

Running head: WEIGHT CHANGES IN A TELEHEALTH AND GROUP PROGRAM

WEIGHT CHANGES IN A HOME TELEHEALTH AND A GROUP WEIGHT  
MANAGEMENT PROGRAM

by  
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Weight Changes in a Home Telehealth and a Group Weight Management Program  
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May 18, 2013

### Abstract

**Objective:** The objective of this study was to determine if a home telehealth-based weight loss program [HT/teleMOVE!] results in similar or better weight loss outcomes compared to a traditional group-based program [MOVE!] in the Veteran population. **Design:** This was a prospective study with a four-month intervention period. Patients who completed one cycle (4 months) of the MOVE! and HT/teleMOVE! were included in the study. Two previous weights from these subjects between 1 and 5 years prior to enrollment in the program were the control weights. **Subjects:** One hundred twenty-two overweight or obese patients completed one cycle of either the MOVE! ( $n=92$ ) or HT/teleMOVE! ( $n=30$ ) weight loss program between April 2012 and November 2012. **Statistical Analysis:** ANOVA was used to evaluate intragroup absolute weights at each time point. A series of independent *t*-tests evaluated intragroup absolute and percent weight changes over time in the entire ( $N=122$ ) group and in those that lost ( $n=79$ ) or gained ( $n=35$ ) weight. The frequencies of participants in each program that gained, lost, or had no change in weight post-intervention were evaluated using the chi-square test for independence. **Results:** There was a significant difference in the absolute weight at year -2 prior to enrollment between MOVE! and HT/teleMOVE! (234.8 vs. 253.2,  $p=0.04$ ), but not between any other absolute weights at year -1 (236.8 vs. 247.92,  $p=0.21$ ), enrollment (242.17 vs. 253.17,  $p=0.23$ ), or program completion (238.23 vs. 245.03,  $p=0.46$ ). Post-intervention, participants in the MOVE! program lost an overall average of  $1.79\pm 3.98\%$  of their initial body weights and participants in the HT/teleMOVE! program lost an overall average of  $3.13\pm 4.37\%$  of their initial body weights, though these differences were not statistically significant ( $p=0.12$ ). Twenty point six five percent of MOVE! and 26.27% of HT/teleMOVE! participants lost 5% or more of their initial body weight. Thirty-two point six percent of MOVE! and 16.67% of HT/teleMOVE! participants gained weight, with similar average weight gain (6.36 lb. vs. 6.88 lb.). Chi-squared test for independence indicated there were no significant differences between the distributions of patients who lost, gained, or had no change in weight between both programs ( $p=0.373$ ). **Conclusion:** MOVE! and HT/teleMOVE! programs resulted in similar weight loss outcomes, with clinically significant weight loss in those individuals who lost weight during the intervention. Future studies should use a control group, a larger sample size, and investigate morbidity indicators, such as blood pressure or a lipid panel, to determine if weight loss results in improvement in disease state.

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## Chapter 1. Introduction

It is difficult to ignore the growing problem of obesity in the United States. In 2010, the rates of overweight and obesity were 36.2% and 27.5%, respectively (CDC, 2010). It is estimated that by the year 2020, 83% of men and 72% of women will be overweight or obese (Shute, 2011). The personal and societal costs of obesity are numerous and devastating. One hundred twelve thousand people die from obesity-related causes each year (CDC, 2010). In 2006, the average obese person paid an estimated \$1,429 more in health care costs than a normal-weight individual. (Finkelstein, Trogon, Cohen, and Dietz, 2009). This is no exception within the Veterans Health Administration [VHA], where prevalence of overweight and obesity was 73.0% and 27.0% among men and 68.4% and 31.6% among women in the year 2000 (Das et al., 2005).

Overweight and obesity have traditionally been treated through (1) face-to-face lifestyle interventions intended to produce behavior change, (2) the use of medications, or in more severe cases of obesity, (3) bariatric surgery. More recently, however, advances in technology and the prevalence of household Internet access have allowed for technology to augment or replace these more traditional weight loss programs, potentially increasing patient access to care and decreasing overhead and labor costs.

The VHA's traditional group-based weight loss program, MOVE! was supplemented with a home telehealth-based program, HT/teleMOVE!, in 2010, to increase access to care among rural and working Veterans while decreasing intervention costs. On average, one clinician has a continuous patient load of 150

patients in the HT/teleMOVE! program, versus the 50 patients in the average MOVE! program group class. Some studies have suggested that using telehealth-based weight-loss interventions resulted in the same amount of weight loss as a traditional group-based intervention (Haugen, Tran, Wyatt, Barry, and Hill, 2007; Appel et. al, 2011), but telehealth research is still in its infancy. This is the first study of its kind to compare a home telehealth-based weight loss program with a traditional group-based program within the Veteran population.

### **Research Questions**

Does participation in a home telehealth-based weight loss intervention (HT/teleMOVE!) and/or a group-based weight loss intervention (MOVE!) produce weight loss results in overweight and obese Veterans? Are the weight outcomes between the programs similar?

### **Subproblems**

1. What are the components of the two weight loss programs?
2. How will weight loss be measured and classified?
3. What will analysis of the weight change results in the HT/teleMOVE! program indicate when compared to the weight change results in the MOVE! program?

### **Limitations**

1. The weight data used for the prospective portion of this study is based upon measurements from different scales and different settings (home and clinic). The consistency of weigh-in practices will affect the outcome of the study.
2. The weight data used for the retrospective portion of this study is based upon historical measurements entered in the medical record from different VA

hospitals. The consistency and reliability of scales used in different VA hospitals, as well as an unknown number of clinicians' documentation of patient weights in the medical record, will affect the outcome of the study.

3. Some of the historical weight data used for the retrospective portion of this study was collected at appointments with a dietitian or a MOVE! appointment because the availability of other historical weight data was limited. Therefore, these weights were not true control weights.
4. Some of the study participants (in either group) may have been participating in the patient gym regularly or another weight loss intervention during the time of the study intervention. This was not controlled for in the study.
5. The study closed 3 months earlier than intended, due to the researcher's job relocation. Therefore, the sample size of the home telehealth based program and of the subjects who participated in both weight loss programs simultaneously was smaller than required for adequate exploration of the research question.
6. Due to early study closure, patient demographic information was unable to be collected, precluding the ability to control for potentially confounding demographic factors.

### **Delimitations**

1. This study included only Veterans of the United States of America or dependents receiving care through the VHA.
2. This study included only overweight and obese patients (those with a Body Mass Index greater than or equal to 25 kg/m<sup>2</sup>).
3. This study included only individuals 18 years of age and older.

4. This study included only active participants of MOVE! group classes (attended five of eight group class sessions) and HT/teleMOVE! (achieved at least a 70% response rate during one cycle of the program, or completed 82 sessions of the program within 4 months) .
5. For those in the HT/teleMOVE! program, this study group included only those with a functional internet router or landline telephone that consent to the use of technology.

### **Assumptions**

1. Weight data collected was accurate and reliable.
2. Patients were ready to make lifestyle changes to lose weight.
3. Patients were absorbing weight loss information in these programs and utilizing that information to make lifestyle changes.
4. Patients' ability to lose weight and interest in weight loss was the same regardless of the time of year.
5. Patients who attended the MOVE! group classes came to the weigh-in session prior to class.
6. Four months' time was long enough for patients to lose a measurable amount of weight.

### Definition of Terms

**Bariatric surgery:** A variety of surgical procedures used to treat obesity in individuals with Class II and Class III obesity. The most widely-used surgeries are laparoscopic adjustable gastric banding, commonly called “lap band” surgery, and roux-en-y gastric bypass surgery, commonly called “gastric bypass” surgery.

**Body Mass Index [BMI]:** A measure of weight status that takes one’s height into account.

$$\text{BMI}=\text{wt}(\text{kg})/\text{ht}^2(\text{m})$$

**Clinically significant:** a value that signifies a practical benefit to a clinician or patient. Clinically significant weight loss is defined in the literature as a 5%-10% weight loss. With a 5%-10% weight loss, many patients notice health benefits, such as improved breathing with exercise, lower cholesterol values, or lower blood pressure, depending on the patient’s initial health conditions.

**Comorbidities:** the presence of two or more chronic, long-standing diseases in the body at the same time. Since overweight and obesity are considered to be diseases, any other chronic condition an overweight or obese person has is often referred to as a comorbidity. Obesity often occurs with a number of comorbidities, including high blood pressure, high cholesterol, heart disease, sleep apnea, and arthritis.

**Home telehealth:** telehealth services (see telehealth) to or from a patient’s home. VHA uses this terminology to describe “home telemonitoring,” in which a patient is enrolled in a program, or disease management protocol, that uses a home-messaging device or cell phone to track vital signs and communicate with the patient’s health care provider. Some disease management protocols within the VA include depression, heart disease, and weight management.

**HT/teleMOVE! Program:** a lifestyle intervention program in the VHA that utilizes home telehealth (see home telehealth) to provide care

**Lifestyle Intervention:** a weight loss intervention intended to increase a person’s energy expenditure and decrease a person’s energy intake through producing behavior change.

**Mortality:** death or dying

**MOVE! Program:** a group class-based lifestyle intervention program in the VHA

**Non-responder:** any patient enrolled in the HT/teleMOVE! Program (see HT/teleMOVE! Program) that does not complete an educational module on any given day. After 30 days of “non-responder status,” a patient is disenrolled from the HT/teleMOVE! program.

**Obesity:** Having a body weight that is much higher than recommended due to an accumulation of excessive body fat. An adult is classified as obese if he or she has a BMI of 30 kg/m<sup>2</sup> or higher. Obesity is further divided into classes:

Class I: BMI 30.0-34.9 kg/m<sup>2</sup>

Class II: BMI 35.0-39.9 kg/m<sup>2</sup>

Class III: BMI 40 kg/m<sup>2</sup> or greater

**Overweight:** Having a body weight that is higher than optimal for health. An adult is classified as overweight if he or she has a BMI of 25 kg/m<sup>2</sup>-29.9 kg/m<sup>2</sup>.

**Pharmacotherapy:** using medications to treat disease. Pharmacotherapy for obesity supplements lifestyle intervention treatments with medications specifically developed to cause weight loss.

**Telehealth:** broadly, health care at a distance. Telehealth services can be used to promote health, prevent disease progression, or cure disease. Telehealth often involves the exchange of health-related services and information via telecommunications technologies. Telehealth has many definitions and applications. It may be as simple as discussing a patient's health with him or her over the telephone, or as sophisticated as a patient using a home-messaging device to send vital signs (blood pressure, blood glucose finger sticks, or weight) to a health care provider over a phone line or internet connection. Telemedicine and telehealth are often used interchangeably.

**Veteran:** any man or woman who was a former active member of the military services of the United States of America, and, for the purposes of this study, who is eligible to receive health care benefits through the VHA.

## Chapter 2. Literature Review

Overweight and obesity is a problem worldwide, especially in the United States. It is estimated that by the year 2020, 83% of men and 72% of women will be overweight or obese (Shute, 2011). The concern with overweight and obesity is the accompanying increased risk for chronic disease, decreased quality of life, and increased health care costs. Because of the current obesity problem, investigation of effective weight loss programs is warranted.

Although overweight and obesity are caused by excess weight gain related to energy intake and output imbalance, it is currently quantified using a Body Mass Index (BMI). BMI, calculated as weight in kilograms (kg) divided by the square of the height in meters (m<sup>2</sup>), strongly correlates with the amount of a person's body fat (Centers for Disease Control and Prevention [CDC], 2010) and is the normative measurement by which a person's health status and disease risk is classified (U.S. Department of Health & Human Services [USDHHS], 1998). The Centers for Disease Control and Prevention (CDC) define overweight as a BMI of 25 kg/m<sup>2</sup> or greater and obesity as a BMI of 30 kg/m<sup>2</sup> or greater (2010). Obesity is further separated into classes: "Class I" is a BMI of 30.0-34.9 kg/m<sup>2</sup>, "Class II" is a BMI of 35.0-39.9 kg/m<sup>2</sup>, and "Class III" is a BMI of 40 kg/m<sup>2</sup> or greater (USDHHS, 1998). People defined as "severely obese" (Classes II and III) can be as much as 100 to 200 pounds or more overweight (Sturm, 2003).

Overweight and obesity are typically treated utilizing lifestyle interventions intended to increase energy expenditure and decrease energy intake. These interventions often include any combination of calorie-controlled meal plans,

exercise recommendations, weight loss education, and the usage of self-monitoring tools, such as weigh-ins or food journaling. They were traditionally conducted face-to-face, in a group or individual setting, but advances in technology have allowed for both greater flexibility and personalization in the methods of intervention, delivery and educational content. The purpose of this literature review is to synthesize articles in the current body of evidence related to the development of technological methods supplementing traditional methods of managing overweight and obesity. To do this, one needs to understand why management of overweight and obesity is both fiscally necessary on a national scale as well as personally necessary to those who are affected by the condition. The current theories regarding treatment of overweight and obesity, effective methods of treatment, and how technology alters and improves the methods of treatment will be investigated.

### **Overweight and Obesity**

Recently, the prevalence of overweight and obesity has increased from 35.5% and 15.9% in 1995, respectively, when the Behavioral Risk Factor Surveillance System (BRFSS) annual telephone survey system began to monitor the weight status of the United States (CDC, 1995), to 36.2% and 27.5%, respectively in 2010 (CDC, 2010). Not only did rates of overweight and obesity increase during that time, but the prevalence of Class III obesity did as well. Alarming, the prevalence of Class III obesity is increasing twice as fast as the prevalence of obesity alone. The population size of the Class III obese quadrupled from 1 in 200 adult Americans to 1 in 50 between 1986 and 2000 according to CDC's BFRSS data (Sturm, 2003). From 2000 to 2005, Sturm (2007) found that the prevalence of a BMI over

40 kg/m<sup>2</sup> increased twice as fast and the prevalence of a BMI of over 50 kg/m<sup>2</sup> increased three times as fast.

Because the prevalence of obesity overall has increased by more than 11% in 15 years (Strum, 2007), healthcare spending has increased significantly as well. Out-of-pocket, private, and insurance expenditures associated with obesity rose from 70 billion dollars in 1995 (Colditz, 1999) to upwards of 147 billion dollars in 2008 (Finkelstein, Trogon, Cohen, & Dietz, 2009). The cost will likely increase as BMIs continue to increase.

Overweight and obesity is not only financially destructive, but is also physically detrimental. Overweight and obesity are strongly associated with comorbidities including osteoarthritis, some cancers, obstructive sleep apnea, urinary incontinence, the development of cataracts, and diabetes (Villareal, Apovian, Kushner, & Klein, 2005). Obesity is a significant predictor of mortality: 112,000 excess deaths each year are due to obesity-related causes (CDC, 2010). Peeters et al. (2003) found that obese adults, at age 40, lived 6 -7 years less than did their normal-weight counterparts. It is clear that overweight and obesity are associated with extremely high fiscal and physical costs.

### **Weight Loss Theories and Treatments**

For individuals who are overweight, weight loss is associated with reduced risk for disease and increased quality of life. A clinically significant weight loss has been reported in the literature to be at least 5%-10% of body weight, since this level of reduction in body weight has been found to reduce or eliminate disorders associated with overweight, Class I, and Class II obesity (Blackburn, 1995).

Although weight loss interventions in Class III obese have not been widely-evaluated, one study suggested that similar improvements in LDL cholesterol, triglycerides, blood pressure, and hemoglobin A1C was seen in Class III obese as in leaner obese populations after a one-year weight loss intervention (Unick, Beavers, Jakicic, Kitabchi, Knowler, Wadden, & Wing, 2011). To achieve weight loss of at least this magnitude, three techniques for treating overweight and obesity have been studied extensively in the literature. The main two methods are lifestyle interventions and pharmacotherapy (Villareal et al., 2005). For the Class II and Class III obese at a high risk for obesity-associated morbidity and mortality and a history of failed attempts at weight loss, bariatric surgery may be indicated after careful evaluation for weight loss and/or improvement of comorbid conditions (USDHHS, 2000).

### **Lifestyle Interventions**

Research within the past 30 years has focused on lifestyle interventions as an effective, inexpensive, and efficient treatment for both overweight and obese patients. Alternative therapies such as medication use and bariatric surgery, although viable options in many cases, are expensive, require extensive screening, and are not accessible enough to meet the enormous scope of the overweight and obesity problem in the U.S. (CDC, 2010). Lifestyle interventions with the best results include diet, physical activity, and behavioral modification components (USDHHS, 2000). Behavioral modifications usually include self-monitoring, goal-setting, shaping, reinforcement, and stimulus control techniques. (Wadden & Butryn, 2003).

