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Implementation and Effectiveness of a Psychosocial Weight Management Program for Individuals with Schizophrenia

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Abstract

The objective of this study was to examine the effectiveness of a weight loss program for individuals with schizophrenia in usual care. The study included 146 adults with schizophrenia from two mental health clinics of the Department of Veterans Affairs. The 109 individuals who were overweight or obese were offered a 16-week, psychosocial, weight management program. Weight and BMI were assessed at baseline, 1 year later and at each treatment session. Only 51% of those who were overweight or obese chose to enroll in the weight management program. Participants attended an average of 6.7 treatment sessions, lost an average of 2.4 pounds and had an average BMI decrease of 0.3. There was no significant change in weight or BMI compared to the control group. Intervention strategies that both improve utilization and yield greater weight loss need to be developed.

Keywords

schizophrenia; psychosis; weight management; program implementation

Introduction

While significant advances have been made in the pharmacological management of psychosis, gains are being offset by the increased liability of weight gain associated with newer 2nd generation antipsychotic medications. At present, the vast majority of antipsychotic medication prescriptions are for the 2nd generation medications. As a result, the most common, serious side-effect that is seen in schizophrenia is weight gain and related diabetes, hyperlipidemia, and hypertension. Weight gain, obesity, and resultant medical problems are increasingly recognized as critical side-effects and pervasive problems in schizophrenia. Although efficacy studies have shown support for weight loss programs in schizophrenia, studies examining the effectiveness of these interventions into routine care are lacking. This paper describes the effectiveness of an in-person, psychosocial, weight management intervention for individuals with schizophrenia.

Compared to the general population, individuals with schizophrenia are more likely to be overweight or obese (42% vs. 27%).^{1,2} Obesity increases the risk for cardiovascular morbidity, impaired quality of life, and death.³ It is also a risk factor for diabetes.⁴ The

prevalence of diabetes is particularly high in schizophrenia (16% – 25%) compared to the general population (4%),⁵ and there is evidence that this prevalence has increased since the introduction of 2nd generation antipsychotic medications.⁶ Ninety percent of diabetes cases are type II diabetes (Marder, 2004), and obesity is a particularly important risk factor as 90% of individuals with type II diabetes are obese.⁷ Other medical consequences associated with weight gain are hyperlipidemia, hypertension, cardiovascular disease, gallstones, osteoarthritis, sleep apnea, and colon, breast, and endometrial cancer.^{8–12}

Weight gain has been associated with the use of 2nd generation antipsychotic medications, which differ in their weight gain liability.¹³ Second generation antipsychotic medications have almost entirely displaced older first generation medications. While these new medications offer certain advantages in terms of tolerability, this medication class has weight gain as a major side-effect. Olanzapine and clozapine have, on average, the greatest risk for weight gain (an average of 10 pounds during relatively brief efficacy trials).¹³ Risperidone and quetiapine are associated with moderate risk for weight gain, and ziprasidone and aripiprazole are associated with little or no risk.^{13, 14}

Development of the EQUIP Wellness Program

Although research had shown an association between 2nd generation antipsychotics and weight gain previously¹, clinicians and clinic administrators did not become aware of this relationship until mid-2003. Clinicians voiced concern about this weight gain as well as the related problems of hypertension, diabetes, coronary artery disease, and early mortality. In addition, psychiatrists at one of the intervention sites became increasingly frustrated by receiving Quality Reports highlighting the high percentage of significant weight problems among their caseload but then having few treatment options to address this problem. To respond to a growing demand for such services, research staff including a psychiatrist (PI) and psychologist (Project Manager), had multiple meetings with administration of several medical center care lines, including Psychiatry and Dietetics (or Nutrition Services), in order to organize weight loss services. While there was agreement for the need of targeted services for obesity, neither site possessed the expertise to work with individuals with schizophrenia. Despite a willingness to learn, it was clear that existing dietary and psychiatry staff would not have the capacity to provide these services and that additional resources would be required.

