider SM was strongly associated with an improvement in DRP scores ($P<0.01$). Similarly, Wade-Vuturo, Mayberry and Osborn (2013) and Harris et al. (2009), concluded that greater patient-provider SM use was associated with positive clinical outcomes, especially glycemic control. Finally, Greenwood et al. (2014) showed that Hemoglobin A1c levels were significantly decreased as a result of SM use. This study, too, although not statistically significant, did

show an improvement in clinical outcomes including percent total cholesterol change and percent triglyceride change among subjects in the intervention group who read SMs compared to the subjects in the control group. A 10% loss of body weight, can lower cholesterol, blood pressure and improve the body's ability to produce insulin and prevent or delay the onset of Type 2 diabetes.

This study did have several limitations. First, the sample size and the power of the study were low. At a significance level of .05 and 80% power, the study would have needed 253 subjects per group or a total of 506 subjects to detect a 1% difference in the outcomes between the intervention and the control group. Future studies should consider a larger sample size and a longer duration in order to achieve a study strength that would show statistical significance in its outcomes. Next, the study coordinator assumed that anyone identified as a MHV user, used the SM feature in the patient portal. This study showed, however, that roughly 50% of the participants in the intervention group (n=11) did not use SM. According to the read receipt feature, only eight participants in the intervention group read the SMs. Furthermore, only five participants read all eight messages that were sent over a six month period. The age of the participants may have had an effect on whether SMs were read or not. The mean age of the 11 participants in the intervention group that did not read the SMs was 63.1 years; however, the mean age of those in the intervention group who read the SMs was 61.4 years, suggesting that slightly younger participants were more apt to read SMs. A quarter (25%) of the participants in the intervention group that read the SMs rated their computer knowledge as beginner compared to more than a third (36%) of the non-readers in the intervention group. This would suggest that there is a slight correlation between participants who read

the SMs and self-assessed their computer knowledge as higher than a beginner. To more effectively measure if motivational, content-focused SMs resulted in better weight-related outcomes, the MOVE! Coordinator would need to consider adding a session to the MOVE! curriculum on how to use the SM feature in the MHV patient portal. Also, the post class questionnaire was completed by each person who completed the MOVE! group, regardless if they were part of the control group or the intervention group. The data collected was a self-assessment that resulted in information that could not be verified for accuracy. Not all of the post questionnaires were completed. The data, however, was only used for descriptive purposes and only provided a few potential correlations related to the outcomes. Finally, future research should consider a randomized control design to confirm the association between receiving motivational, content-focused SMs and improved weight loss related outcomes.

Overall, the current Choose to MOVE! Weight Management Program is achieving positive weight-related outcomes. Between January 2015 and September 2015, the MOVE! program achieved an average weight loss of 4.5kg. In addition, the initial mean BMI compared to the final mean BMI(36.24, $\pm$4.38 vs. 34.8 $\pm$4.93) along with the initial waist circumference (49.21, $\pm$4.65 vs. 46.02, $\pm$ 4.65), and percent body fat (36.38%, $\pm$4.44 vs. 33.59%, $\pm$5.04) showed improvement. Similar positive outcomes were also achieved in percent change in fasting glucose (-3.98%), Hemoglobin A1c (-3.24%), HDL (-1.08%) and ALTs (-5.91%). Bi-monthly, face-to-face sessions that focus on healthy eating habits and regular physical activity are achieving positive results. The interdisciplinary team approach to weight management uses a variety of teaching modalities that has been proven to be highly effective without the use of SMs.

The Choose to MOVE! Weight Management Program is offered at the Milwaukee, Green Bay and Appleton VAs. Each site offers a 12-session, 6 month class that meets bi-monthly. Classes are taught by an interdisciplinary weight management team that includes a registered dietitian, pharmacist, behavioral health specialist or a nurse practitioner and a physical or occupational therapist. One RDN is the MOVE! Coordinator for all three sites. She has the responsibility of developing a course curriculum that ensures Veterans are taught how to eat healthy, exercise and make behavioral changes in order to lose weight, keep it off, and improve their overall health.

The MOVE! program in Milwaukee has been in existence since 2005. Since then, hundreds of Veterans have participated in the Choose to MOVE! Weight Management Program and lost weight. With 75% of Veteran population considered overweight or obese, the MOVE! program has made significant progress in helping address obesity in the Veteran population.