Which intervention component is the most effective is still under debate, especially in the treatment of Class II and Class III obesity. Goodpaster et al. (2010) conducted a one-year single-blind randomized control study to ascertain if a physical activity program would cause Class II and Class III obese participants to lose more weight than caloric restriction alone. The researchers examined these effects in one hundred thirty 30-to-55-year-old African American and white adult participants randomized into two groups, one with a caloric restriction of 1,200 to 2,100 kcal alone based on desired body weight loss of 8% to 10% in 12 months and initial physical activity of moderate intensity progressed to five days per week for 60 min, and one with the same caloric restriction but a six month delay prior to participation in physical activity. At both six months and 12 months, both groups lost a significant ( $p < 0.01$ ) amount of weight;  $M = 10.9$  kg, 95% CI [6.4-9.9] and  $M = 12.1$  kg, 95% CI, [10.0-14.2] for the initial physical activity group and  $M = 8.2$  kg, 95% CI [6.4-9.9] and  $M = 9.9$  kg, 95% CI [8.0-11.7] for the delayed physical activity group. The initial physical activity group, however, lost significantly ( $p = 0.02$ ) more weight at six months than the delayed physical activity group, even after accounting for interaction effects between group assignment and time. Eighty percent of initial-activity participants versus 60% of delayed-activity participants lost at least 5% of their body weight at six months, and 78% of the initial-activity group versus 65% of the delayed activity group lost at least 5% of their body weight at 12 months. Additionally, Goodpaster et al. (2010) found that the Class III obese lost significantly ( $p = 0.047$ ) greater percentage body weight than the Class II obese  $M = 10.9\%$ , 95% CI [8.9%-13.0%] versus  $M = 7\%$ , 95% CI [4.2%-9.9%] at 12 months, regardless of

ethnicity or group assignment. It appears that the immediate inclusion of both caloric restriction and physical activity even in the Class II and Class III obese is more effective than caloric restriction alone; however, these results have limited application across the larger population because the participants were mostly women ages 40-50 years (Goodpaster et al., 2010).

Research is in fairly strong agreement that techniques of behavioral counseling, caloric restriction, and exercise are safe and effective in younger adults, but questions still remain with regard to the safety, efficacy, and best practices to achieve intentional weight loss in older adults. Intentional weight loss in older adults is controversial due to potential risks associated with the loss of bone and muscle mass, including the inability of older adults to maintain activities of daily living (ADLs) and live independently (Bernstein & Luggen, 2010). Investigations of current literature have not yet yielded the most effective methods to achieve intentional weight loss and the amount of intentional weight loss in obese older adults that maintains preservation of bone and muscle mass.

Villareal et al. (2011) sampled 93 obese men and women over the age of 65 living independently and randomized them into (a) a control group, (b) a diet group, (c) an exercise group, and (d) a diet plus exercise group for one year. All groups were supplemented with 1500 mg calcium and 1000 IU of vitamin D per day. The main outcome measure was decreased frailty (measured by the change in score on the Physical Performance Test), but weight loss was a secondary outcome. The researchers found that all interventions significantly ( $p < 0.001$  between all possible pairs, except diet-exercise vs. exercise,  $p = 0.04$ ) improved frailty over the control

group. Weight loss was seen in the diet and diet-exercise groups, ( $9.7\pm 5.4$  kg and  $8.6\pm 3.8$  kg at one year, respectively) and was statistically significantly increased ( $p < 0.001$  for both) between the diet versus control and diet-exercise versus exercise groups. In this study, the caloric restriction component appeared to be a more crucial intervention for weight loss versus exercise alone. Again, older and more educated white females were the largest percentage (63%) of this study population, so this study's results cannot be generalized to the older obese population as a whole (Villareal et al., 2011).

Miller (2010) conducted a similar study in 71 obese adults over the age of 60 (mean age of  $69.5\pm 5.8$  years). Subjects were divided into a weight loss (WL) group ( $n=39$ ) with three interventions, including (1) a caloric restriction of up to 1,000 kcal per day using a partial meal replacement (PMR), (2) 60-min weekly educational sessions led by a Registered Dietitian and (3) 60 min of exercise three times per week. The control group was a weight stable (WS) group ( $n=32$ ), who were encouraged to maintain their weight throughout the study and attended bimonthly group presentations on general health. After six months, participants in the WL group lost 8.8 kg overall compared to a 0.1 kg gain for participants in the WS group ( $p < 0.05$ ; Miller, 2010).

These studies support the premise that interventions including caloric restriction and exercise could result in a weight loss of up to 8 kg in a year for the obese older adult (Miller, 2010; Villareal et al., 2011). Miller (2010), however, did use up to two PMRs daily in his study, which could have resulted in patients more easily attaining the caloric intake goal, given that consuming two meal replacements

would provide a known number of kcal. Still, these two studies support that caloric restriction and exercise can be safe in the older adult, especially when appropriate supplementation is included. They also support that lifestyle interventions (Miller, 2010; Villareal et al., 2011) can be as effective as weight loss medication (Davidson et al., 1999; Wadden et al., 2005) for weight loss treatment.

### **Lifestyle Interventions Utilizing Technology**

In the past 10 years, in an effort to improve access to care, convenience of treatment, and patient motivation, technological interventions have been studied as an adjunct to the traditional forms of overweight and obesity treatment. Research on technology-based weight loss programs is still in its infancy, but is no less valuable than research on traditional methods of weight loss. Technological weight loss interventions are thought to be a low-cost and easily-accessible alternative to face-to-face treatment, largely due to the number of people in the United States that have access to both the Internet and smart phones. An estimated 44% of total householders have access to the Internet both at home and outside of the home, including 55% of those 35-54 years of age and 28% of those older than 55 years (U.S. Department of Commerce, 2010). According to the Pew Research Center, 53% of Americans owned smartphones in February of 2012 (Sterling, 2012).

Technology's influence on weight loss interventions can be observed in the prevalence of calorie-counting applications for smart phones and internet browsers, hand-held and wrist-worn "tracker" devices designed to estimate daily energy expenditure, "smart" scales that can connect to one's computer, and virtual mediums (skype, text messages, internet forums, and email) in which one can

interact with a health coach or dietitian. These technological interventions have emerged in just the past ten years; therefore, research in this area is more limited when compared to research on traditional lifestyle interventions. Studies on the use of technology for weight loss interventions typically include the overweight, Class I, and Class II categories of obesity, but a few studies have shown modest weight loss in the class III obese, as well (Rogers, 2012). Khalylis, Yiaslas, Bergstrom, and Gore-Felton (2010) identified five components in 21 studies that increase the success of technological weight loss interventions: self-monitoring, counselor feedback and communication, social support, structured program, and individually-tailored programs. Programs that had fewer of these key components did not produce weight losses that were as great as those with more of the key components. The studies that mitigated these technological disadvantages of lack of feedback and accountability by providing interactions with a counselor either online or brief in-person visits tended to have better weight loss results (Khalylis, Yiaslas, Bergstrom, and Gore-Felton, 2010). Consistent with these results, Krukowski, Harvey-Berino, Ashikaga, Thomas, and Micco (2008) found feedback from a counselor or health coach to be the best predictor of weight loss during the 6-mo treatment period of a 12-month online behavioral weight loss control program.

Van Wier et al. (2011) investigated the effect of weight loss counseling via email and telephone on body weight in 1,386 overweight Dutch men ( $n=929$ ) and women ( $n=457$ ) with a mean age of  $43\pm 8.6$  years. All participants received self-help brochures about the risks of being overweight, and the benefits of a healthful diet and consistent physical activity. The email group accessed additional information

on behavior modification modules via an interactive Web site and received emails from their personal counselor once they completed each module. The phone group accessed the same behavioral modification modules as the email group, though in a workbook format, and interacted with their counselor via phone once they completed each module. The control group had no additional counseling beyond the brochures. There were 630 total dropouts and some participants lost to follow-up for the two-year analysis, resulting in a total  $n$  of 792 in the final analysis. The percentages of male and female subject withdrawals were not evaluated.

After six months, the intervention groups experienced significant weight loss compared to the control group;  $M=1.6$  kg, 95% CI [2.2 to -1.0] in the phone group and  $M=0.7$  kg, 95% CI [1.2 to -0.1] in the Internet group, but at two years, there were no significant differences between all groups. At two years, all groups, including the control group, had lost from 1 to 2 kg in total. No  $p$  values were given in this study at six months to show significant weight loss in the intervention groups compared to the control group; the researchers merely stated that the values were significant. It appears that at two years participants were not able to continue their initial weight loss from the 6-month intervention (some regained some weight and most maintained their weight loss from the intervention), but conclusions from this study are somewhat limited due to the high attrition rate (50% completing less than three Internet or four phone sessions) the high loss to follow-up (missing data), and the reliance on self-reported weights for the two-year follow-up (Van Wier et al., 2011).

In another randomized controlled trial, Morgan, Lubans, Collins, Warren, and Callister (2011) studied the efficacy of an Internet-based weight loss program in

male staff aged 18-60 years at the University of Newcastle in Australia. In contrast to other Internet weight-loss studies, Morgan et al. (2011) wanted to study overweight and obese men exclusively, and recruited participants with BMIs of 25 kg/m<sup>2</sup> to 37 kg/m<sup>2</sup>. Sixty-five participants were randomized into either an Internet group ( $n=34$ ) or a control group ( $n=31$ ) and weights were taken at baseline, and at three, six, and 12 months by trained and blinded assessors. A 60-min information session was given to both groups separately on behavior strategies for weight loss, but the Internet group received orientation on a diet and physical activity tracker Web site. The Internet group was instructed to track their food intake and physical activity on the Web site. Researchers provided individualized feedback to participants in the Internet group based on the contents of their food and physical activity Web site diaries.

Researchers found that both the control and the intervention groups lost a significant ( $p<0.001$ ) amount of weight from both baseline to three-month follow-up (-0.3 kg vs. -4.8 kg, respectively) as well as from the three-month to six-month follow-up, (-3.5 kg vs. -5.3 kg, respectively) using intent-to-treat analysis. Significant ( $p<0.001$ ) weight loss was also reported at 12 months compared to baseline for both groups (-3.1 kg vs. -5.3 kg, respectively). At three months, however, significantly more participants in the Internet group had lost more than 5% of their baseline weight compared to the control group (55.6% vs. 28%,  $p=0.04$ ). At 12 months, this difference was no longer statistically significant (57.7% vs. 30.5%, respectively,  $p=0.062$ ). Those participants in the Internet group who used the Web site more often measured by (1) number of daily exercise entries, (2) number of

weekly check-ins, and (3) number of days of diet entries, lost more weight than those who used the Web site less often. Significant correlations were found at both three months ( $r=0.56, p<0.001$ ;  $r=0.48, p<0.01$ ; and  $r=0.71, p<0.001$ , respectively) and six months for all three of these types of Web site usage ( $r=0.53, p=0.002$ ;  $r=0.55, p=0.01$ , and  $r=0.72, p<0.001$ , respectively). At 12 months, these correlations continued to be significant across these three types of Web site usage.

The researchers postulated that lack of between-group differences existed because only 41.5% of participants in the Internet group complied with treatment. Additionally, the control group was not a “true” control. Diet and physical activity information was still supplied to participants, and in a booklet they could take with them and use later. The results are encouraging, however, because even with a limited amount of interaction between the researchers and the participants, a clinically significant weight loss of 5% or more was seen in both groups. In addition, the men gave the program positive feedback: they believed the website was useful and that they were provided with enough support to achieve their weight loss goals (Morgan et al., 2011). This suggests that clinician workload in intervention programs for adult males under age 61 may not need to be particularly intensive to achieve clinically significant weight loss.

One aspect of the Morgan et al. study (2011) that may have inflated results, however, was that the baseline activity of the University men as measured by seven days of pedometer steps was 8,505 steps per day, close to the “active” 10,000 steps per day recommendations for weight loss (Tudor-Locke & Bassett, 2004). Both of these studies (Morgan et al., 2011; Van Weir et al., 2011) seem to suggest that

successful weight loss interventions utilizing technology are possible. It appears, however, that the interventions in these particular studies do not provide enough personalized feedback or accountability to participants as suggested by Khalylis, Yiaslas, Bergstrom, and Gore-Felton (2010) as a component of a successful weight loss intervention utilizing technology. Changing the study designs to provide more accountability to participants may have prevented the significant study attrition and lack of participation demonstrated in these two studies. Increased physical activity and/or self-monitoring could have contributed to the greater weight loss seen in Morgan et al. (2009) versus Van Wier et al. (2011), but Van Weir et al.'s (2011) study had a much larger sample size, up to 12 times larger.

To test whether continuous self-monitoring augmented by technology improves weight loss outcomes as compared to intermittent self-monitoring or in-person individual counseling, Polzien, Jakicic, Tate, and Otto (2011) used a validated SenseWear™ Armband energy expenditure monitor in 58 underactive (<20 min of physical activity three days per week) overweight and obese (BMI of 25 kg/m<sup>2</sup> to 39.9 kg/m<sup>2</sup>) adult men ( $n=1$ ) and women ( $n=57$ ) ages 18 to 55 (mean age 41.3±8.7 years). Researchers randomized the study participants into three groups for a twelve-week intervention: (a) a standard in-person behavioral weight control program consisting of seven in-person counseling sessions with instructed energy intake of 1,200 to 1,500 kcal per day and 20-40 min per day five days per week of moderate exercise with paper diary monitoring (SBWP), (b) a continuous technology-based program (CON-TECH) using the SenseWear™ armband daily (plus treatment from SBWP), and (c) an intermittent technology-based program

(INT-TECH) with SBWP treatment plus usage of the SenseWear™ armband for only three weeks (weeks 1, 5, and 9) with paper diary monitoring the other weeks.

Eighty-eight percent of participants completed the intervention.

Intention-to-treat analysis revealed weight losses of  $4.1\pm 2.8$  kg,  $6.2\pm 4.0$  kg, and  $3.4\pm 3.4$  kg for SBWP, CON-TECH, and INT-TECH, groups, respectively ( $p=0.04$ ). Percentage weight loss was  $4.6\pm 3.2\%$ ,  $7.1\pm 4.6\%$ , and  $3.8\pm 3.8\%$ , respectively, for the three groups. Weight loss was significantly greater in CON-TECH versus INT-TECH groups ( $p\leq 0.05$ ). No other significant differences related to weight loss between groups were found (Polzien et al., 2011).

This study, although somewhat limited by a small sample size and high percentage of female participants, demonstrates that use of technology in weight loss intervention may result in weight loss comparable to that in a traditional program, but with less frequent in-person contact needed (Polzien et al., 2011). Polzien et al. (2011) had better weight loss than the web and email-based study (Morgan et al., 2011) even with a similar population size. At 12 weeks, Morgan et al.'s (2011) results were a 4.8 kg weight loss in the intervention group, whereas Polzien et al. (2011) observed weight loss of  $6.2\pm 4.0$  kg in their CON-TECH 12 week technology group. Because their INT-TECH technology group had a weight loss of  $3.4\pm 3.4$  kg in 12 weeks, similar to Morgan et al. (2011), it appears that technology-related interventions may need to require a daily commitment to the program, as well as self-monitoring components, to enhance compliance and weight loss outcomes versus intermittent interactions and lack of self-monitoring. None of these studies included remote access to individualized, consistent clinician support,

however, which may further improve weight loss results and is the hallmark of the telehealth delivery system in the VA medical system.

### **Pharmacotherapy**

Orlistat (Xenical, Roche), phentermine/topiramate (Qsymia, Vivus, Inc.), and lorcaserin (Belviq, Arena Pharmaceuticals and Eisai, Inc.) are currently the only drugs approved by the Food and Drug Administration (FDA) to treat obesity as an adjunct to lifestyle modifications through diet, behavior therapy, and exercise. All of these drugs are recommended for use only in the presence of obesity or overweight with at least one comorbid condition such as hypertension or diabetes (U.S. Department of Health and Human Services, 2012). They also have been shown to be more effective in combination with a diet and exercise program versus a placebo. A drug called sibutramine (Meridia, Abbott Laboratories) was also approved by the FDA to treat weight loss until 2010, when the Sibutramine Cardiovascular Outcomes Trial indicated that sibutramine increased the risk of cardiovascular events (James et al., 2010). Below is a brief review of each of the FDA approved weight loss drugs.

**Xenical.** Xenical inhibits pancreatic lipase production and thus absorption of dietary fat. (Monkhouse et al., 2009). In a randomized clinical trial, 796 men and women with a BMI of 30 kg/m<sup>2</sup> to 44 kg/m<sup>2</sup> were prescribed a reduced-energy diet from 1,200 to 1,500 Calories (kcal) per day during a 4-week placebo run-in period (Davidson et al., 1999). The 635 patients who were at least 75% compliant per placebo pill count were randomized to receive (a) a placebo, (b) 60 mg Xenical three times daily, or (c) 120 mg Xenical three times daily, for two years. The first year focused on weight loss and the second year focused on weight maintenance.

Exercise was encouraged, but not monitored. At the end of two years, 57% of the placebo group and 46% of the Xenical group had withdrawn from the trial; therefore, intent-to-treat analysis was done. Patients treated with Xenical lost significantly more weight,  $7.08 \pm 0.54$  kg for those treated with 60 mg and  $7.94 \pm 0.57$  kg for those treated with 120 mg, than those treated with a placebo ( $4.14 \pm 0.56$  kg) in the first year ( $p < 0.001$ ) and kept more weight off during the second year ( $p < 0.001$ ). At the end of two years, average weight loss was  $1.65 \pm 0.62$  kg for the placebo group and  $5.02 \pm 0.73$  kg for the combined Xenical groups ( $p < 0.001$ ). There were no clinically significant changes in lipid levels, glucose levels, or blood pressure with Xenical use (Davidson et al., 1999).