A review of empirically validated weight interventions for individuals with schizophrenia found that these programs emphasized nutrition, exercise, and behavioral change to stabilize or reduce weight.^{18–22} Subsequent reviews and results of meta-analyses support the efficacy of behavioral or psychoeducation-based interventions to stabilize weight and promote modest weight loss among individuals with schizophrenia.^{23–25, 19, 26} Components of these psychosocial interventions have included: 1) psychoeducation regarding diet and exercise, 2) goal-setting, 3) self-monitoring of food and physical activity level, 4) caloric restriction, and 5) increase in physical activity. Clinical trials have found support for modest weight loss among individuals with severe mental illness who received the psychosocial intervention relative to those in the control condition.^{27–32, 21, 22, 33, 34} Weight loss in these studies ranged from 1–7 pounds with a mean weight loss of 5 pounds across all 10 studies. Even modest weight loss has been associated with health benefits, including improved cardiovascular health among individuals who are overweight or obese.^{35–40} Given the available evidence, the EQUIP team developed an implementation toolkit for a “Wellness” program, with standardized protocols for weight management services specifically designed for clients with severe mental illness.

Study Aims

Although efficacy studies have shown support for weight loss programs in schizophrenia, studies examining the effectiveness of these interventions in routine care are lacking. Efficacy studies address whether a treatment improves outcomes under controlled conditions that optimize separation of the treatment effect through design features such as randomization, control conditions, homogeneous samples, standardized treatment protocols, and blinding of participants, assessors and clinicians. Although high in internal validity, such studies have limited external validity as they often deviate substantially from usual treatment conditions. For example, efficacy studies have enrolled highly motivated clients, provided free care, paid participating clients, used specialized clinicians, excluded clients with comorbid conditions, and used research staff to maintain compliance. In contrast, effectiveness research addresses whether these interventions work in usual care where clients may not want weight services, may be ambivalent regarding weight loss and are not compensated for participation, and where mental health clinicians may not have expertise in wellness services or believe in the efficacy of the intervention.

The present study evaluates the effectiveness of a psychosocial, weight loss program for individuals with schizophrenia in usual care. The specific aims are: 1) describe the prevalence of overweight and obese veterans, 2) to examine utilization of weight-loss services in usual care and identify predictors of utilization, and 3) to examine outcomes of the EQUIP Wellness Program compared to a control group.

Methods

Study Design

“Enhancing Quality-of-care In Psychosis” (EQUIP) was a longitudinal VA project that included evaluation of a chronic care model for schizophrenia (see implementation paper for greater details regarding study design⁴¹). Data were collected at mental health clinics within the Greater Los Angeles and Long Beach VA Healthcare Systems. Psychiatrists were randomized to the chronic care model (intervention group) or treatment as usual (control group). Veterans at these clinics were assigned to the same study arm as the psychiatrist with whom they were associated. Participants in this study were *only* those who were assigned to the intervention arm of the EQUIP study. Hence, this study is not a randomized trial.

EQUIP enrolled a random sample of adult clients who met the following criteria: 1) a diagnosis of schizophrenia or schizoaffective disorder as determined by an abbreviated version of the Structured Clinical Interview for the *DSM-IV*,⁴² and 2) at least one mental health clinic visit during a four-month period. Real-time, visit-based sampling was used over a five-month enrollment period to identify a random sample of clients that met criteria. To ensure that visit frequency did not affect the probability of being selected, clients were eligible only at their first visit during the enrollment period. Fifty-one percent of eligible clients consented to participate ($N = 398$). Written informed consent from clinicians and clients was obtained after the study had been fully explained.

The EQUIP Wellness Program was offered only to those individuals who were in the EQUIP intervention arm of the study. Therefore, this study includes only those who were randomized to the chronic care model ($N = 146$). Clients were interviewed in person at baseline and approximately one year later. They were offered the weight management intervention during this time if they were overweight. For the purpose of this study, those who were overweight/obese and chose to utilize the weight loss program are considered the intervention group, and those who were overweight/obese and did not enroll in the weight loss program are considered the control group. Veterans who did not enroll in this weight

loss program did not have access to any other weight loss program. Those who attended the weight loss program were also weighed at each session. In addition, the research team facilitated monthly calls with each site's opinion leader and nurse care coordinator in order to address barriers to implementation of the program.

Participants

Study participants ($N = 146$) were primarily male (93%) and averaged 50.8 ± 9.1 years old. Sixty-nine percent of participants were White, 18% were African-American, 8% were Hispanic, and 5% were from other ethnic groups. Most (89%) were unemployed, and approximately half of the sample had never married (49%).

Measures

The height and weight of all study participants was measured at baseline. Weight was measured again at the 12-month follow-up. Body Mass Index (BMI) was calculated at each assessment based on weight and height. Individuals who participated in the Wellness Program were also weighed weekly, and their BMI was calculated for their first and last weight sessions. Data on antipsychotic medication was also collected. Clozapine and olanzapine were classified as high weight liability medications. Risperidone, quetiapine, thioridazine, and thiorazine were classified as moderate weight liability medications, and all other first generation antipsychotic medications were classified as none/low weight liability medications. If a participant was taking more than one antipsychotic medication, the medication with the highest weight gain liability was considered primary. Data regarding utilization of individual and group sessions were also collected.