CHAPTER 6: CONCLUSION

The purpose of this research project was to improve the weight-related outcomes of the Choose to MOVE! Weight Management Program with the use of motivational, content-focused SMs. The present study, however, did not show that SMs produced better weight loss-related outcomes including weight loss, BMI, body fat and waist circumference. However, a slight improvement in total cholesterol and triglyceride levels was observed. Overall, the MOVE! program is achieving positive clinical outcomes with its current course curriculum and is successfully helping Veterans lose weight, keep it off, and improve their overall health.

Future research is needed to determine if adding motivational, content-focused SMs to the Choose to MOVE! Weight Management Program would significantly improve the quality of the program or produce better weight loss-related outcomes. At this time, increasing MOVE! staff or designating additional hours for SM purposes are not needed to enhance the MOVE! program. The current MOVE! program is achieving positive weight loss-related results including weight loss, BMI, body fat, waist circumference, Hemoglobin A1c, fasting glucose, HDL and ALTs. Future research is needed to determine the association between receiving motivational content-focused SMs and improved weight loss-related outcomes.

.

BIBLIOGRAPHY

Bredfeldt, C.E, Compton-Phillips, A.L & Snyder, M.H. (2011). Effects of between visit physician-patient communication on Diabetes Recognition Program scores. *International journal for Quality in Health Care, 23* (6), 664-673

Centers for Disease Control and Prevention. (2014). High blood pressure fact sheet. Retrieved from http://www.cdc.gov/nchs/fastats/hypertension.htm

Centers for Disease Control and Prevention. (2014). Adult Obesity Facts. Retrieved from http://www.cdc.gov/obesity/data/adult.html

Centers for Disease Control and Prevention. (2014). Halting the Epidemic by Making Health Easier At A Glance 2011. Retrieved from http://www.cdc.gov/chronicdisease/resources/publications/aag/obesity.htm.

Centers for Disease Control and Prevention (2013). Cholesterol Fact Sheet. Retrieved from http://www.cdc.gov/dhdsp/data_statistics/fact_sheets/fs_cholesterol.htm

Centers for Disease Control and Prevention. (2014) *National Diabetes Statistics Report: Estimates of Diabetes and Its Burden in the United States, 2014*. Atlanta, GA: U.S. Department of Health and Human Services. Retrieved http://www.cdc.gov/diabetes/pubs/statsreport14/national-diabetes-report-web.pdf.

Centers for Medicare and Medicaid. (2009). Fact Sheets: Medicare and Medicaid health information technology: title IV of the American Recovery and Reinvestment Act

Retrieved from http://www.cms.gov/Newsroom/MediaReleaseDatabase/Fact-Sheets/2009-Fact-Sheets-Items/2009-06-16.html

Flegal, K.M., Carroll, M.D., Kit, B.K, Ogden, C.L. Prevalence of obesity and trends in the distribution of body mass index among US adults, 1999-2010 (2012). *Journal of the American Medical Association 307*(5), 483-490

Funnell, M.M, Brown, T. L, Childs, B. P, Haas, L.B, Hosey, G.M, …Weiss, M.A. (2011). National Standards for Diabetes Self-Management. *Diabetes Care, 34*, S89-S96. Doi: 10.2337/dc11-S089

Go, A.S., Mozaffarian, D., Roger, V.L., Benjamin E.J., Berry, J.D.…Turner, MB (2013). 2013 Update: A Report from the American Heart Association. *Circulation.* 127:e6-e245. doi: 10.2337/dc12-2625

Greenwood, D.A., Hankins, A. I., Parise, C.A., Spier, V., Olveda, J., Buss, K.A. (2014). A Comparison of In-person, Telephone, and Secure Messaging for Type 2 Diabetes Self-Management Support. *The Diabetes Educator.* Retrieved from tde.sagepub.com at US DEPT OF VETERAN AFFAIRS. Doi: 10.1177/0145721714531337

Institute of Medicine (2001). Crossing the Quality Chasm: A New Health System for the 21st Century. Washington D.C.: National Academy Press

Littman, A.J., Boyko, E.J., McDonell, M.B., and Fihn, S.D. (2012) Evaluation of a Weight Management Program for Veterans. *Prev Chronic Dis,* 9, 110267. Doi: http://dx.doi.org/10.5888/pcd9.110267