**Qsymia.** Qsymia, approved by the FDA in July of 2012, combines the appetite suppressant phentermine, which is thought to increase blood concentrations of leptin, the satiety-signaling hormone, and topiramate, which augments the activity of neurotransmitters in the brain to increase satiety and decrease appetite. Exact mechanisms of drug action are unknown (U.S. Department of Health and Human Services, 2012). In a one-year placebo-controlled clinical trial in which participants received lifestyle modification education, Qsymia achieved clinically-significant weight loss of 5% or greater in 67% of participants that was statistically-significant when compared to the placebo group ( $p < 0.05$ ) (Coleman, Golden, Roberts, Egan, Weaver, & Rosebraugh, 2012).

**Belviq.** Belviq, although also approved in the summer of 2012, has a very different mechanism of action than Qsymia. Belviq selectively activates serotonin receptors in the brain, which helps to decrease food consumption and promote

satiety (U.S. Department of Health and Human Services, 2012). Belviq is not yet available to consumers, however. In a one-year placebo-controlled clinical trial in which participants received lifestyle modification education, Belviq achieved clinically-significant weight loss of 5% or greater in 47% of participants (Belviq). This was a statistically-significant weight loss compared to the placebo group ( $p < 0.05$ ) (Coleman, Golden, Roberts, Egan, Weaver, & Rosebraugh, 2012).

Neither Belviq nor Qsymia have been widely studied. In the Xenical study (Davidson et al., 1999), diet and exercise therapy was included, but the high attrition rate of the study may have blunted the weight loss results.

None of the drugs, however, are without their side effects. One of the concerns with Xenical is the fat malabsorption associated with its use. In a two-year randomized controlled trial done in Europe, at least 10% of 683 patients experienced increased defecation or oily stool related to Xenical use more frequently than with placebo use (Sjostrom et al., 1998). These gastrointestinal side effects did not appear to cause patients to withdraw from the trial; however, 83% of the Xenical-treated group and 76% of the placebo-treated group finished one year of treatment (Sjostrom et al., 1998). Qsymia was also associated with dose-dependent mean increases in heart rate up to 1.6 bpm when compared with placebo in one study, but concurrent decreases in blood pressure due to increased myocardial oxygen consumption in subjects taking Qsymia mitigated these effects (Coleman et al., 2012). A specific concern for women is that Qsymia appears to increase the risk of birth defects, including newborn orofacial cleft in humans; therefore, women must be on contraceptives when taking the drug. Belviq may increase the risk of

developing brain and breast tumors in humans, though pathologists classified few mammary tumors developed by rats on the drug as malignant and concluded that very little amounts of the drug enters the central nervous system and crosses the blood-brain barrier (Coleman et al., 2012).

The cost of these drugs is another concern. One year of treatment with 120 mg Xenical three days per week has an average wholesale cost of \$1,325.60 (Hauptman et al., 2000). At this time, Qsymia is sold only through certified mail-order pharmacies whose employees completed a Qsymia-provided training program. The average cost of the recommended dose is \$160 for a one-month supply, or up to \$1,920 for one year of treatment, and insurance coverage for the drug is estimated at 1 out of 5 prescriptions (Doheny, 2012).

Although pharmacotherapy for weight loss is certainly a reasonable part of a treatment plan, it is an adjunctive therapy, recommended in conjunction with a lifestyle intervention plan. It is clear that the side effects on one's health and wallet are considerable, and questions still remain in the literature with regard to their safety and efficacy.

### **Bariatric Surgery**

Research suggests that bariatric surgery may result in sustained weight loss, the improvement of comorbid conditions, and a decrease in early mortality, especially in the Class II and Class III obese (Society of American Gastrointestinal and Endoscopic Surgeons [SAGES] Guidelines Committee, 2008). Laparoscopic adjustable gastric banding (LAGB) and laparoscopic Roux-en-y gastric bypass (RYGB) are the most common (Monkhouse, Morgan, Bates, & Norton, 2009). LAGB

decreases food intake, thus energy intake, via the placement of an adjustable band around the top of the stomach to restrict the size of the opening from the throat to the stomach. RYGB restricts both food intake and absorption by surgically creating a small stomach pouch that attaches directly to the lower part of the small intestine, bypassing the duodenum and upper intestinal tract (U.S. Department of Health and Human Services, 2011). Other bariatric surgeries include biliopancreatic diversion with a duodenal switch (BPD-DS) and vertical sleeve gastrectomy (VSG), but these are less common due to their complexity and cost (U.S. Department of Health and Human Services, 2011). LAGB is the only FDA-approved surgery; it was approved in 2001 (U.S. Department of Health and Human Services, 2011).

The debate between which surgery (LAGB versus RYGB) produces faster and more sustained weight loss with the most minimal side effects, resulting in better correction of comorbidities and the most profound decrease in early mortality, is ongoing. RYGB appears to be the most effective for the improvement of comorbid conditions: 84% of patients with diabetes and 97% with dyslipidemia saw improved and/or resolved conditions after one year. In contrast, LAGB surgery improved and/or resolved diabetes in only 48% of patients and dyslipidemia in only 59% of patients after one year (Kral & Naslund, 2007). Romy, Donadini, Giusti, and Suter (2012) found a significantly lower total cholesterol and LDL level ( $p < 0.01$ ) after 5 years in patients who had RYGB compared to patients who had LAGB. In this study, 442 patients who had either RYGB or LAGB were matched for age, BMI, and sex (Romy, Donadini, Giusti, & Suter, 2012). Both surgeries improved and-or resolved obstructive sleep apnea to similar degrees: up to 95% in patients receiving a LAGB

surgery and up to 80% in patients receiving RYGB (Kral & Naslund, 2007), but these results are limited by a lack of comprehensive follow-up after one year.

It may be that more rapid weight loss in the first year with RYGB is the cause of this dramatic improvement in various comorbidities, but this remains under debate. Romy, Donadini, Guisti, and Suter (2012), matched 442 patients who had undergone either LAGB or RYGB for age, BMI, and sex, and found that patients who had undergone RYGB had better weight loss results than those that had undergone LAGB. Maximal weight loss was achieved after 18 months for RYGB patients and 36 months for LAGB patients ( $p<0.01$ ) with a significantly ( $p<0.001$ ) higher excess weight loss [EWL] (78.5% vs. 64.8%). EWL is defined as the portion of patient's weight, in kg, that increases his or her BMI above 25 kg/m<sup>2</sup>. It is often transformed into a percentage of the patient's initial weight (for the purposes of this paper, EWL means % EWL.) At 6 years, although there was some weight regain in both groups (EWL of ~70% vs. ~50%; exact values were not given in the paper or on the graph), the difference in EWL remained significant ( $p<0.001$ ) (Romy, Donadini, Giusti, & Suter, 2012). A limitation in this study that minimizes the results is the low response rate after 12 years (~54%), especially when taking into account that other studies have shown consistent follow-up is a critical factor for surgery success. In one study, LAGB patients lost to follow-up but then asked to return to follow-up experienced less than 25% of EWL versus patients after 2, 4, and 8 years of regular follow-up ( $M=16.3\%$ ,  $27.0\%$ , and  $42.0\%$  EWL, respectively). These results were all significant ( $p<0.001$ ,  $p<0.001$ ,  $p=0.026$ , respectively). (Te Riele, Boerma, Wiezer, Borel Rinkes, & van Ramshorst, 2010). O'Brien, Brown, and Dixon (2005) found

that after 4 years, percentage weight loss was approximately 55%, whether LAGB or RYGB surgery was chosen. Romy, Donadini, Giusti, and Suter's results may have differed because their sample consisted only of patients from their own clinic whereas O'Brien, Brown, and Dixon conducted a meta-analysis of several studies. In another study, weight loss in patients with RYGB was evaluated via literature review; a weighted EWL mean of 54.0% was calculated from 9 studies with a follow-up period of 10 years or more (O'Brien, MacDonald, Anderson, Brennan, Sci, & Brown, 2013).

O'Brien, MacDonald, Anderson, Brennan, Sci, & Brown (2013) followed patients at their clinic in Melbourne, Australia that had LAGB surgery between September 1994 and December 2011. 3,227 patients (78% women) with a mean BMI of 43.8 kg/m<sup>2</sup> were treated by LAGB at the clinic, and 3,132 completed at least a six-month follow-up. The researchers were able to identify 919 patients who completed 10 or more years of follow-up, and 714 (78%) that had completed at least 10 years of follow-up. Fifty-four patients completed 15 years of follow-up. For all patients, EWL maximized at 2 years ( $n=2784$ ,  $M=51.8\pm 1.04\%$ ). EWL was maintained throughout follow-up, however, with patients who completed more than 10 years of follow-up having a mean EWL of  $47.2\pm 2.20\%$  at 10 years ( $n=714$ ) and  $47.2\pm 8.27\%$  at 15 years ( $n=54$ ). The researchers did a comprehensive literature review and found that results of other studies were consistent with their results, including Himpens, Cadière, Bazi, Vouche, Cadière, & Dapri (2011). Himpens et al. (2011) found a mean 42.8% of EWL ( $sd=33.92\%$ ) and a mean BMI decrease from 41.57-33.79 kg/m<sup>2</sup> ( $sd=7.52$ ) within 12 years in 70 patients who had LAGB. After

these 12 years, 60.3% were pleased or very pleased with the surgery (Himpens et al., 2011). Although these results are encouraging for the Class II and Class III obese, these weight loss results may be inflated, as patients lost to follow-up tend to have poorer weight loss outcomes, as shown by te Riele, Boerma, Wiezer, Borel Rinkes, & van Ramshorst (2010).

Patients who have bariatric surgery have the potential to reduce cost to society over patients who qualify for surgery and do not have it. Christou, Sampalis, Liberman, Look, Auger, McLean, and MacLean (2004) found that a surgical cohort of severely obese patients had a statistically significant ( $p < 0.001$ ) reduced cost to society over the 5-year study period when matched with non-surgical controls (\$8,813 versus \$11,854) (Christou et al., 2004). Still, bariatric surgeries are personally expensive, with RYGB costing \$18,000 to \$35,000 and LAGB surgery costing a little bit less, from about \$17,000 to \$30,000 (Mann, 2011). Medicare or other insurance plans may cover the surgeries if patients meet particular requirements (USDHHS, 2009), depending on patients' coverage.

There are some significant side effects to bariatric surgery, however. Depending on the surgery modality, severe nutrient malabsorption, especially of the B vitamins, strictures, hernias, and infections as a result of the surgery may all occur (U.S. Department of Health and Human Services, 2011). Himpens et al. (2011) found that 39% ( $n=32$ ) of their study population experienced complications as a result of LAGB, with 12 patients requiring band repositioning and 26 patients needing band ablation after a mean of 3.6 years. Fourteen patients switched to RYGB due to these complications or to weight gain (Himpens et al., 2011). In a case-matched study

(matched for age, sex, and BMI) of 442 patients, half that underwent RYGB and half that had LAGB, Romy, Donadini, Giusti, & Suter (2012) found that the 6-year long-term complication rate was significantly higher after LAGB than RYGB (41.6% vs. 19%,  $p < 0.001$ ), resulting in more reoperations (26.7% vs. 12.7%,  $p < 0.001$ ) and band removal in 47 patients and/or conversion to RYGB in 28 patients. This study was conducted on patients from the same medical team who performed the bariatric surgery between March 1998 and May 2005, however, two different LAGB procedures were used during the study period. The researchers did not track which LAGB procedure each patient underwent, so it is unknown how this may have affected the results of the study. Complication rates due to LAGB may be artificially inflated if one type of LAGB was less familiar to a surgeon or performed less precisely than another. Regardless of the complication rate, mortality of both RYGB and LAGB is low, approximately 0.28% within 30 days (Buchwald, Estok, Fahrback, Banel, & Sledge, 2007). None of the other studies previously reviewed had any study participant die as a result of the surgery (Romy, Donadini, Giusti, and Suter, 2012; Himpens et al., 2011; O'Brien et al., 2013). The above research indicates that bariatric surgery can be an effective and safe approach when lifestyle interventions and pharmacotherapy have been unsuccessful in the Class II and III obese.

Lifestyle interventions, pharmacotherapy, and bariatric surgery have been effective treatments for overweight and obesity in the literature, but current literature does not accurately represent the general populace. In most of the studies reviewed, middle-aged, higher-educated, white women comprised a majority of the study sample. Ninety-one point nine percent of Veterans are male (U.S. Department

of Veterans Affairs, 2010). In 2010, approximately 11% of Veterans were black, 6% were hispanic, 4% were “all other races,” and the rest were white (U.S. Department of Veterans Affairs, 2010). To examine weight loss interventions in a more diverse population, including males, this study utilized Veterans Affairs [VA], as the study site.

### **Veterans Health Administration**

The VA healthcare system has an enormous scope. It includes 152 hospitals, 817 outpatient, community, and outreach clinics, and 8,570,000 enrollees (U.S. Department of Veterans Affairs, 2012). The projected nationwide Veteran population as of September 2011 was 22,234,000 people with 8.13% female Veterans (U.S. Department of Veterans Affairs, 2011). In 2007, the estimated median age of male veterans was 61 years, and the estimated median age of female veterans was 47 years. An estimated 42% of male veterans and an estimated 18% of female veterans were 65 or older (U.S. Department of Veterans Affairs, 2010). A study of 1.8 million veterans who received Veterans Health Administration [VHA] care during the year 2000 found a prevalence of overweight and obesity of 73.0% and 27.0%, respectively, among men. Among women prevalence was 68.4% overweight and 31.6% obese (Das et al., 2005). A study of 933,084 patients who received VHA care in 2002-2006 revealed that 35.5% of patients met the criteria for obesity, but only 34.1% of those patients received at least one outpatient visit for obesity-related education or counseling (Noël et al., 2010).

**Weight Management in the VA**

Based on the prevalence of obesity in the Veteran population, it is clear that weight loss interventions are needed within the VA. In 2001–2002, through nationwide administrative surveys of all VHA medical centers, less than half of those surveyed indicated they provided weight management programs, whether programs were referrals to a dietitian or more integrated programs (Kinsinger et al., 2009). In response, VA services for overweight and obese Veterans, MOVE! was developed in 2006. MOVE! is currently the largest clinically based weight management program in the United States (Littman, Boyko, McDonell, & Fihn, 2012). Although MOVE! differs from institution to institution and can be implemented according to each VA hospital's independent needs and desires, the basic framework is a five-level treatment model. Level 1 implements self-assessment (MOVE! 23 questionnaire) and guided self-care through handouts located on the MOVE! website. Level 2 addresses patients who have indicated to their primary care physician or dietitians that they are ready to make behavioral changes. Patients receiving Level 2 treatment participate in 90-min twice-monthly in-person group lifestyle sessions addressing nutrition, physical activity, and behavior change, after attending a 120-min introduction session. Levels 3 - 5 involve pharmacological, inpatient, and surgical treatments respectively (Kinsinger et al., 2009). Since MOVE!'s implementation, every VHA hospital and over one-half of VHA community-based outpatient clinics provide MOVE! services. Ninety-five percent of eligible patients are now offered the MOVE! program, with 10-12% these patients, or 300,000 Veterans, participating (Kahwati, Lance, Jones, & Kinsinger, 2011).

A handful of studies have been conducted to determine whether the MOVE! Program has been effective. Kahwati, Lance, Jones, & Kinsinger (2011) evaluated a subset of MOVE! patients first seen between July 1, 2008 and September 30, 2009 ( $n=31,854$ ) and matched them with a sample of 71,725 overweight and obese comparison patients from a cohort of 3,798,530 patients seen at the VA during the same time period. The matching characteristics included gender, age, BMI class, and comorbidity status. The mean age of the MOVE! subset was 57.6 y ( $sd=10.4$ ) and 89.9% were male. Thirty-five percent lived in rural or highly rural areas. Of these patients, 12.1% and 11.6% received either intense (8 or more visits in 6 months) or sustained (treatment spanning 4 months or longer) treatment, respectively. Thirteen point four percent of patients received both intense and sustained treatment. Sixty-two point nine percent of patients received treatment that was neither intense nor sustained, but they did attend at least 2 MOVE! classes.

Results indicated that at 6 months, patients who participated in intense or sustained MOVE! treatment lost 8.3 lb. (95% CI [-8.9, -7.5]), compared to MOVE! patients overall (3.6 lb., 95% CI [-3.9, -3.3]) and control matched subjects (1.0 lb., 95% CI [-1.1, -0.9]). Overall, 31.6% of patients receiving intense and sustained treatment lost 5% or more of their body weight, compared to those that were either intense (22.5%), sustained (19%), neither (15%), or controls (12.5%). Kahwati, Lance, Jones, & Kinsinger (2011) concluded that although the weight loss results were promising, only 13.4% of MOVE! participants evaluated in this study engaged in the intense and sustained treatment and were thus able to attain a weight loss greater than 3.6 lb. This study was limited by its retrospective design

and lack of investigation regarding data significance, but the large sample size, nationwide sample pool, and the similarity of the matched controls strengthened the study's results.