Mozzafarian D., Benjamin E.J., Go A.S…Turner, M.B.. Heart Disease and Stroke Statistics-2015 Update: a report from the American Heart Association. *Circulation*. 2015;e29-322

Nelson, K.M. (2006). The Burden of Obesity Among a National Probability Sample of Veterans. *J Gen Intern Med, 21*(9), 915-919

Nwankwo T, Yoon SS, Burt V, Gu Q. Hypertension among adults in the US: National Health and Nutrition Examination Survey, 2011-2012. NCHS Data Brief, No. 133. Hyattsville, MD: National Center for Health Statistics, Centers for Disease Control and Prevention, US Dept of Health and Human Services, 2013

Otte-Trojel, T. deBont, A. van de Klundert, J., Rundall, T.G. (2014). Characteristics of patient portals developed in the context of health information exchanges: early policy effects of incentives in the meaningful use program in the United States. *J Med Internet Res, 16*(11), e258. Doi: 10.2196/jmir.3698

Shimada, S.L., Hogan, T.P., Rao, S.R., Allison, J.J., Quill, A.L., Feng, H.,...Houston, T.K. (2013). Patient-Provider Secure Messaging in VA Variations in Adoption and Association With Urgent Care Utilization. *Medical Care,51*(3), S21-S28

US Department of Veterans Affairs (2014). My HealtheVet. Retrieved from https://www.myhealth.va.gov/index.html

US Department of Veterans Affairs (2013). Veterans Health Administration. Retrieved from http://www.va.gov/health/NewsFeatures/20111115a.asp

US Department of Veteran Affairs (2015). National Center for Health Promotion and Disease Prevention. Retrieved from http://www.prevention.va.gov/

Wade-Vuturo, A.E., Mayberry, L.S. & Osborn, C.Y. (2013). Secure messaging and diabetes management: experiences and perspectives of patient portal users. *Journal of the American Medical Information Association*, *20*, 519-525. doi:10.1136/amiajnl-2012-001253

Weiner, B.J., Haynes-Maslow, L., Kahwati, L.C., Kinsinger, L.S., Campbell, M.K. (2012). Implementing the MOVE! weight-loss management program in the Veterans Health Administration, 2007-2010: a qualitative study. *Prev Chronic Dis 9*,E16

Zhou, YY, Kanter, MH, Wang, JJ & Garrido T. (2010). Improved Quality At Kaiser Permanente Through E-Mail Between Physicians And Patients. *Health Aff, 29*, (7), 1370-1375

Appendix A. MOVE! Curriculum

Class	Speaker	Topic	Primary Objectives
1	Medical	Intro to MOVE! Icebreaker Establish ground rules Discuss group expectations Success story Benefits of weight loss Explain weight self-management	• Understand group expectations and agree to group confidentiality • Identify at least 2 health benefits from a 10% weight loss • Optional: Understand hot to take an appropriate blood pressure
	Nutrition	Explain BMI & health risk Calories in vs. calories out Intro to food labels Explain use of food & physical activity logs	• Know what their current BMI is and what it measures • Identify the relationship between calories and weight • Identify where to find calories and serving size on the food label
	Physical Activity	Physical Activity Guidelines Physical Activity Pyramid Benefits of Physical Activity Exercise Safely BAM	• Understand PA Guidelines (at least 150 minutes of moderate intensity PA/week or at least 75 minutes of vigorous intensity activity) • Name at least 3 benefits of regular physical activity • Be aware of the Be Active & MOVE! Program and how to enroll
2	Medical	Medications and Weight	• Have an updated medication list in CPRS • Identify at least 2 conditions that my require less medications as a result of losing weight
	Nutrition	Calories in vs. calories out (review) Keeping food records Reading labels Serving size Activity: Measuring Portions (cup and bowl demonstration) "Food Detective" Activity: Compare Food Labels (cereals)	• Understand how to appropriately complete food record • Demonstrate label reading for serving size and calories and understand how to find nutrition facts if food labels are not available (Calorie King, Internet) • Understand how to appropriately measure portions • Know their personalized daily calorie goal
	Behavior	Habit Change Goal Setting	• Be able to demonstrate SMART goal setting
3	Medical	Strategies for reaching health and fitness goals	• Name at least 2 strategies for reaching health and fitness goals
	Nutrition		• Identify how to build a healthy plate using the plate method • Be able to return demonstrate label reading for serving size and calories
	Physical Activity	How to prepare for physical activity Warm/Cold weather exercise options Explain how to use pedometers and increase steps Activity: walking break to demonstrate use of pedometer	• Understand how to use pedometers to track physical activity and record activity on daily food and physical activity logs • Identify points to consider when being active: gear, locations, safety, warm-up & cool-down • Identify at least 2 ways to be physically active during each season
4	Medical	Diabetes/Pre-diabetes 15-15 Rule	• Veteran should be able to identify if he/she has diabetes/prediabetes • If diabetic, Veteran should understand how to appropriately identify and treat hypoglycemia using the 15-15 rule
	Nutrition	Carbohydrates Liquid Calories/Alcohol	• Understand recommended limits for alcohol consumption • Identify at least 2 food groups with carbohydrates • Understand how carbohydrates affect blood sugars and weight