Basing their research on the design of the above study, Littman, Boyko, McDonell, & Fihn (2012) evaluated the MOVE! program retrospectively between the periods of October 1, 2005, and September 31, 2008 in the Veterans Integrated Service Network (VISN) 20, which includes hospitals in Alaska, Oregon, Idaho, and Washington State. Out of 76,599 patients potentially eligible for MOVE! at these facilities, 3,192 (4.2%) participated in the program. Both participants and non-participants ( $N=73,407$ ) were included in the analysis, but some were excluded due to lack of follow-up data or implausible weights after 6 or 12 months. Weights were taken on the date of the first MOVE! encounter (for MOVE! participants) or on the date of implementation of MOVE! at the facility (for non-participants), or up to 30 days prior to each date. Weights were also taken at 6 and 12 months, or as close to that as possible (168-349 days for nonparticipants, and 169-350 days for participants). The average baseline weight for the nonparticipants ( $n=19,487$ ) was 223.3 lb., 95% CI, [222.7-223.9] and the average BMI was 32.2 kg/m<sup>2</sup>, 95% CI, [32.1-32.3]. Participants ( $n=942$ ) were heavier than nonparticipants, with an average baseline weight and BMI of 252.3 lb., 95% CI, [248.9-255.6] and 36.8 kg/m<sup>2</sup>, 95% CI, [36.4-37.2] respectively. After multivariate adjustment, weight change between the groups was significantly greater ( $p=0.048$ ) at 6 months for participants (-2.1 lb., 95% CI, [-2.8,-1.5]) than non-participants (0 lb., 95% CI, [-0.2,0.1]) but not at 12 months ( $p=0.07$ ), when participants lost an average of -1.7 lb from baseline (95% CI,

[-2.5,-0.9] and nonparticipants gained an average of 0.3 lb from baseline (95% CI, [0.1,0.4]) Participants at all facilities that had 6 or more MOVE! visits (the study did not specify how many participants this included) had significantly greater weight losses at both 6-month and 12-month follow-up than nonparticipants. Participants lost an average of 2.6 lb. more (95% CI, [-3.8,-1.5] at 6 months and 3.7 lb. more at 12 months (95% CI, [-5.1,-2.3]). Despite the encouraging weight loss results from the study, conclusions that can be made from these results are somewhat limited. The study had large amounts of missing data, which limited the amount of subjects who could be included in the analysis and decreases the strength of conclusions made from the data ( $N$  decreased from 3,192 participants to 942 participants and from 73,407 to 19,487 for nonparticipants). The patients were not randomized into MOVE!; thus, motivation to lose weight is a confounding variable and may explain the observed weight loss in the MOVE! participant group. The researchers did not calculate their power for this study, either.

Dahn et al. (2011) at the Miami VA assessed the effects of MOVE! after implementation by comparing weight change pre and post enrollment. Researchers sampled 862 Veterans (85% men and 80.5% obese) who enrolled in MOVE! at different times from January 2005 to April 2007 at the Miami VA. The Veterans served as their own controls in the analysis. Weights were taken from the medical charts at 1, 3, and 5 years prior to enrollment and at 3, 6, and 12 months post-enrollment. Linear regression analysis found significantly different ( $p < 0.01$ ) pre and post intervention weight loss trajectories, which suggests a treatment effect of the MOVE! program. Analysis revealed that Veterans gained on average 2 kg per

year prior to MOVE! enrollment. Post-enrollment, Veterans enrolled in group classes had an average weight loss of 1.6 (0.78) kg per year ( $p < 0.001$ ; Dahn et al., 2011).

The results of this study (Dahn et al., 2011) are somewhat limited as the study did not have a control group and there is a possibility that other factors affected weight loss post-enrollment, although researchers minimized this bias by sampling patients from 2005 to 2007 and including different enrollment classes. As a result of this design, this study only showed a correlation of enrollment in the MOVE! program and weight loss, therefore, not causation. Additionally, Veterans only lost 1.6 kg per year as opposed to 8 or more kg in one year in previously discussed studies (Goodpaster et al., 2010; Villareal et al., 2011), but this may be due to the less-intensive nature of the MOVE! program versus the other two studies. All three studies included primarily patients with BMIs of 30 kg/m<sup>2</sup> or higher. Goodpaster et al.'s (2010) subjects had the most weight loss (mean weight losses of 12.1 kg and 9.9 kg at one year) likely due to a greater caloric restriction of 1,200 to 2,100 kcal per day; Villareal et al.'s (2011) subjects merely reduced their caloric intake by 500 kcal to 750 kcal per day, which may have been less than the caloric restriction of Villareal et al.'s (2011) study if subjects were eating 3,000 kcal or more a day at baseline. Baseline caloric intake in this study was not reported (Villareal et al., 2011). Regardless, the MOVE! program does not necessarily hold patients accountable for a reduced caloric intake or exercise. It does recommend a daily 500-1,000 kcal reduction based on weight with 2.5 hours or more of daily physical activity in at least 10-minute increments and provide a food diary and

activity log for patients to log their intake and exercise (Department of Veteran's Affairs, 2011).

In a 2009 nationwide study at all VA medical centers, of the patients who would benefit from weight management based on BMI, health status, and absence of contraindications, 7.5% had participated in MOVE! (Kinsinger et al., 2009). Thirty-seven point nine percent of obese veterans in a nationwide sample of 933,084 Veterans using the VA for health care reported living more than 30 miles from their most-frequently used VA facility, however (Noël et al., 2010). In addition to distance hindering many Veterans, others identified barriers to participation including the time of day the program is offered and an inability to obtain transportation the hospitals where the program is offered (Kinsinger et al., 2009). In an effort to increase access to care for overweight and obese veterans, as well as provide a method of daily accountability and commitment to potentially improve weight loss outcomes, a MOVE! home telehealth option was developed in 2009, called Home Telehealth (HT)/teleMOVE! Since 2010, The VA's Health Promotion and Disease Prevention program estimated that 7,000 patients have enrolled in HT/teleMOVE! nationwide (2011).

### **Telehealth**

Telehealth is defined as a methodology that removes the time and distance barriers for the delivery of health care services or related health-care activities (American College of Nurse Practitioners, n.d.). Telehealth can include transmission of health care activities from medical center to medical center (as in a real-time diabetic retinal exam) from medical center to specialist's office (as in an head CT

sent to the neurologist's office from the medical center), or from the patient's home to the medical center (as in home telehealth), depending on the service. Home telehealth increases the convenience of health care and can allow for more intensive patient monitoring. It incorporates technologies such as telephones, computers, interactive video transmissions, direct links to health care instruments, transmission of images, and conferencing by phone or video to provide the "right care, in the right place, at the right time" (U.S. Department of Veterans Affairs, 2011). The VHA's Office of Telehealth Services (OTS) was recently created to promote and increase telehealth services within the VHA system, especially home telehealth. Some of their telehealth areas of service include home-based care for veterans with diabetes, chronic obstructive pulmonary disease, spinal cord injuries, dementia, heart failure, depression, hypertension, and post-traumatic stress disorder. Nurses monitor veterans' vital signs, symptoms, and clinical indicators of each condition through telehealth devices connected to a phone landline or Internet router.

A vital component of home telehealth is the teamwork between the health care provider and the patient or caregiver. The patient's or caregiver's role is to learn monitoring skills to manage chronic health conditions. The health care provider's role is to intervene immediately if the patient's signs and symptoms warrant, preferably prior to hospitalization or emergency room visits. Preliminary analysis from a cohort of 17,025 patients showed a 25% reduction in hospital bed days of care and a 19% reduction in numbers of hospital admissions following the implementation of telehealth in the VA (Darkins, Ryan, Kobb, Foster, Edmonson, Wakefield & Lancaster, 2008). In 2011, an estimated 385,000 Veterans were

receiving telehealth care, with 65,500 Veterans receiving home-based telehealth care. Reported satisfaction rates with home-based telehealth were approximately 85% (Darkins, 2012).

### **Weight management and telehealth**

Within the last 10 years, traditional behavioral interventions for weight loss have been augmented with telehealth-based programs with encouraging results. A small telehealth pilot study, ASPIRE-VA (Damschroder, Lutes, Goodrich, Gillon, & Lowery, 2010) was done through the VA to investigate weight loss outcomes and feasibility using a small-changes approach to weight loss. After receiving a food diary logbook, a workbook, and a pedometer, 14 participants followed up with a lifestyle coach via phone weekly for 12 weeks to review goals and set new goals for the following week. Weight loss at 12 weeks from baseline was  $M=-3.8 \pm 3.6$  kg,  $p=0.03$  though there was no significant ( $p=0.24$ ) change in amount of walking activity at 12 weeks from baseline ( $+786 \pm 2288$  daily steps). Although this study is limited by its very small sample size, and feasibility in a large population is questionable given the workload demands on the lifestyle coach, there is definite potential for a greater weight loss with a larger sample size with less workload demand on the coach.

In 2012, a follow-up study to ASPIRE-VA, ASPIRE II (Lutes, Daiss, Barger, Read, Steinbaugh, & Winett), examined the impact of a similar intervention, a 3-month group-based in-person weight loss treatment followed by a 6-month phone-based follow-up. Participant body weights, waist circumferences, total steps, and caloric intake using a 7-day food record were recorded at baseline, and after 3 and

6 months. In this pilot study, 25 overweight and obese women with an average BMI of  $31.4 \pm 4.9$  kg/m<sup>2</sup> and an average age of 49.7 years completed both the initial and follow-up interventions with 86% attendance in group sessions and a 73% phone call completion rate. Attendance during the group-based initial phase of the program was found to be positively associated with continued weight loss during follow-up ( $r(20) = -0.64, p = 0.001$ ).

Using an intent-to-treat analysis (imputed weight of +0.3 kg/month following last follow-up contact for the three participants that did not complete) after the initial treatment, participants lost an average of 3.2 kg ( $p < 0.001$ ) and continued to lose during the 6-month follow-up ( $M = -2.1$  kg,  $p = 0.017$  vs. completion of initial program) for a total mean weight loss of 6.1 kg ( $p < 0.001$ ), or an average of 6% body weight loss, across the 9-month intervention. For completers, mean initial, follow-up, and total weight losses were 3.6 kg ( $p < 0.001$ ), 2.5 kg ( $p = 0.013$ ), and 6.1 kg ( $p < 0.001$ ), respectively. Across the entire 9-month interval, the mean decrease in completer BMI was 2.3 kg/m<sup>2</sup> ( $p < 0.001$ ) and the mean decrease in waist circumference was 5.9 inches ( $p < 0.001$ ). There was no significant ( $p = 0.06$ ) change in walking activity, ( $M = +886$  steps/day) at the end of 9 months vs. baseline ( $M = 7896 \pm 2586$  steps/day), but caloric intake was significantly decreased ( $M = -496$  calories,  $p = 0.03$ ). This follow-up study to ASPIRE demonstrates that modest, yet clinically-significant (~6%) weight loss is possible over a longer follow-up duration than 3 months, and that statistically-significant weight loss can continue via a telephone-based delivery after a group intervention has been completed.

There are many limitations to this study, however. There was a small, singular gender sample size with a number of unique characteristics likely absent in the general population. First, the women selected for the study were much more active than the average person with a baseline step count per day close to the “active” 10,000 steps per day recommendations for weight loss (Tudor-Locke & Bassett, 2004). Additionally, these women were well-educated, with a mean of 15.8 years of schooling, and were fairly self-motivated already, as evidenced by an 86% participation rate in weekly group sessions. Therefore, these results may not be applicable to less educated or less motivated populations. In addition, it is not possible to separate the effects of the initial group sessions from the telephone-based intervention to determine whether the telephone delivery system alone would have been effective or if it was the initial group interaction that caused the telephone delivery to become effective. The initial, weekly, face-to-face, group sessions may have inspired more adherence and commitment to the program and skewed the results of the follow-up, biweekly telephone-based intervention (Lutes et al., 2012).

Outside the VA health system, using a larger, sample size and a study design comparing a telephone intervention with an in-person intervention, Appel et al. (2011) studied weight loss over two years in 415 obese patients with an average age of  $54.0 \pm 10.2$  years with one or more cardiovascular risk factors (hypertension, diabetes, or hypercholesterolemia). Patients (63.6% women and 41.0% black) were stratified into three groups: (a) a control group (met with a weight-loss coach at the beginning and end of the study after data collection and received weight loss web

sites and brochures), (b) an in-person intervention group (a combination of nine group and three individual sessions for the first 3 months and one group and two individual sessions for the last 3 months), and (c) a remote support intervention group (12 weekly phone calls with a coach for the first 3 months and one call per month for the last 3 months). Patients were required to have regular access to a computer and basic computer skills to be in the study. Both intervention groups had access to a study website with educational content, self-monitoring tools, and feedback regarding weight loss progress. Patients in the in-person support group could choose to conduct their individual sessions via phone as well. Participants in the intervention groups were encouraged to lose 5% of their baseline weight in six months and maintain the reduced weight until the close of the study.

Results showed significantly more weight loss at all time points (6, 12, and 24 months) in both intervention groups compared to the control group. There were no significant differences between the two intervention groups at any time point; in this study, the remote support intervention was as effective as the in-person support intervention. Mean weight losses from baseline using intent-to-treat analysis for the control group, remote support group, and in-person support group at 6 months were  $1.4 \pm 0.4$  kg,  $6.1 \pm 0.5$  kg, and  $5.8 \pm 0.6$  kg, respectively ( $p < 0.001$ , for both intervention groups versus the control group). At 24 months, patients had gained some weight back; mean weight losses from baseline for control group, remote support group, and in-person support were  $0.8 \pm 0.6$  kg,  $4.6 \pm 0.7$  kg, and  $5.1 \pm 0.8$  kg, respectively. At 24 months, 38.2% and 18.3% of patients in the remote group had achieved clinically significant weight loss of at least 5% and at least 10%,

respectively ( $p < 0.001$  versus control). Percentage of patients in the in-person support that achieved at least 5% and 10% weight loss at 24 months was 74.4% and 41.4% respectively ( $p < 0.001$  versus control; Appel et al., 2011).

These results are encouraging, echo the findings of Lutes et al. (2012) above and reinforce that clinically significant weight loss is possible with telehealth; however, Appel et al.'s study (2011) is not without limitations. The complexity and overlap of treatment between the intervention groups does not allow for accurate assessment of the relative contribution of each individual component as it relates to final weight loss. One cannot, therefore, definitively conclude which factor, whether it was the telephone calls to the counselor, the website, or the personalized counseling, that impacted weight loss the most. Additionally, although the total amount of contacts recommended for each intervention group were different (in-person recommendation was 57 visits and remote recommendations was 36 phone visits), participation rates for each intervention component were equal between the two interventions at approximately a median of 16 total visits. This may have decreased the weight loss results of participants in both the in-person and remote support groups below expected values, had they participated fully. On the other hand, a strength of this study was its attempt to reflect an actual primary care practice: study eligibility criteria was lenient, patients were encouraged but not required to attend the group sessions, and patients were not mandated to use the website (although reminder emails and phone calls were sent if patients did not log into the website after 7-10 days and after 14 days). Even with a comparatively less-stringent intervention, attrition rates were 5.0% at 6 months and 13.0% at 24

months for the remote support group and 8.7% at 6 months and 15.9% at 24 months for the in-person support group. It appears that remote support may promote better participant adherence over time than in-person support. The researchers did not present any potential significant differences between these attrition rates in their paper (Appel et al., 2011).

Weight maintenance alone using self-monitoring techniques has been explored through telehealth as well. Haugen, Tran, Wyatt, Barry, & Hill (2007) found that 87 adult participants who had lost 7% of their body weight or more using an email and web-based telehealth weight-maintenance intervention in comparison with both a traditional classroom-based intervention and no intervention for six months lost the same amount of weight and maintained that loss as well as those participants in the traditional intervention group ( $M=0.6$  kg weight loss in the traditional group and  $M=0.5$  kg weight loss in the telehealth group,  $p=0.02$ ). Participants in the no intervention group, in contrast, gained an average of 1.7 kg, which was significantly more than the telehealth and traditional groups ( $p=0.02$ ). There were no differences in overall satisfaction between the telehealth and traditional groups ( $p=0.43$ ), but individuals in the telehealth group rated their program as more convenient compared with the traditional group ( $p=0.0001$ ; Haugen et al., 2007). This significant result supports the lower attrition rate seen in the remote support group in Appel et al. (2011) and suggests that greater adherence to treatment is likely related to improved treatment convenience. Neither Haugen et al. (2007) nor Lutes et al. (2012) conducted their studies in the VA health system, but the findings of both studies may have positive implications for patients who

choose to discontinue going to MOVE! class and use HT/teleMOVE! as a convenient means for weight maintenance (Haugen et al., 2007) or continued loss (Lutes et al., 2012).

### **Weight Management through HT/teleMOVE!**

An average of 800,000 Veterans live in Illinois (Department of Veterans Affairs, 2007) and 26.1% of male veterans and 23.1% of female veterans use VA health care (U.S. Census Bureau, 2009), so it can be estimated that 393,600 veterans use VA health care in the state of Illinois. It is estimated that there are 4,490 patients receiving care through Hines VA hospital (Chicago, IL) that have a BMI of 25 kg/m<sup>2</sup> or more and are thus potentially eligible for the MOVE! program at any given time (U.S. Department of Veterans Affairs, 2011). The VHA Office of Rural Health (2012) estimates that 3.4 million Veterans enrolled in the VA system, or 41%, live in rural or geographically-remote areas. In an attempt to meet the needs of the patients at Hines that are not able to come to the MOVE! program group classes, Hines VA Hospital received funding to implement HT/teleMOVE! in October 2010.

The HT/teleMOVE! program is composed of a three-month or more intervention of 78 sessions (at a rate of one session per day). Although veterans are invited to participate in as many three-month rounds as desired, the material in the initial three-month round is repeated in subsequent rounds. Veterans can start in HT/teleMOVE! at any time, immediately upon receiving nutrition education, behavioral counseling, and equipment training in the enrollment appointment with the care coordinator. Veterans also set process goals with the care coordinator, two nutrition goals and two activity goals, to achieve their weight loss goal, which is

typically 5% of their body weight. Veterans in the HT/teleMOVE! program receive an educational booklet (MOVE! Weight Management booklet), a Health Buddy® at-home telemonitoring device (Health Hero) and a scale (AND) to use at home. Daily, the Health Buddy® asks veterans different knowledge, skills, and behavior-based questions, such as “What is the recommended portion size of a piece of meat?” or “Did you meet your physical activity goal this week?” The veterans’ answers to the questions are transmitted through a phone landline or Internet router and can be accessed from the vendor website by the HT/teleMOVE! care coordinator at the hospital site. The weights are transmitted weekly through a scale, which participants attach to the Health Buddy,® by a USB cord. The HT/teleMOVE! care coordinator reviews and records the weights monthly and reviews the patients’ answers to the questions weekly.

Understanding how the HT/teleMOVE! program and home telehealth affect weight loss would contribute additional understanding of the components of effective telehealth weight loss programs and lead to more effective weight loss programs that maximize weight loss results and minimize workload on the coach, thus decreasing overall costs. Because the program is so new, there has been no research on the program’s effectiveness.

At-home telemonitoring using a home-telemonitoring device and a scale has been studied before, just not in the Veteran population. In the only study to date based on a combination of telephone counseling and at-home telemonitoring, Van Wormer et al. (2009) randomized 100 (91 females and nine males, with an average age of 46.1 years  $\pm$  8.6) Active HealthPartners employees with a BMI of at least 32

kg/m<sup>2</sup> into an intermediate-start (IS) group ( $n=45$ ) and a delayed-start (DS) group ( $n=55$ ) for an 18-month weight loss intervention utilizing an RD-led telephone-based weight loss program and an at-home telemonitoring device. Study participants weighed themselves daily on the at-home telemonitoring device and answered questions regarding eating and activity habits such as “Are you choosing healthy foods?” This information was transmitted via computer daily to the telephone counseling staff. Study participants also engaged in 10-15 min phone calls with an RD every other week for 20 weeks. The DS group acted as a control group for the first six months of the study.

Intent-to-treat analysis showed that for participants in both the IS and DS groups, the time they experienced the most weight loss was at 6 ( $7.5\pm 5.2$  lb.) and 12 months ( $2.9\pm 1.4$  lb.) from baseline, respectively, during their active treatment phase (12 months was 6 months of intervention for the DS group). Weight losses were significant at these time points for both groups ( $p<0.001$ ,  $p=0.023$ , respectively). The researchers concluded that the intervention was more successful than no intervention in the short-term. There was a high attrition rate of 15% at the six-month follow-up and 35% at the 12-month follow-up into the intervention period, which somewhat invalidates the results of the study (Van Wormer et al., 2009). This study had no control group to compare weight loss outcomes with a more traditional approach, either. This study suggests that weight loss interventions utilizing home telehealth in the obese population may be effective, but more research is necessary.

### Summary

Overweight and obesity is a severe, ubiquitous, and multi-faceted problem. Although pharmacological and bariatric surgery treatments have been found to be effective methods of weight loss, these can be expensive and are not suitable for all patients. Neither treatment modality is without its side effects.

In contrast, lifestyle interventions are low-cost, non-invasive, patient-centered forms of treatment that have produced clinically significant weight loss results rivaling those seen in pharmacotherapy trials. Although weight loss interventions greater than two years in length have not been widely studied, weight maintenance trials suggest that prolonged intervention would continue to be effective. Even Class II and Class III obese and older adult patients, contrary to popular belief, can lose weight effectively with lifestyle intervention treatment. It appears that an intensive program including specific daily caloric reduction of 500 kcal or more based on a goal of 10% weight loss, encouragement of daily exercise for at least 30 minutes most days of the week, self-monitoring tools, and social support are essential pieces of lifestyle interventions, whether or not the intervention is augmented by technology.

Technological weight loss interventions appear to be as effective as in-person interventions, if the intervention includes the same essential pieces as a traditional lifestyle intervention. In fact, telehealth interventions in particular may promote greater adherence to weight loss treatment due to their increased convenience over traditional programs. The MOVE! Program is the VA's lifestyle intervention answer to weight management issues among Veterans. However, with increased

overweight and obesity rates in the Veteran population and with many Veterans living 30 miles or more from MOVE! classes, it is essential to investigate the weight loss results of the HT/teleMOVE! program as a more convenient treatment modality to achieve weight loss in the Veteran population. Although the studies that have been done are promising, many of these studies have high attrition rates and small sample sizes with a primarily female demographic that do not accurately represent a greater population. Studying weight loss interventions using telehealth at the VA will fill gaps in the current body of research. Ninety-one point nine percent of Veterans are male (U.S. Department of Veterans Affairs, 2010), an estimated 42% are 65 or older (U.S. Department of Veterans Affairs, 2010), and 73.0% and 32.9% of 1.8 million veterans in 2000 were overweight and obese (Das et al., 2005). Therefore, the Veteran population provides an ideal setting in which to study the efficacy of lifestyle interventions augmented with telehealth to achieve weight loss in overweight and obese older adult males.

### Chapter 3. Methods

This prospective study was conducted at Edward Hines Jr. VA Hospital (S 5<sup>th</sup> Avenue) in Hines, IL. The Hines VA Hospital Institutional Research Board [IRB] and Mount Mary College IRB approved this study. Hines VA hospital is one of five VA hospitals in the state of Illinois, and one of 817 VA hospitals in the nation (Department of Veteran's Affairs, 2012). In 2011, Hines treated approximately 56,000 Veterans (VA Great Lakes Health Care System, 2012). It is estimated that there are almost 5,000 patients receiving care through Hines VA hospital and its community-based outpatient clinics who are overweight or obese that qualify for weight loss services, or the MOVE! Program, through the VA (U.S. Department of Veterans Affairs, 2011). The VHA Office of Rural Health (2012) estimates that 3.4 million (41%) Veterans enrolled in the VA system live in rural or geographically-remote areas. In an attempt to meet the needs of the patients at Hines who are not able to come to the MOVE! program group classes either due to distance or other factors, Hines VA Hospital received funding to implement HT/teleMOVE! in October 2010. The purpose of this study was to examine the weight loss outcomes following participation in the MOVE! versus HT/teleMOVE! programs at Hines VA.

#### **Study Design**

The study sample was a convenience sample comprised of all patients who had enrolled in either the MOVE! or the HT/teleMOVE! program for at least one complete cycle of 4 months during the period of April 2012 through December 2012. Four weights were collected for each patient. A retrospective medical record chart review was used in a similar manner to Dahn et al. (2011) to identify subjects' two

most recent baseline weights in the past five years for comparison, starting from at least one year prior to enrollment or as close as possible (see page 34 for further study details). The two control weights recorded prior to program enrollment were at least one year apart, if possible. Most weights were collected at 1 and 2 years prior to enrollment in the program. For the intervention weights, the initial weight was collected immediately upon MOVE! or HT/teleMOVE! program enrollment and the final weight was collected upon MOVE! or HT/teleMOVE! program completion, after one complete program cycle of 4 months. If Veterans participated in both MOVE! and HT/teleMOVE! at different times during the intervention period, initial and final weights for each program were collected.

### **Subjects**

Subjects were intended to be representative of the estimated 841,679 Veterans in Illinois, of which 55,295 are female Veterans (Westat, 2010). Six hundred seventy-three thousand three hundred eleven Veterans are white non-Hispanic, 120,511 are black non-Hispanic, and 30,795 are Hispanic of any race (U.S. Department of Veterans Affairs, 2011). In Cook County, where Hines hospital is located, there are 231,252 Veterans. The target population included patients in the HT/teleMOVE! and MOVE! programs at Hines VA Hospital in Hines, IL. These patients were United States of America Veterans and dependents, ages 18 years and older, with a BMI of 25 or greater. The HT/teleMOVE! patients had the ability to utilize technology to set up and interact with the Health Buddy® home telemonitoring device, had a functional landline telephone or internet with a router, and were not planning to relocate during their time of participation in the program.

Study participants were excluded from the analysis if they failed to complete the MOVE! program (failure to attend at least five of eight class offerings), failed to complete 82 sessions of the HT/teleMOVE! program within four months' time, or failed to respond to the Health Buddy® home telemonitoring device for 30 days or more.

### **Program Enrollment**

At Hines VA Hospital, there are a few different options for participating in weight management programs. Upon a consult from a Veteran's primary care provider and attendance at the group MOVE! preview class presenting the weight management options at Hines, Veterans at Hines can select any combination of the following options: the group-based MOVE! Program, the self-directed HT/teleMOVE! Program, and one-on-one individual appointments with a registered dietitian, exercise specialist, or psychologist. Both the MOVE! and the HT/teleMOVE! programs have a similar intervention duration of 3-4 months, require regular weigh-ins, have a weight loss goal of 5% of initial body weight, and provide weight loss education using a patient-centered approach. The programs only differ in their method of delivery. Also available for Hines VA Hospital Veterans participating in any of the above weight management options is the MOVE! Gym. Supervised by certified personal trainers, the MOVE! gym is open for 3 hr in the afternoon three days per week. Veterans can use the cardiovascular and strength equipment once they have been cleared for exercise by their primary care provider, have attended a two-hour group orientation to exercise class and have participated in a two-hour individual orientation to gym equipment session.

**MOVE! Program.** Enrollment into the Hines MOVE! Program was on a “rolling enrollment” basis. Veterans started in MOVE! group classes on the second Tuesday of the month by attending the MOVE! introduction class, followed by eight 60-min group classes in the subsequent four months on the first and third Tuesday mornings of the month. MOVE! group classes were taught by different members of an interdisciplinary team comprised of a registered dietitian, a certified health and fitness specialist, a psychologist, a pharmacist, a medical doctor, and a social worker. Topics included those pertinent to weight loss, including managing stress, eating out, moving more, and monitoring portion sizes and food choices. There is a suggested MOVE! national lesson plan, which has been adapted at Hines VA hospital (Appendix A). There were approximately 50-70 Veterans in each MOVE! group class. Before each MOVE! group class, Veterans were weighed with lightweight clothing on and without shoes on a digital scale by a trained medical support assistant (MSA) or dietitian at the appointment location.

**HT/teleMOVE! Program.** HT/teleMOVE! also used a rolling enrollment system. Veterans enrolled in HT/teleMOVE! at their convenience, and attended an individual orientation or the 2 hr orientation class. The individual orientation was held with the HT/teleMOVE! dietitian either in-person or via phone for participants who could not attend the orientation class. The orientation class was limited to ten participants and was held twice weekly on either Mon, Tue, or Wed mornings, depending on the availability of the HT/teleMOVE! dietitian. The purpose of either orientation was to teach participants basic weight loss education, problem-solving strategies, goal-setting strategies, and exercise equipment usage and expectations of

the participants. Throughout the course of the 3 month program, Veterans were encouraged to weigh themselves in the same state of dress and at the same time as possible at every weigh-in. They were encouraged to keep their scale on a hard flat surface for accurate weighing. They were advised that their weights would naturally fluctuate within a couple of pounds from day to day, and that tracking weekly weight trends is a better monitor of overall weight loss progress.

Participants were required to set at least one nutrition-related and one physical activity-related SMART goal, reviewed and agreed-upon by the dietitian prior to starting the program.

The equipment utilized by the HT/teleMOVE! program to assist participants in meeting those goals included a Health Buddy® at-home telemonitoring device (Bosch Healthcare, Palo Alto, CA), an educational booklet with modules similar to those taught in the MOVE! group classes (MOVE! Weight Management booklet), and a digital scale (AND Medical, San Jose, CA) that plugs into the Health Buddy® with a USB cord. Every day, the Veteran weighed himself or herself on the digital scale, interacted with the Health Buddy®, and answered a topic module comprised of knowledge, skills, and behavior-based questions, such as “What is the recommended portion size of a piece of meat?” or “Did you meet your physical activity goal this week?” (Appendix B). These modules varied by topic, are standardized for every Veteran, and must be completed in the order they are presented to the Veteran. Depending on the Veteran’s answer to a particular question, the Health Buddy® may have referred him or her to a module in the MOVE! Weight Management booklet (Appendix C) for more information and recommendations. The Veterans’

answers to the questions were transmitted through a phone landline or Internet router and were accessed daily from the vendor website by the HT/teleMOVE! dietitian at the hospital site. The HT/teleMOVE! dietitian reviewed the patients' weights and answers to the questions and assessed the need for a telephone or electronic message (sent via the computer directly to the Health Buddy®) intervention. Veterans were given the HT/teleMOVE! dietitian's contact information and could telephone with a question or concern. The HT/teleMOVE! dietitian recorded every HT/teleMOVE! participant's weight in the electronic medical record and once per month sent each patient an electronic message with their updated weight progress in the program. At the end of the three months, the HT/teleMOVE! dietitian phoned the Veteran and reviewed his or her program progress toward behavior change and weight loss. Veterans were allowed to participate in as many three-month rounds as desired, but the material in the initial three-month round was repeated in subsequent rounds.

Veterans were allotted one additional month to complete program material if they did not finish in three months because they missed a module on any given day. A Veteran that misses a module on any particular day is termed a "non-responder" for the duration of time that he or she continues to miss modules. Non-responders may not respond to the Health Buddy for a number of reasons, including hospitalization, forgetfulness, lack of motivation to continue with the program, technical difficulties, or a vacation. The HT/teleMOVE! dietitian sent a letter or called the non-responder if 7 days elapsed without module use, and reminded the non-responder again to complete the modules after 14 days elapsed. Upon

enrollment in the program it was communicated to the Veteran that they would be disenrolled from the program by the HT/teleMOVE! dietitian if 30 days elapsed without a response to a module or to the HT/teleMOVE! dietitian's reminders. Veterans were permitted to disenroll upon their request at any time during the course of the program.

### **Data Analysis**

Analysis of intragroup and intergroup weight changes over time was performed using the Statistical Package for the Social Sciences (version 19, 2011, SPSS, Inc., Chicago, IL) software. A one-way repeated measures ANOVA and Tukey's post hoc analysis was used to evaluate intragroup weights at each time point. A series of independent samples *t*-tests were used to evaluate intergroup absolute and percentage weight changes over time as well as intergroup absolute weights at each time point. The frequencies of participants in each program that gained, lost, or had no change in weight post-intervention were evaluated using the chi-squared test for independence. A series of independent samples *t*-tests were used to evaluate post-intervention intergroup absolute and percentage weight changes in those that lost and those that gained weight. All comparisons in this study were considered statistically significant at  $p < 0.05$ .

## Chapter 4. Results

Three hundred forty-two participants enrolled in MOVE!, HT/teleMOVE!, or both programs between April 1, 2012 to November 30, 2012. Of these participants, 122 (35.7%) did not finish one complete cycle of MOVE!, HT/teleMOVE!, or both programs due to disenrollment or failure to meet completion criteria. Ninety-six participants did not finish either MOVE! or HT/teleMOVE! due to early study closure and the researcher's job relocation with departure from the study site. All of these subjects were excluded from the analysis. Included in the analysis were 92 subjects who completed one cycle of MOVE! and 30 subjects who completed one cycle of HT/teleMOVE!. Two subjects completed one complete cycle of both programs, but these subjects were excluded from the analysis due to the small sample size of the group. Demographic characteristics aside from gender were not collected on the subjects due to the researcher's departure from the study site without the IRB's permission to access demographic information after departure. There were 116 males (95%) and six females (5%) in the patient population.

### **Intragroup Weight Changes Over Time**

There was a significant difference between the more recent control [year -1] and initial intervention weights as well as between the initial control [year -2] and initial intervention weights in the MOVE! Group (Fig. 1). Prior to enrollment in the MOVE! Program, subjects gained weight over that time frame. In both the MOVE! Group and the HT/teleMOVE! Group, average weights upon program completion were significantly lower than average weights upon program enrollment ( $p < 0.013$  for both, using Tukey's post hoc analysis). The difference between year -2 and final

intervention weights in the HT/teleMOVE! group trended toward significance ( $p=0.016$  using Tukey’s post hoc analysis).

Figure 1. Average MOVE! and HT/teleMOVE! Weights Pre and Post-Intervention.