	Behavior	Mindful Eating Emotions & your weight Activity: Clementine & pretzel mindfulness demonstration	• Explain what mindful eating is • Demonstrate how to eat more mindfully • Identify how emotions can impact food choices and eating behaviors
5	Medical	Heart disease Fatty liver disease	• Identify HDL as good cholesterol and LDL as bad cholesterol • Identify at least 2 contributors to high triglycerides • Understand that weight loss is the primary treatment for NASH
	Nutrition	Explain different types of fat 4 ways to go good fat: eliminate, substitute, moderation, read labels Calorie content of fats Activity: Use food diary from previous week to identify fats and have each patient select 3 ways to go good fat	• Identify which types of fat are good and which types of fat are bad • Determine which foods in our meal plan are high in fat • Identify at least one dietary source of good fat and one dietary source of bad fat and understand the difference between them • Understand that all types of fat (even good fats) are high in calories
	Physical Activity	Lifestyle vs planned activity Barriers to physical activity Making exercise fun	• Understand the difference between lifestyle and planned physical activity • Identify one barrier to physical activity and at least one way to overcome that barrier
6	Medical	Pain control Weight loss medications	• Identify at least 2 non-prescription strategies used for pain control • Understand effect of orlistat on weight and potential side effects
	Nutrition	Special occasion eating Activity: count number of 'special occasions' in one year Hunger vs. fullness Mindful eating (review)	• Recognize frequency of special occasion eating and understand how frequent splurges can impact weight loss • Identify at least 3 strategies for making healthier food choices during holidays and special occasions • Understand the difference between hunger, satiety and fullness
	Behavior	Conquer triggers & cues Planning ahead Social aspects of eating Managing stress	• Identify at least 2 environmental cues that may affect their eating and physical activity choices • Have patients develop a plan for successfully managing social cues • Have patients develop a plan for managing stress
7	Medical	Mid-group evaluation Sleep apnea	• Understand that overweight/obesity is a risk factor for sleep apnea and that weight loss may help improve the condition
	Nutrition	Dining out Barriers to making healthy choices while dining out Super-size me video Activity: review restaurant nutrition fact on-line	• Identify at least 2 healthy alternatives when dining out • Understand consequences of daily unhealthy food choices and limited physical activity on weight, cholesterol/TG and general health
	Physical Activity	Duration, frequency and intensity of physical activity Talk test/borg scale	• Understand the FITT concept • Understand how to use the 'talk test' to assess intensity of physical activity
8	Medical	Overcome plateaus Review benefits of 10% weight loss Review 'why I joined MOVE!' worksheet from class 1	• Recognize and understand weight plateaus • Name at least 2 ways to get past a weight plateau • Identify the reasons why they want to lose weight
	Nutrition	Fiber Frequent feeder Snacks	• Identify at least 3 food sources with fiber • Identify recommended daily fiber intake • Identify at least 2 benefits of eating smaller more frequent meals