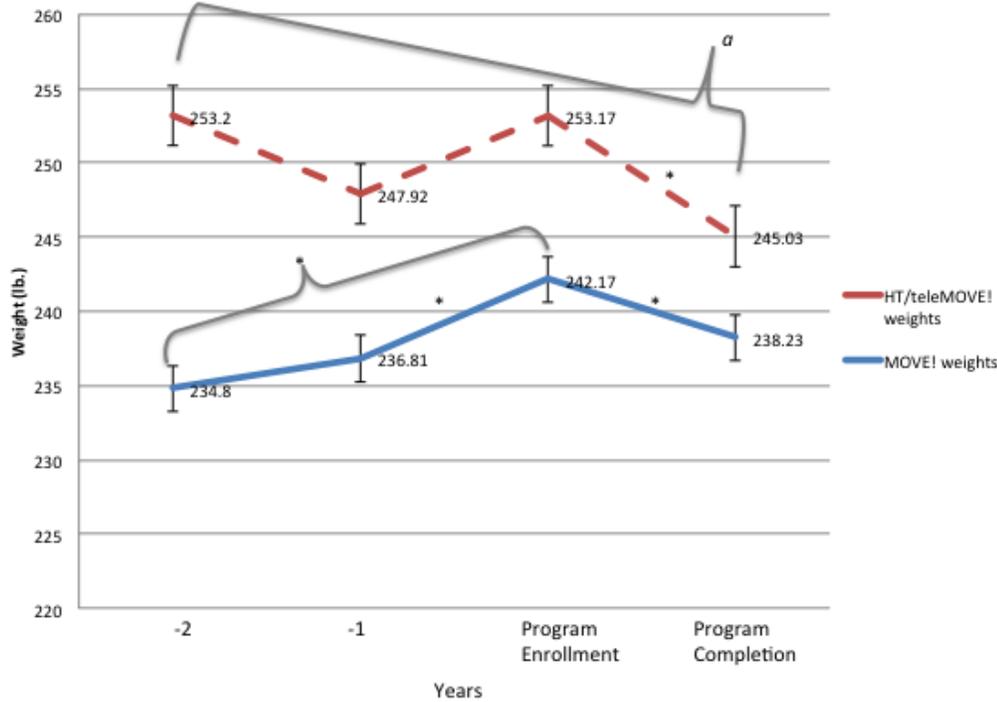


Figure 1. Absolute weights of MOVE! and HT/teleMOVE! participants pre and post-intervention. Pre-intervention is defined as 2 (to 5) and 1 years before enrollment in the program. Post-intervention is defined as 0.25 years (4 months) after enrollment in the program. \* indicates significance, where  $p<0.013$  for within-group weight changes between each time point.  $\alpha$  indicates a trend toward significance, where  $p=0.016$ .

### Intergroup Weight Changes Over Time

There were no significant differences in weight changes between MOVE! and HT/teleMOVE! over time from year -2 to year -1 (0.13 vs. -3.54,  $p=0.08$ ), year -1 to initial intervention (3.52 vs. 1.55,  $p=0.46$ ), or from enrollment to program completion (-4.37 vs. -7.28,  $p=0.12$ ). There was a significant difference found in the absolute weight between MOVE! and HT/teleMOVE! at year -2 (234.8 vs. 253.2,  $p=0.04$ ), but not between any other absolute weights at year -1 (236.8 vs. 247.92,

$p=0.21$ ), enrollment (242.17 vs. 253.17,  $p=0.23$ ), or program completion (238.23 vs. 245.03,  $p=0.46$ ) (Table 1).

Table 1. Between-Group Weight Comparisons Pre and Post-Intervention.

Variable	MOVE! Participants (n=92)		HT/teleMOVE! Participants (n=30)		p value
	Mean	(s.d.)	Mean	(s.d.)	
<b>Absolute Weights (lb)</b>					
Year -2	234.8	41.15	253.2	41.2	<b>0.04 *</b>
Year -1	236.81	41.28	247.92	39.73	0.21
Year 0 (Intervention starts)	242.17	43.73	253.17	42.42	0.23
Year 0.25 (Intervention ends)	238.23	43.67	245.03	41.48	0.46
<b>Weight changes (lb)</b>					
Year -2 to Year -1	0.13	9.34	-3.54	9.61	0.08
Year -1 to Year 0	3.52	12.99	1.55	11.32	0.46
Year 0 to Year 0.25 (Intervention Period)	-4.37	9.45	-7.28	10.9	0.17
<b>Percent weight changes</b>					
Year -2 to Year -1	0.20%	4.01%	-1.06%	3.55%	0.33
Year -1 to Year 0	1.40%	5.25%	0.89%	4.79%	0.64
Year 0 to Year 0.25 (Intervention Period)	-1.79%	3.98%	-3.13%	4.37%	0.12

Table 1. Absolute weights and weight changes of MOVE! and HT/teleMOVE! Participants. Year -2 is defined as 2 to 5 years prior to the intervention, Year -1 is defined as 1 year prior to the intervention, Year 0 is the start of the intervention, and Year 0.25 is the conclusion of the intervention after 4 months' time. \* indicates significance, where  $P<0.05$  for between-group measures.

### Post-intervention Weight Changes in MOVE! Compared to HT/teleMOVE!

Weight changes, whether loss or gain, were similar between MOVE! and HT/teleMOVE!. Post-intervention, participants in the MOVE! program lost an overall average of  $1.79 \pm 3.98\%$  of their initial body weights and participants in the HT/teleMOVE! program lost an overall average of  $3.13 \pm 4.37\%$  of their initial body weights, though these differences were not statistically significant from each other ( $p=0.12$ ) (Figure 2). Twenty-six point two seven percent of total HT/teleMOVE! participants lost 5% or more of their initial body weight, vs. 20.65% of total MOVE! participants (Figure 3).

Figure 2. Post-Intervention Average Percentage Weight Change of all MOVE! and HT/teleMOVE! Participants

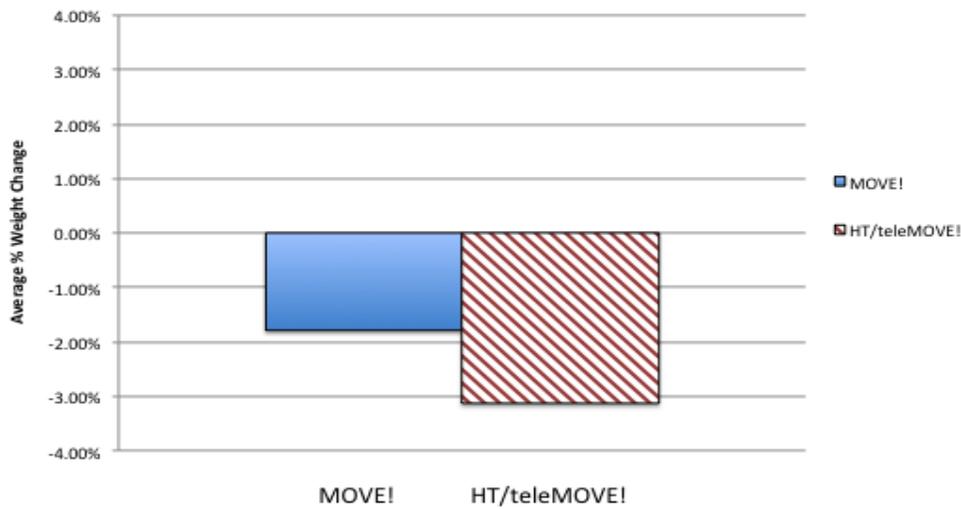


Figure 2. Average percentage weight loss after MOVE! and HT/teleMOVE! Programs for all participants. Overall, Participants in the MOVE! Program ( $n=92$ ) lost an average of 1.79% of their initial body weights. Participants in the HT/teleMOVE! Program ( $n=30$ ) lost an average of 3.13% of their initial body weights. These differences were not statistically significant ( $p=0.12$ ).

Figure 3. Percentages of Participants in MOVE! and HT/teleMOVE! with Clinically Significant Weight Loss

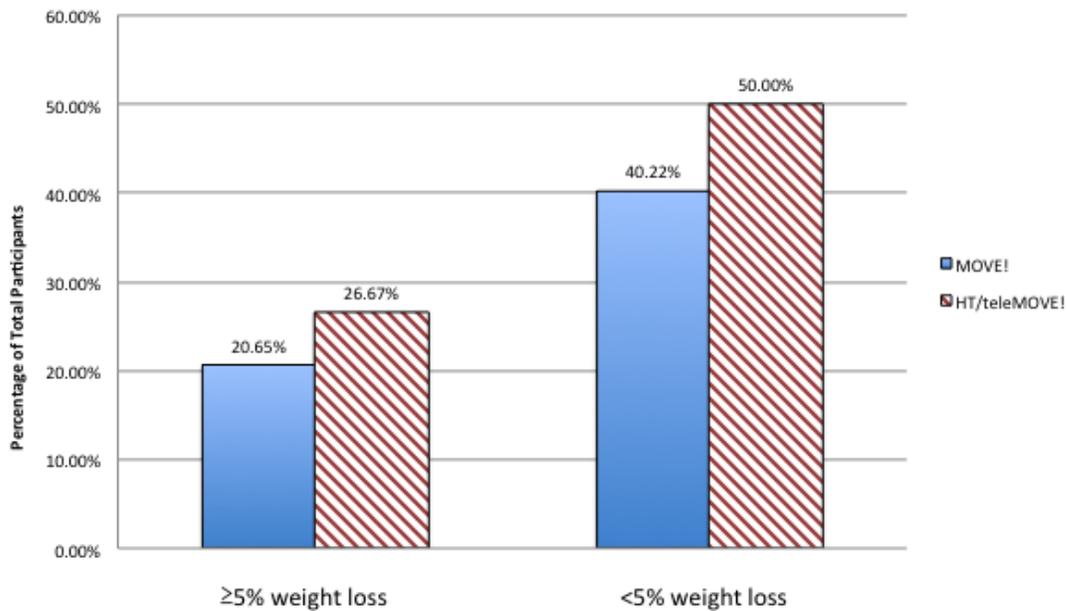


Figure 3. Percentage of total participants in MOVE! and HT/teleMOVE! Programs, classified by percentage weight loss category. 20.95% of MOVE! participants ( $n=19$ ) lost 5% or more of their initial body weight. 34.78% of HT/teleMOVE! Participants ( $n=8$ ) lost 5% or more of their initial body weight.

For those that lost weight in the MOVE! Group, the average weight loss was 10.01±6.02 lb (Figure 4), or 4.46±3.05% of the participants’ initial body weight (Table 2). The average weight loss of the HT/teleMOVE! participants that lost weight was 11.00±8.71 lb (Figure 4), or 4.70±3.59% of the participants’ initial body weight (Table 2).

Figure 4. Post-Intervention Weight Changes of MOVE! and HT/teleMOVE! Participants, Classified by Weight Status Outcome

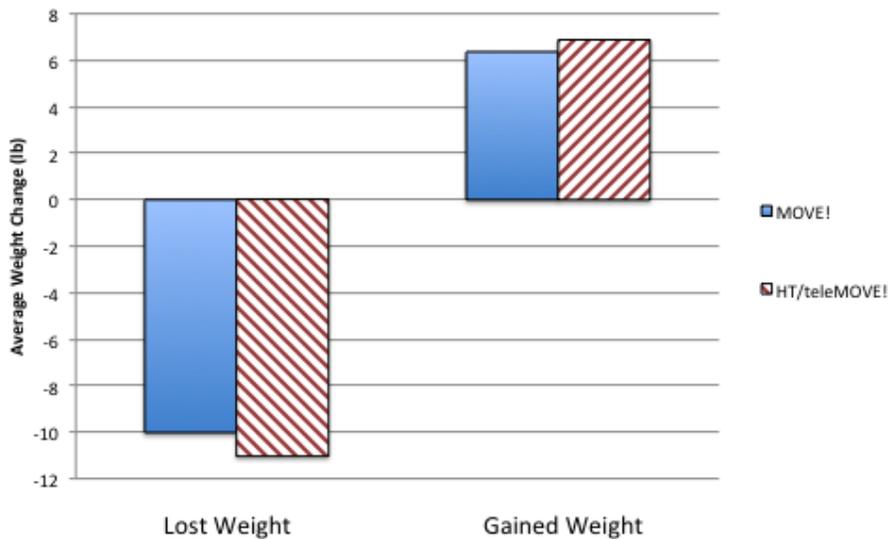


Figure 4. Average weight changes after MOVE! and HT/teleMOVE! Programs for participants that lost weight and participants that gained weight. Weight loss: the MOVE! Program ( $n=56$ ) average weight loss was 10.01 lb. The HT/teleMOVE! Program ( $n=23$ ) average weight loss was 11.00 lb. Weight gain: the MOVE! Program ( $n=30$ ) average weight gain was 6.36 lb. The HT/teleMOVE! Program ( $n=5$ ) average weight gain was 6.88 lb. There were no significant differences found in these absolute weight status outcomes between the programs.

Table 2. Between-Group Weight Comparisons Post-Intervention, Classified by Weight Status Outcome

Weight Status	MOVE!		HT/teleMOVE!		p value
	Mean	(s.d.)	Mean	(s.d.)	
Participants that lost weight total n=79	4.46%	3.05%	4.70%	3.59%	0.76
Participants that gained weight total n=35	2.72%	1.46%	2.22%	2.35%	0.50

Table 2. Percentage weight changes of MOVE! and HT/teleMOVE! Participants post-intervention, classified by weight status outcome. Participants that lost weight in the MOVE! group (n=56) lost approximately 4% of their original body weight, the same amount of weight as participants that lost weight in the HT/teleMOVE! group (n=23). Participants that gained weight in the MOVE! group (n=30) gained approximately 2% of their original body weight, the same amount of weight as participants that gained weight in the HT/teleMOVE! Group (n=5). Eight participants maintained their weight throughout the intervention, six from the MOVE! group and two from the HT/teleMOVE! Group. No between-group statistical significance was detected in any weight status category.

Thirty-two point six percent of MOVE! participants (n=30) gained weight (Figure 5), with an average weight gain of 6.36 lb. (Figure 4), or 2.72% of their initial body weights (Table 2). Participants in the HT/teleMOVE! program that gained weight (n=5) gained 6.88 lb., on average (Figure 4), or 2.22% of their initial body weights (Table 2).

Figure 5. Post-Intervention Weight Status of MOVE! and HT/teleMOVE! Participants

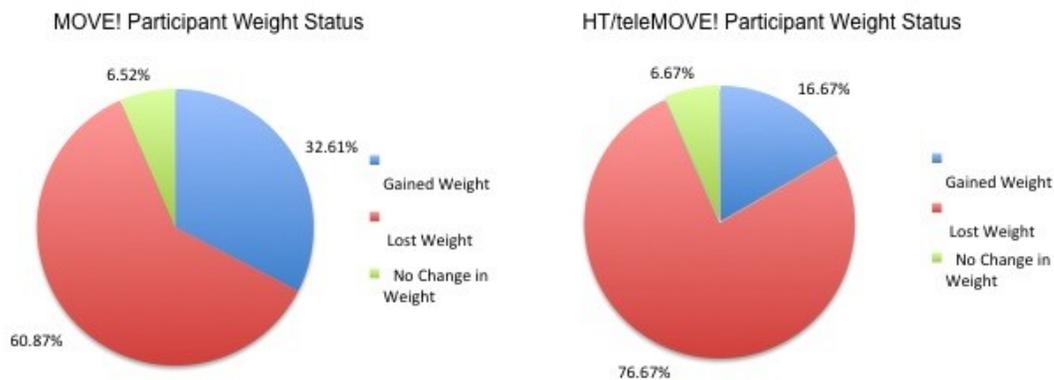


Figure 5. Weight status of participants after MOVE! (n=92) and HT/teleMOVE! (n=30) Programs. Post-intervention, participants were classified as gained weight, lost weight, or no change in weight (no change in weight was defined as gaining or losing one pound or less). There were no significant differences found in the distribution of participants that gained weight, lost weight, and had no change in weight between the programs.

## Chapter 5. Discussion

This study demonstrated that enrollment in either MOVE! or HT/teleMOVE! for a four-month cycle is associated with weight loss: more Veterans who enrolled in MOVE! or HT/teleMOVE! experienced weight loss than weight gain or weight maintenance. Average body weight was significantly lower upon program completion compared to program enrollment in both programs. In addition, the average percentage of body weight loss approached clinical significance for those that lost weight during the intervention in both programs (4.46% body weight loss in MOVE! and 4.70% body weight loss in HT/teleMOVE!). Interestingly, prior to program enrollment, subjects in the MOVE! program experienced significant weight gain, which suggests that participation in the program resulted in the weight loss..

### **Limitations**

Although the findings of this study are promising, they are limited due to several weaknesses. The first weakness is the lack of a true control group. Subjects were used as their own controls in the manner of Dahn et al., 2011, so it is possible that study subjects could have participated in MOVE! or another weight loss intervention prior to study enrollment in 2012. Indeed, a review of clinic appointments associated with weight measurements in the patient's electronic medical record indicated that several control weights were taken at appointments with a dietitian or at a MOVE! appointment. Efforts were made to eliminate use of historical weights that were taken at an appointment with a dietitian or at a MOVE! appointment as control weights. Although these weights were not true control

weights, some were included in the study as control weights because the availability of other historical weight data was limited.

A second weakness of this study is the lack of subject demographic data, which precluded the ability to control for potentially confounding demographic variables. Perhaps the weight losses associated with the programs observed in this study were results of a participant's background, motivations, or of another weight loss intervention that the participant was involved in at the time of the study rather than the study intervention itself. Without demographic data, possible confounding factors cannot be explored.

A third weakness of this study is the limited sample size, partially due to an unanticipated early study closure as a result of the researcher's job relocation with departure from the study site. The component of the research question exploring weight outcomes between (1) subjects in MOVE! (2) subjects in HT/teleMOVE! and (3) subjects in both programs simultaneously was unable to be explored due to the extremely small sample size ( $n=2$ ) of participants that truly enrolled in both programs simultaneously.

Another weakness of this study was that the weights of study subjects in either group were measured on different scales under different conditions. MOVE! participants were weighed at Hines VA Hospital immediately prior to each MOVE! group class by the Medical Support Assistant. HT/teleMOVE! participants weighed themselves at any time during the day in the privacy of their own home.

Additionally, although a majority of participants in both groups were measured on an AND (AND Medical, San Jose, CA) digital scale, weights may have been taken on

different scales. For MOVE! group weigh-ins, some participants may have been weighed on a balance beam scale present in the room for a back-up scale if the digital scale ran low on batteries or if a lot of participants were weighing-in simultaneously and an additional scale was needed. Some participants in the HT/teleMOVE! group may have weighed in on a favorite home scale instead of the AND digital scale and entered their weight manually into the telemonitoring device; this would be the weight sent to the researcher to record in the electronic medical record instead of the weight directly from the AND digital scale.

Further, the instruction manual that accompanies the AND digital scale recommends the scale be placed on a hard flat surface with the plastic feet attached to the bottom of the scale to obtain an accurate weight. Some of the participants in the MOVE! group were weighed on a very thin carpeting that was present in the weigh-in room before it was replaced with flooring in June 2012, in antithesis to these recommendations. HT/teleMOVE! participants likely had access to some type of hard, flat surface in their own home. Moreover, MOVE! participants were weighed with their clothing on, while HT/teleMOVE! participants were able to weigh themselves in the privacy of their own home and possibly removed their clothing for weigh-ins. Any of the above, or additional, deviations from the recommended scale and weigh-in practices described in the methods section of this study may have confounded the results and either overestimated or underestimated the observed weight changes.

## **Strengths**

Study strengths include that participants were meticulously tracked throughout their enrollment in either program to ensure they met the inclusion criteria and were, in fact, an active program participant. Study subjects were taken from a variety of enrollment groups over 8 months' time, minimizing bias related to enrollment time of year. Also, this weight loss study has a unique study population comprised primarily of men (vs. women in the typical weight loss study).

## **Comparisons with Other Studies**

Although these study findings cannot be generalized to a greater population beyond that of overweight and obese Veterans at Hines VA Hospital, they are consistent with other studies of overweight and obese Veterans, including the findings of Kahwati, Lance, Jones, & Kinsinger (2011) and Dahn et al. (2011). Kahwati, Lance, Jones, & Kinsinger evaluated weight loss outcomes of MOVE! patients undergoing either intense (8 or more visits in 6 months) or sustained (treatment spanning 4 months or longer) treatment. In their evaluation of the MOVE! program, 31.6% of patients receiving both intense and sustained treatment lost 5% or more of their body weight, compared with 19% of those who received only sustained treatment (Kahwati, Lance, Jones, & Kinsinger, 2011). According to Kahwati, Lance, Jones, & Kinsinger's (2011) criteria, the HT/teleMOVE! program could be described as intense and sustained, and the MOVE! program could be described as sustained. In this current study, 34.78% of HT/teleMOVE! patients (intense and sustained treatment) lost 5% or more of their initial body weight, compared with 33.93% of MOVE! patients (sustained treatment), though there were

no significant differences between the groups with regard to percent of initial body weight lost. Although both of the treatment groups in this study appear to have a greater percentage of participants that achieved clinically-significant weight loss, this study's sample size ( $n=122$ ) was much smaller than that of Kahwati, Lance, Jones, & Kinsinger (2011) ( $n= 4, 282$ ) and includes participants in only one facility vs. 140 facilities.

Similar to this study, Dahn et al. (2011) evaluated weight trajectories prior to and post enrollment in the MOVE Program, although there are some differences in methodologies of both data analysis and study design. Dahn et al. evaluated participant weight trajectories using linear regression in 388 patients, while this study evaluated absolute weight over specific time periods, absolute weight changes, and percentage body weight change in 122 patients. Dahn et al. (2011) found an average weight gain of 2 kg per year prior to enrollment in the 10-week (2-3 months) MOVE! program, and an average weight loss of 1.6 kg/year post enrollment for the initial year. In the current study, participants in the MOVE! group had an average, statistically significant weight gain of 7.37 lb. one to five years prior to enrollment and participants in the HT/teleMOVE! group had an initial weight loss of 5.28 lb. at year -2, but then a subsequent gain of 5.25 lb. in the year prior to enrollment.

Participants who enrolled in the HT/teleMOVE! program weighed significantly more than those in the MOVE! program at year -2. The 18.4 lb. difference in the average first absolute control weight (at year -2) between the groups was statistically significant ( $p=0.04$ ), and can likely be explained by the self-

selected nature of group assignment inherent in the study design. Participants who enrolled in the HT/teleMOVE! group may have had previous attempts at weight loss through the MOVE! program or other methods. Often, subjects are referred to the HT/teleMOVE! program through the MOVE! program, or indicate upon enrollment that they have tried other methods of weight loss, which initially resulted in weight lost but failed to produce further weight loss or caused rebound weight gain. The pattern of weight gain immediately prior to enrollment in the HT/teleMOVE! Group, as opposed to that of participants that enrolled in the MOVE! group, suggests that this might be the case.

Although Dahn et al. (2011) had a shorter intervention duration than this study, 2-3 months vs. 3-4 months, they were able to evaluate post-enrollment weights at 3, 6, and 12 months. This study did not evaluate post-enrollment weights, which weakens this study when compared to Dahn et al., since research has suggested that maintenance of weight loss is difficult due to compensatory changes in energy expenditure that favor the original body weight (Leibel, Rosenbaum, & Hirsch, 1995). Therefore, study participants that lost weight may have regained the weight post-intervention, though some of them did likely continue to participate in MOVE! support groups or another cycle of HT/teleMOVE!, which may have helped mitigate weight regain.

The findings of this study suggest that MOVE! or HT/teleMOVE! for three to four months may be effective for weight loss. Future research is needed to investigate whether either of these programs are associated with sustainable weight loss both during and post-intervention, in matched control and intervention groups.



## Chapter 6: Conclusions and Recommendations

This is the first study conducted on the HT/teleMOVE! program in the VA system, and the second study conducted on a weight management program using a home-telemonitoring device. This study demonstrated that weight loss interventions using telehealth are associated with weight loss of a similar magnitude as traditional programs. In fact, clinically significant weight loss (~5%) was seen within 4 months in both programs, which suggests that interventions need not be lengthy. The results of this study were consistent with other studies examining weight loss interventions within the Veteran population.

In the past 15 years, rates of overweight and obesity have climbed from 35.5% and 15.9% to 36.2% and 27.5%, respectively, in the U.S (CDC, 2010) and are projected to continue to rise. By 2020, if the prevalence of overweight and obesity continues along its current trajectory, an average of 77%, or three in four Americans, could be overweight or obese (Shute, 2011) Overweight and obesity is associated with a variety of preventable comorbid factors as well as early mortality. As a result, it costs the Medicare system an additional \$1,723 per year for each obese person and the private insurance sector an additional \$1,140 when compared to a person of normal weight (Finkelstein, Trogon, Cohen, & Dietz, 2009).

Because of the societal costs associated with overweight and obesity, health promotion programs, such as HT/teleMOVE! and MOVE!, are slowly growing in popularity, but remain underfunded in the health care system as a whole. Traditionally, health promotion programs are regarded by some as less cost-effective with more dubious benefits than a curative, or disease treatment program.

A growing body of literature, including the landmark Senior Risk Reduction Demonstration (SRRD) suggests that health promotion programs can actually save money; one arm of the study saved \$958 in Medicare costs with 14.2% less hospitalizations in one year (Centers for Medicare & Medicaid Services, 2012).

It is encouraging that health promotion interventions that utilize technology, such as the HT/teleMOVE! program, have the potential to decrease not only labor and overhead costs, but costs to the entire healthcare system associated with overweight and obesity. Due to the potentially-high upfront cost related to purchasing equipment and training staff, this is yet undetermined. Perhaps a cost-benefit analysis would help to establish if this is the case.

Increasing the sample size of the study would be beneficial for future studies, as well as having demographic information and a true, matched control group. Moreover, examining not only weight loss as an outcome variable, but the effect of weight loss on comorbidities, such as diabetes or hypertension, would help establish this intervention as one that could reduce societal costs associated with overweight and obesity. Long-term impact of the intervention should be studied by extended follow-up with participants. Generally, weight loss interventions need to reinforce sustained weight loss. Whether or not HT/teleMOVE! is equally, more, or less effective at promoting sustained weight loss compared to the traditional MOVE! Program and other weight loss programs is unclear. This study contributed to the positive body of evidence in the literature that weight loss interventions utilizing technology may be effective, but there must be further research to confirm this relationship.

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Appendix A.

MOVE! Class and Curriculum Schedule  
2012

Class date	Class #	Clinic Name	Class Time	Class Leader(s)	Class Title	Materials Needed/Handouts	Other Duties
1/3/12	7	HIN MOVE WT MGT DIETITIAN-G HIN MOVE MD-G	9-10am 10-11am	Rochelle Dagna/Satter	Exercise Medications for Obesity	Calories Burned during common physical activities, Barriers to Physical Activity, Benefits to Physical activity Medications and Weight Loss	AV Set Up: Power Point: Nutrition & Exercise for Weight Management 2010 Power Point: MOVE! Group Medication Lecture
1/10/12	Program Intro	HIN MOVE WT MGT INTRO RD-G	9-1130am	Lisa/Rochelle	Introduction to MOVE! Weight Management 101	Are you Ready?/Basics of Weight Loss MOVE! Log Book Waist Circumference Consent Forms My HealthEvet Journal/Worksheet Set Your Weight Loss Goals Meal Planning Handout	AV Set Up: Power Point: MOVE! Intro Session September 2011 Power Point: Introductory to MOVE! Exercise RK
1/11/12	Orientation to Exercise	HIN MOVE EXERCISE INTRO-G	9-1030am	Rochelle	Orientation to Exercise	Physical Activity and You; How to Determine Your Target Heart Rate; Borg Scale, Physical Activity Limitations for Certain Medical Conditions	AV Set Up
1/17/12	8	HIN MOVE WT MGT DIETITIAN-G	9-10am	Chanda Jessica	My HealthEvet Intro to TeleMOVE!	TeleMOVE! Brochure Intro to TeleMOVE! Group class#8 power point	AV Set Up: Power Point: Intro to TeleMOVE! Class 8 Consent Forms Pictures (need camera)

1/17/12	Behavioral support	HIN MOVE BEHAVIORAL SUPPORT	10-11am	Nicole	Varies	Varies	AV Set Up
1/24/12	Support	HIN MOVE SUPPORT 1	9-10am	Lisa/Rochelle	Varies	Varies	AV Set Up
2/7/12	1	HIN MOVE WT MGT DIETITIAN-G	9-10am	Lisa/Rochelle	Food Labels and Weight Loss	Nutrient Label Claims Labels for Cereal and Ice Cream	AV Set Up: Power Point: MOVE! Labels 2011
2/14/12	Intro	HIN MOVE WT MGT INTRO RD-G	9-1130am	Lisa/Rochelle	Introduction to MOVE! Weight Management 101	Are you Ready?/Basics of Weight Loss MOVE! Log Book Waist Circumference Consent Forms My HealthEvet Journal/Worksheet Set Your Weight Loss Goals Meal Planning Handout	AV Set Up: Power Point: MOVE! Intro Session September 2011 Power Point: Introductory to MOVE! Exercise RK
2/15/12	Orientation to Exercise	HIN MOVE EXERCISE INTRO-G	9-1030am	Rochelle	Orientation to Exercise	Physical Activity and You; How to Determine Your Target Heart Rate; Borg Scale, Physical Activity Limitations for Certain Medical Conditions	AV Set Up
2/21/12	2	HIN MOVE PSYCHOLOGY-G	9-10am	Paul	Overcoming Thoughts, Behaviors and Environmental Factors that Contribute to Obesity	Fighting Hidden Factors That Contribute to Obesity	AV Set Up Power Point: MOVE! 2010 Psychology Consent Forms Pictures (need camera)
2/21/12	Behavioral support	HIN MOVE BEHAVIORAL SUPPORT	10-11am	Nicole	Varies	Varies	AV Set Up
2/8/12	Support	HIN MOVE SUPPORT 2	9-10am	Nicole	Varies	Varies	AV Set Up
3/6/12	3	HIN MOVE WT MGT DIETITIAN-G	9-10am	Lisa/Rochelle	The Healthy Plate and Beverages "Divide and Conquer"	Healthy Plate Making Healthy Food Choices Liquid Calories	AV Set Up Power Point: Healthy Plate and Beverages Divide and Conquer

Appendix A. (continued)

3/13/12	Intro	HIN MOVE WT MGT INTRO RD-G	9-1130am	Lisa/Rochelle	Introduction to MOVE! Weight Management 101	Are you Ready?/Basics of Weight Loss MOVE! Log Book Waist Circumference Consent Forms My <del>HealthE</del> et Journal/Worksheet Set Your Weight Loss Goals Meal Planning Handout	AV Set Up: Power Point: MOVE! Intro Session September 2011  Power Point: Introductory to MOVE! Exercise RK
3/14/12	Orientation to Exercise	HIN MOVE EXERCISE INTRO-G	9-1030am	Rochelle	Orientation to Exercise	Physical Activity and You; How to Determine Your Target Heart Rate; Borg Scale, Physical Activity Limitations for Certain Medical Conditions	AV Set Up
3/20/12	4	HIN MOVE MD-G	9-9:45am 9:45-10:30am	Paul/Ileana <del>Sattar</del>	Benefits/Barriers of Regular Exercise Medical Risks of Obesity (Testimonial)	Power Point Presentation  BMI chart Pedometer	AV Set Up Power Point: MOVE!!! Power Point: Obesity ( <del>Uadi</del> ) Consent Forms Pictures (need camera)
3/27/12	Support	HIN MOVE SUPPORT 1	9-10am	Lisa/Rochelle	Varies	Varies	AV Set Up
3/20/12	Behavioral support	HIN MOVE BEHAVIORAL SUPPORT	10-11am	Nicole	Varies	Varies	AV Set Up
4/3/12	5	HIN MOVE WT MGT DIETITIAN-G	9-10am	Jessica  Lisa/Rochelle	Intro to TeleMOVE!  Dining Out/Fast Food	TeleMOVE! brochure Intro to TeleMOVE! Group class#5 power point  Restaurant Tips and alternatives Fast Food Tips and alternatives	AV Set Up Power Point: Intro to TeleMOVE! Group Class #5  Power Point: MOVE! Dining Out 2011
4/10/12	Intro	HIN MOVE WT MGT INTRO	9-1130am	Lisa/Rochelle	Introduction to MOVE! Weight Management	Are you Ready?/Basics of	AV Set Up: Power Point: MOVE! Intro Session

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		RD-G			101	Weight Loss MOVE! Log Book Waist Circumference Consent Forms My <del>HealthE</del> et Journal/Worksheet Set Your Weight Loss Goals Meal Planning Handout	September 2011  Power Point: Introductory to MOVE! Exercise RK
4/11/12	Orientation to Exercise	HIN MOVE EXERCISE INTRO-G	9-1030am	Rochelle	Orientation to Exercise	Physical Activity and You; How to Determine Your Target Heart Rate; Borg Scale, Physical Activity Limitations for Certain Medical Conditions	AV Set Up
4/17/12	6	HIN MOVE SWS-G	9-10am	Nicole	Coping with Stress/My <del>HealthE</del> et	Dealing with Stress, Anxiety and Depression Thought Control	AV Set Up Power Point: MOVE! Class stress Consent Forms Pictures (need camera)
4/24/12	Support	HIN MOVE SUPPORT 2	9-10am	Nicole	Varies	Varies	AV Set Up
4/17/12	Behavioral support	HIN MOVE BEHAVIORAL SUPPORT	10-11am	Nicole	varies	varies	AV Set Up
5/1/12	7	HIN MOVE WT MGT DIETITIAN-G  HIN MOVE MD-G	9-10am 10-11am	Rochelle  <del>Dagna/Sattar</del>	Exercise  Medications for Obesity	Calories Burned during common physical activities, Barriers to Physical Activity, Benefits to Physical activity  Medications and Weight Loss	AV Set Up: Power Point: Nutrition & Exercise for Weight Management 2010  Power Point: MOVE! Group Medication Lecture
5/8/12	Intro	HIN MOVE WT MGT INTRO RD-G	9-1130am	Lisa/Rochelle	Introduction to MOVE! Weight Management 101	Are you Ready?/Basics of Weight Loss MOVE! Log Book Waist Circumference	AV Set Up: Power Point: MOVE! Intro Session September 2011

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Appendix A. (continued)