	Behavior	Slips & Setbacks Define a slip Identify triggers for a slip Ways to resolve a slip Make a plan to deal with slips	• Identify one way you can plan ahead to prevent and control slips
9	Medical	Options: Herbal Supplements	• Optional: Understand the potential risks of using herbal supplement • Optional: Understand the difference between an herbal supplement and vitamin
	Nutrition	Recipe modification Activity: Sample recipe modification on whiteboard	• Demonstrate ability to modify a recipe to decrease calories, fat and/or sodium content
	Physical Activity	4 elements of physical fitness Strength training Therabands demonstration Core exercises demonstration	• Understand what your core muscles are and give one example of a core exercise • Demonstrate proper use of therabands
10	Medical	Bone health Calcium and Vitamin D	• Understand why calcium and Vitamin D are important
	Nutrition	Finesse your food Activity: create a healthy plate	• Demonstrate creating a healthy meal via the plate method using paper food models
	Behavior	Keep it positive Discuss how to change negative thoughts to positive thoughts MOVE! Success Story example	• Demonstrate how to change a negative thought to a positive thought • Identify thoughts, feelings and behaviors that influence their eating behaviors
11	Medical	Optional: Cancer Optional: Smoking & Second-hand smoke	• Optional: Understand that being overweight may increase the risk of certain types of cancer • Optional: Understand risks associated with smoking and exposure to second hand smoke
	Nutrition	Sodium	• Understand how excessive sodium intake impacts (blood pressure, weight, etc.) • Identify recommended daily limit for sodium intake (<2300 mg for general populations, <1500 mg for African Americans, adults >50 years old, or anyone with HTN, CKD or DM) • Identify at least 2 foods that are high in sodium
	Physical	Ways to be more active, have fun, and stay motivated	• Identify 1 indoor activity that you enjoy
12	Medical	Present completion certificates Final lab review Final class quiz & evaluation	• Be able to discuss health benefits of weight loss • Compare initial labs with current
	Nutrition	Provide weight graph to Veteran Nutrition review BMI, Weight, % body fat, waist circumference Food and physical activity logs Plan for future follow up	• Compare initial measurements (i.e. BMI, weight, waist circumference, % body fat) with current • Identify and enroll in VA programs for continued weight loss/maintenance (i.e. MOVE! Forward, Be Active and MOVE!, TeleMOVE!)
	Behavior	Review why I joined MOVE! Worksheet from class Staying motivated Dealing with boredom	• Identify at least one way to stay motivated • Identify one way to overcome boredom

Appendix B. Choose to MOVE! Classes by Site

Site	Class	Instructors
Milwaukee	4-Week Intro Series: Group meets weekly for 4 consecutive weeks. Week 1: Orientation Week 2: Nutrition Week 3: Physical Activity Week 4: Behavioral Health Participants begin an 8-session Choose to MOVE! group that meets bi-monthly for 4 months.	Registered Dietitian Dietetic Technician Registered PharmD Psychologist
Appleton	12-Session Choose to MOVE! Participants join a 12-session Choose to MOVE! group that meets bi-monthly for 6 months.	Registered Dietitian Physical Therapist PharmD Nurse Practitioner
Green Bay	12-Session Choose to MOVE! Same as Appleton.	Registered Dietitian PharmD Nurse Practitioner Physical Therapist

Appendix C. Choose to MOVE! Sample SMs Implemented in Classes 4 through 11.

Class	Sample Secure Messages
4	Remember that your weight is dependent on calories. Work on decreasing the amount of calories that you eat or drink and increase the number of calories that you burn by being more physically active. Be sure to keep a log of all the foods and beverages you consume each day. Also, keep track of your physical activity – remember the goal is to work up to at least 30 minutes of exercise at least 5 days per week!
5	The two most important things to look at on a food label are serving size and calories. Are you keeping a food record and tracking your portions and your calories? Using the plate method can help you create a healthy meal. Remember to fill your plate ½ full of fruits and vegetables, ¼ full of lean protein or meat and ¼ full of starch. Remember to eat a variety of fruits and vegetables each day! Are you getting 150 minutes of physical activity each week? Remember that every 10 minutes counts so try to sneak in a quick 10-minute walk 3 times per day and you will reach the goal of 150 minutes in no time! See you at the next Choose to MOVE! Class.
6	Daily physical activity is very important for weight management. Start by adding an extra 5 to 10 minutes of exercise each day. Little things can help too like taking the stairs instead of the elevator or parking a little further away from the door when you go grocery shopping. Every extra step you take will help! The same goes for changing your diet; start with making a few small improvements such as snacking on fruit or vegetables instead of chips and drinking water instead of high calorie beverages. Over time, these small changes will add up to be huge improvements in your health!
7	Keeping track of your portions and calories is very important. Are you remembering to write down everything you eat? Reading food labels can help you make healthy food choices. Make sure you look at the serving size and the calories. Keep working at increasing your physical activity – the minimum goal is 150 minutes each week but working up to 300 minutes each week can help you achieve greater success with weight loss and maintaining your weight loss. Keep up the great work!
8	Have you been meeting your nutrition and physical activity goals each week? Remember it is important to set measureable goals to help keep you moving in the right direction. Keep walking! It is important to exercise every day. Wearing a pedometer can help you keep track of the number of steps that you take. Work on increasing your steps a little each day. Daily exercise burns calories and helps you lose weight. Are you tempted to make unhealthy choices when you are in a hurry or very hungry? Try to keep healthy snacks available such as fresh fruit or pre-washed and cut up vegetables so you can make healthy choices when on the go. Keep unhealthy snacks out of the house so you are less tempted to overindulge.