						Consent Forms My HealthEyet Journal/Worksheet Set Your Weight Loss Goals Meal Planning Handout	Power Point: Introductory to MOVE! Exercise RK
5/9/12	Orientation to Exercise	HIN MOVE EXERCISE INTRO-G	9-1030am	Rochelle	Orientation to Exercise	Physical Activity and You; How to Determine Your Target Heart Rate; Borg Scale, Physical Activity Limitations for Certain Medical Conditions	AV Set Up
5/15/12	8	HIN MOVE WT MGT DIETITIAN-G	9-10am	Charada Jessica	My HealthEyet Intro to TeleMOVE!	TeleMOVE! Brochure Intro to TeleMOVE! Group class#8 power point	AV Set Up: Power Point: Intro to TeleMOVE! Class 8 Consent Forms Pictures (need camera)
5/22/12	Support	HIN MOVE SUPPORT 1	9-10am	Lisa/Rochelle	Varies	Varies	AV Set Up
5/15/12	Behavioral support	HIN MOVE BEHAVIORAL SUPPORT	10-11am	Nicole			AV Set Up
6/5/12	1	HIN MOVE WT MGT DIETITIAN-G	9-10am	Lisa/Rochelle	Food Labels and Weight Loss	Nutrient Label Claims Labels for Cereal and Ice Cream	AV Set Up: Power Point: MOVE! Labels 2011
6/12/12	Intro	HIN MOVE WT MGT INTRO RD-G	9-1130am	Lisa/Rochelle	Introduction to MOVE! Weight Management 101	Are you Ready?/Basics of Weight Loss MOVE! Log Book Waist Circumference Consent Forms My HealthEyet Journal/Worksheet Set Your Weight Loss Goals Meal Planning	AV Set Up: Power Point: MOVE! Intro Session September 2011  Power Point: Introductory to MOVE! Exercise RK

						Handout	
6/13/12	Orientation to Exercise	HIN MOVE EXERCISE INTRO-G	9-1030am	Rochelle	Orientation to Exercise	Physical Activity and You; How to Determine Your Target Heart Rate; Borg Scale, Physical Activity Limitations for Certain Medical Conditions	AV Set Up
6/19/12	2	HIN MOVE PSYCHOLOGY-G	9-10am	Paul	Overcoming Thoughts, Behaviors and Environmental Factors that Contribute to Obesity	Fighting Hidden Factors That Contribute to Obesity	AV Set Up Power Point: MOVE! 2010 Psychology Consent Forms Pictures (need camera)
6/26/12	Support	HIN MOVE SUPPORT 2	9-10am	Nicole	Varies	Varies	AV Set Up
6/19/12	Behavioral support	HIN MOVE BEHAVIORAL SUPPORT	10-11am	Nicole	Varies	Varies	AV Set Up
7/3/12	3	HIN MOVE WT MGT DIETITIAN-G	9-10am	Lisa/Rochelle	The Healthy Plate and Beverages "Divide and Conquer"	Healthy Plate Making Healthy Food Choices Liquid Calories	AV Set Up Power Point: MOVE! Class 3 Healthy Plate and Beverages Divide and Conquer
7/10/12	Intro	HIN MOVE WT MGT INTRO RD-G	9-1130am	Lisa/Rochelle	Introduction to MOVE! Weight Management 101	Are you Ready?/Basics of Weight Loss MOVE! Log Book Waist Circumference Consent Forms My HealthEyet Journal/Worksheet Set Your Weight Loss Goals Meal Planning Handout	AV Set Up: Power Point: MOVE! Intro Session September 2011  Power Point: Introductory to MOVE! Exercise RK
7/11/12	Orientation to Exercise	HIN MOVE EXERCISE INTRO-G	9-1030am	Rochelle	Orientation to Exercise	Physical Activity and You; How to Determine Your Target Heart Rate; Borg Scale, Physical Activity Limitations for Certain Medical	AV Set Up

Appendix A (continued)

						Conditions	
7/17/12	4	HIN MOVE MD-G	9-9:45am 9:45-10:30am	Paul/Ileana <b>Sattar</b>	Benefits/Barriers of Regular Exercise Medical Risks of Obesity (testimonial)	Power Point Presentation BMI chart Pedometer	AV Set Up Power Point: MOVE!!! Power Point: Obesity ( <b>Uadi</b> ) Consent Forms Pictures (need camera)
7/24/12	Support	HIN MOVE SUPPORT 1	9-10am	Lisa/Rochelle	Varies	Varies	AV Set Up
7/17/12	Behavioral support	HIN MOVE BEHAVIORAL SUPPORT	10-11am	Nicole	Varies	Varies	AV Set Up
8/7/12	5	HIN MOVE WT MGT DIETITIAN-G	9-10am	Jessica  Lisa/Rochelle	Intro to TeleMOVE!  Dining Out/Fast Food	TeleMOVE! Brochure Intro to TeleMOVE! Group class#5 power point  Restaurant Tips and alternatives Fast Food Tips and alternatives	AV Set Up
8/14/12	Intro	HIN MOVE WT MGT INTRO RD-G	9-1130am	Lisa/Rochelle	Introduction to MOVE! Weight Management 101	Are you Ready?/Basics of Weight Loss MOVE! Log Book Waist Circumference Consent Forms My <b>HealthE</b> et Journal/Worksheet Set Your Weight Loss Goals Meal Planning Handout	AV Set Up: Power Point: MOVE! Intro Session September 2011  Power Point: Introductory to MOVE! Exercise RK
8/15/12	Orientation to Exercise	HIN MOVE EXERCISE INTRO-G	9-1030am	Rochelle	Orientation to Exercise	Physical Activity and You; How to Determine Your Target Heart Rate; Borg Scale, Physical Activity Limitations for Certain Medical Conditions	AV Set Up

8/21/12	6	HIN MOVE SWS-G	9-10am	Nicole	Coping with Stress	Dealing with Stress, Anxiety and Depression Thought Control	AV Set Up Power Point: MOVE! Class stress Consent Forms Pictures (need camera)
8/28/12	Support	HIN MOVE SUPPORT 2	9-10am	Nicole	Varies	Varies	AV Set Up
8/21/12	Behavioral support	HIN MOVE BEHAVIORAL SUPPORT	10-11am	Nicole	Varies	Varies	AV Set Up
9/4/12	7	HIN MOVE WT MGT DIETITIAN-G HIN MOVE-MD	9-10am 10-11am	Rochelle <b>Dagna/Sattar</b>	Exercise  Medications for Obesity	Calories Burned during common physical activities, Barriers to Physical Activity, Benefits to Physical activity  Medications and Weight Loss	AV Set Up: Power Point: Nutrition & Exercise for Weight Management 2010  Power Point: MOVE! Group Medication Lecture
9/11/12	Intro	HIN MOVE WT MGT INTRO RD-G	9-1130am	Lisa/Rochelle	Introduction to MOVE! Weight Management 101	Are you Ready?/Basics of Weight Loss MOVE! Log Book Waist Circumference Consent Forms My <b>HealthE</b> et Journal/Worksheet Set Your Weight Loss Goals Meal Planning Handout	AV Set Up: Power Point: MOVE! Intro Session September 2011  Power Point: Introductory to MOVE! Exercise RK
9/12/12	Orientation to Exercise	HIN MOVE EXERCISE INTRO-G	9-1030am	Rochelle	Orientation to Exercise	Physical Activity and You; How to Determine Your Target Heart Rate; Borg Scale, Physical Activity Limitations for Certain Medical Conditions	AV Set Up Power Point: Orientation to Exercise August 2010
9/18/12	8	HIN MOVE WT MGT DIETITIAN-G	9-10am	<b>Chanda</b>	My <b>HealthE</b> et		AV Set Up: Power Point: Intro to TeleMOVE! Class 8 Consent Forms

Appendix A. (continued)

				Jessica	Intro to TeleMOVE!	TeleMOVE! Brochure Intro to TeleMOVE! Group class#5 power point	Pictures (need camera)
9/25/12	Support	HIN MOVE SUPPORT 1	9-10am	Lisa/Rochelle	Varies	Varies	AV Set Up
9/18/12	Behavioral support	HIN MOVE BEHAVIORAL SUPPORT	10-11am	Nicole	Varies	Varies	AV Set Up
10/2/12	1	HIN WT MGT DIETITIAN-G	9-10am	Lisa/Rochelle	Food Labels and Weight Loss	Nutrient Label Claims Labels for Cereal and Ice Cream	AV Set Up: Power Point: MOVE! Labels 2011
10/9/12	Intro	HIN MOVE WT MGT INTRO RD-G	9-1130am	Lisa/Rochelle	Introduction to MOVE! Weight Management 101	Are you Ready?/Basics of Weight Loss MOVE! Log Book Waist Circumference Consent Forms My HealthEVal Journal/Worksheet Set Your Weight Loss Goals Meal Planning Handout	AV Set Up: Power Point: MOVE! Intro Session September 2011  Power Point: Introductory to MOVE! Exercise RK
10/10/12	Orientation to Exercise	HIN MOVE EXERCISE INTRO-G	9-1030am	Rochelle	Orientation to Exercise	Physical Activity and You; How to Determine Your Target Heart Rate; Borg Scale, Physical Activity Limitations for Certain Medical Conditions	AV Set Up Power Point: Orientation to Exercise August 2010
10/16/12	2	HIN MOVE PSYCHOLOGY-G	9-10am	Paul	Overcoming Thoughts, Behaviors and Environmental Factors that Contribute to Obesity	Fighting Hidden Factors That Contribute to Obesity	AV Set Up Power Point: MOVE! 2010 Psychology Consent Forms Pictures (need camera)
10/23/12	Support	HIN MOVE SUPPORT 2	9-10am	Nicole	Varies	Varies	AV Set Up
10/16/12	Behavior	HIN MOVE	10-11am	Nicole	Varies	Varies	AV Set Up

	Behavioral support	BEHAVIORAL SUPPORT					
11/6/12	3	HIN MOVE WT MGT DIETITIAN-G	9-10am	Lisa/Rochelle	The Healthy Plate and Beverages "Divide and Conquer"	Healthy Plate Making Healthy Food Choices Liquid Calories	AV Set Up Power Point: MOVE! Class 3 Healthy Plate and Beverages Divide and Conquer
11/13/12	Intro	HIN MOVE WT MGT INTRO RD-G	9-1130am	Lisa/Rochelle	Introduction to MOVE! Weight Management 101	Are you Ready?/Basics of Weight Loss MOVE! Log Book Waist Circumference Consent Forms My HealthEVal Journal/Worksheet Set Your Weight Loss Goals Meal Planning Handout	AV Set Up: Power Point: MOVE! Intro Session September 2011  Power Point: Introductory to MOVE! Exercise RK
11/14/12	Orientation to Exercise	HIN MOVE EXERCISE INTRO-G	9-1030am	Rochelle	Orientation to Exercise	Physical Activity and You; How to Determine Your Target Heart Rate; Borg Scale, Physical Activity Limitations for Certain Medical Conditions	AV Set Up Power Point: Orientation to Exercise August 2010
11/20/12	4	HIN MOVE MD-G	9-9:45am 9:45-10:30am	Paul/Ileana <del>Sattar</del>	Benefits/Barriers of Regular Exercise Medical Risks of Obesity (Testimonial)	Power Point Presentation  BMI chart Pedometer	AV Set Up Power Point: MOVE!!! Power Point: Obesity (Ileana) Consent Forms Pictures (need camera)
11/27/12	Support	HIN MOVE SUPPORT 1	9-10am	Lisa/Rochelle	Varies	Varies	AV Set Up
11/20/12	Behavioral support	HIN MOVE BEHAVIORAL SUPPORT	10-11am	Nicole	Varies	Varies	AV Set Up
12/4/12	5	HIN MOVE WT MGT DIETITIAN-G	9-10am	Jessica	Intro to TeleMOVE!	TeleMOVE! Brochure Intro to TeleMOVE! Group class#5 power	AV Set Up Power Point: Intro to TeleMOVE! Group Class #5

Appendix A. (continued)

				Lisa/Rochelle	Dining Out/Fast Food	point Restaurant Tips and alternatives Fast Food Tips and alternatives	Power Point: MOVE! Dining Out 2011
12/11/12	Intro	HIN MOVE WT MGT INTRO RD-G	9-1130am	Lisa/Rochelle	Introduction to MOVE! Weight Management 101	Are you Ready?/Basics of Weight Loss MOVE! Log Book Waist Circumference Consent Forms My HealthVet Journal/Worksheet Set Your Weight Loss Goals Meal Planning Handout	AV Set Up: Power Point: MOVE! Intro Session September 2011  Power Point: Introductory to MOVE! Exercise RK
12/12/12	Orientati on to Exercise	HIN MOVE EXERCISE INTRO-G	9-1030am	Rochelle	Orientation to Exercise	Physical Activity and You; How to Determine Your Target Heart Rate; Borg Scale, Physical Activity Limitations for Certain Medical Conditions	AV Set Up Power Point: Orientation to Exercise August 2010
12/18/12	6	HIN MOVE SWS-G	9-10am	Nicole	Coping with Stress	Dealing with Stress, Anxiety and Depression Thought Control	AV Set Up Power Point: MOVE! Class stress Consent Forms Pictures (need camera)
12/25/12	Support	HIN MOVE SUPPORT 2	9-10am	Nicole	Varies	Varies	AV Set Up
12/18/12	Behavior al support	HIN MOVE BEHAVIORAL SUPPORT	10-11am	Nicole	Varies	Varies	AV Set Up

Appendix B.

Sample of Module from HT/teleMOVE! Program

Risk	Question	Response	Category	Aspect	Report Code
	Welcome back, EARL! Your Health Buddy has today's questions for you. You may begin when you are ready.	continue	General	None	
	It is time to report your weight.	OK	Behavior	Weight	wtcomp
	Turn your scale ON; make sure it shows 0.0. Press continue on the Health Buddy.	<b>Date:</b> 03/25/2013 10:06 AM CDT <b>Weight:</b> 234.4	Symptoms	Weight	
	Remember to weigh yourself daily, approximately the same time of day, wearing the same amount of clothing. Following these instructions will give you your most accurate weight and weight loss.	continue	Behavior	Weight	
	Corn, peas, and potatoes on the vegetable part of the food pyramid are thought of as starchy vegetables. Lentils, beans and tofu are vegetables, but they are part of the meat & beans group because of their high protein content.	continue	Knowledge	Nutrition	
	True or False: Vegetables are great sources of vitamins and minerals and are low in calories and fat.	True	Knowledge	Nutrition	
	True. Vegetables have lots of vitamins and minerals without lots of calories and fat.	continue	Knowledge	Nutrition	
	A serving of a vegetable is:	All of the above.	Knowledge	Nutrition	
	Right. 1 cup of lettuce, 1/2 cup of cooked carrots and 6 oz tomato juice are all one vegetable serving.	continue	Knowledge	Nutrition	

## Appendix C.

## Samples of Modules from MOVE! Weight Management Booklet

S01



## The Basics of Weight Control

A calorie is a unit of energy. Most foods and beverages contain calories.

### To lose weight you need to:

- Eat and drink fewer calories
- Increase physical activity
- Combine the two for the best results



The foods you eat and the beverages you drink provide energy and nutrients. The basic required nutrients are: water, carbohydrates, proteins, fats, dietary fibers, vitamins, and minerals. Carbohydrates, proteins, and fats provide energy in the form of calories. Alcohol (beer, wine, liquor) adds calories without providing nutrition.

### When you take in more calories than you use, you gain weight.

The calories you do not use are stored as body fat. This is true whether these calories came from fats, carbohydrates, proteins, or alcohol.

Use more calories by increasing physical activity. Manage your weight by balancing what you eat and drink with how active you are.

## Appendix C. (continued)

**How do you lose weight?**

- Set your daily calorie goal using this chart.

Current Weight	Daily Calorie Goal
Under 200 pounds	1,200 – 1,500 calories/day
200 – 225 pounds	1,500 – 1,800 calories/day
226 – 250 pounds	1,800 – 2,000 calories/day
251 – 300 pounds	2,000 – 2,500 calories/day
301 – 350 pounds	2,500 – 3,000 calories/day
Over 350 pounds	See a MOVE! Dietitian

- Find your current weight in the left column. Your daily calorie goal for that weight range is listed in the right column. These calorie goals are designed to help you lose about ½ to 2 pounds per week.
- Expect better results if you use the lower number from the daily calorie goal in the chart above.
- Use a book or online calorie counter to accurately track your calories. Handout *S08, Daily Food and Physical Activity Diary*, can be used to track foods and activities.
- When you make it to the next weight range (for instance, you start at 280 pounds and you now weigh 245 pounds), you will need to reduce your daily calorie goal to that lower level.
- If you weigh over 350 pounds or have diet concerns, talk with the dietitian to help set your daily calorie goal.
- Review your *Daily Food and Physical Activity Diary*. Celebrate successful days. On days when goals were not met, think about what got in the way and consider solutions.
- Remember, you need to have clear, daily calorie and physical activity goals to lose weight.

Appendix C. (continued)



## Vegetables

Vegetables are a great source of fiber, vitamins, and minerals!

### Eating vegetables helps to reduce your risk of

- cancer
- heart disease
- stroke
- diabetes, and other diseases

Vegetables may also help you control your hunger and weight.

Vegetables are low in calories and have very little fat. Choose fresh, frozen, or canned vegetables with “No Added Salt”.

### What is a serving of vegetables?

- ½ cup cooked
- 1 cup raw
- ½ cup 100% juice
- ¼ cup dried

**Try to eat from a rainbow of colors of vegetables.  
Each color provides different nutrients.**



**Aim for at least 5 servings of vegetables and/or fruit each day!**

**MOVE!**

N30 Version 3.0  
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