9	When dining out, it can be more difficult to stay on track. Here are some tips to make better choices; order off the light eaters or senior menu, take ½ of your meal home, order water or calorie-free beverages instead of alcohol or soda and choose baked or broiled foods instead of fried. Are you able to exercise 150 minutes each week? Exercising regularly will help you lose weight. Do you have a dog? Take your dog for a walk every day. If taking a walk is too difficult for you, do chair exercises. As long as you are moving, you are burning calories! See you at the next Choose to MOVE! class.
10	Eating during the holidays and on special occasions such as birthdays or potlucks can be a challenge. Letting your friends and family know your weight loss intentions or politely declining food will help you stay on track. Try using a smaller plate or just sampling your favorite foods. You can do it! See you at the next Choose to MOVE! class. If you are getting tired of doing the same exercises every week, vary your routine. Find something new and fun you can do such as hiking, snow shoeing, yoga or enroll in an exercise class at a local gym or senior center.
11	Are you limiting your portions and counting your calories? Remember to write down everything you eat on your food record. Be sure at least ½ of your plate at each meal is filled with fruits and vegetables. Work on increasing your intake of lower calorie, non-starchy vegetables such as green beans, carrots and broccoli. Keep moving! Routine physical activity is the best way to lose weight and keep it off!

Appendix D. Choose to MOVE! Weight Management Program and Secure Messaging Post Class Questionnaire

1. Do you currently receive secure messages in My HealtheVet? If no, skip to question 9.

   Yes No

2. How many MOVE! Program secure messages in My HealtheVet do you recall reading?

   1-3 4-6 More than 6

3. Did you find the secure messages to be motivational to achieve weight loss goals?

   Never Sometimes Always

4. Did you look forward to receiving secure messages in My HealtheVet?

   Never Sometimes Always

5. Did the secure messages help you stay on track with your diet and physical activity programs?

   Never Sometimes Always

6. Do you think your weight loss was related to receiving secure messages in My HealtheVet?
   - No, I did not lose any weight
   - No, the secure messages did not motivate me to lose weight
   - Yes, the secure messages helped motivate me and kept me on track to lose weight

7. Do you feel that secure messaging would have been more helpful if you could have communicated with the person sending the messages?

   Yes No

8. I did not read the secure messages in My HealtheVet because:
   - I am not familiar with secure messaging
   - I don't care to read secure messages
   - I use My HealtheVet for reasons other than secure messaging

9. What is your age?
   - 21-34 years old
   - 35-50 years old
   - 51-65 years old
   - >65 years old
   - Prefer not to answer

10. What is your gender?
    - Male
    - Female

11. Please specify your race:
    - Caucasian or white
    - African American or Black
    - Hispanic or Latino
    - Asian or Pacific Islander
    - Native American or American Indian
    - Prefer not to answer

12. What is the highest level of education you have completed?
    - High School
    - Associates Degree
    - Bachelor's Degree
    - Master's Degree or Doctorate

13. What is your total annual income before taxes?
    - Less than $25999
    - $26000-$40999
    - $41000-59999
    - More than $60000
    - Prefer not to answer

14. What is your experience level using a computer?
    - Beginner
    - Intermediate
    - Advanced

15. How long have you used My HealtheVet?
    - Less than 3 months
    - 3 months – 1 year
    - 1-3 years
    - More than 3 years

Thank you for completing the Choose to MOVE! Post-Class Questionnaire