Intervention

The EQUIP team developed an implementation toolkit for the Wellness Program which included standardized protocols for weight management services specifically designed for clients with severe mental illness. The Wellness Implementation Toolkit was based on the Solutions for Wellness program,⁴³ a psychoeducational program of weight management topics designed for individuals with cognitive difficulties which included written handouts at a 5th grade reading level. The research team manualized Solutions for Wellness by slightly modifying two sections of its program (the Fitness and Exercise section and the Nutrition, Wellness, and Living a Healthy Lifestyle section) and assembling these topics into a 16-session, weekly, group program. Wellness sessions were led by the nurse care coordinator at each site, who had attended a three-day training in Solutions for Wellness delivered by Partners for Excellence in Psychiatry at the University of Medicine and Dentistry of New Jersey-University Behavioral HealthCare.

The EQUIP Wellness Program sessions focused on healthful weight management techniques and light physical exercise. Sessions included education about fiber, water, fat, cholesterol, and sugar; education about portion sizes, the food pyramid, and alcohol; and behavioral techniques to adjust unhealthy eating and begin regular light exercise. Group sessions utilized handouts, knowledge quizzes, and learning principals that work in schizophrenia (i.e., repetition, writing out main points, reading aloud, concrete examples and frequent summaries and evaluation of learning status).⁴⁴ Other adaptations for this population included increased structure and intensity of contacts, simple language and smaller chunks of information delivered at any given time. In addition to weekly group sessions, nurse care coordinators were available to meet with clients individually to discuss weight matters as needed. Attendance and weight were taken at each group session.

Data Analysis Approach

Group differences in pretreatment characteristics were examined using chi-square tests for categorical variables and *t* tests for continuous variables. Logistic regression was used to further examine treatment enrollment, and linear regression was utilized to examine predictors of total sessions attended. In regard to outcome data, we first used paired *t* tests to assess whether changes in weight and BMI from the first to the last session were significantly different from zero. Because weekly weights were not available for those who did not participate in the wellness program, comparisons with the control group were based on data from the baseline and follow-up interviews. Paired *t*-tests were used to assess changes in weight from baseline to follow-up among those who enrolled in the wellness program and among those in the control group. Lastly, repeated measures analysis controlling for site and medication weight gain liability were conducted to examine group difference (wellness program versus control) in treatment outcomes of weight and BMI.

Results

Prevalence of Overweight/Obese Veterans and Treatment Utilization

Seventy-five percent of clients at these clinics ($n = 109$) were overweight or obese. Specifically, 36% ($n = 52$) were overweight with a BMI of 25–29.9 and 39% ($n = 57$) were obese with a BMI of 30 or greater. Only half of individuals who were overweight or obese chose to enter the wellness program, despite their clinician's referral. Of the 109 individuals who were overweight or obese, 51% ($n = 55$) of study participants enrolled in the EQUIP Wellness Program. Those who enrolled in the program were more likely to be obese according to BMI categories whereas those who did not enroll were more likely to be overweight ($\chi^2 = 4.0, p < .05$) (see Table 1). Those who entered the program were also more likely to be receiving treatment at Clinic A as compared to Clinic B ($\chi^2 = 20.3, p < .001$). Those who enrolled in the program did not differ from those who did not in regard to demographic variables, BMI (continuous), weight, or weight gain liability of their antipsychotic medication. A logistic regression predicting enrollment in the weight loss program was conducted with BMI category and clinic as predictors. Overweight individuals were significantly less likely than obese individuals to enroll in the weight loss program (odds ratio = 0.4; 95% CI: 0.2 – 0.9; $p < .05$), and clients at Clinic A were significantly more likely than clients at Clinic B to enroll in the program (odds ratio = 7.2; 95% CI: 3.0 – 17.4; $p < .001$).

Study participants were offered 16 group wellness sessions and as many individual sessions as needed. Among the 55 individuals who enrolled in the program, everyone attended at least one group session for an average of 3.8 (SD = 4.6) sessions. In addition, 75% ($n = 41$) attended at least one individual session for an average of 3.9 (SD = 3.0) sessions. In total, study participants received an average of 6.7 (SD = 5.2) in-person sessions (range 1–23). Linear regression was utilized to examine predictors of total sessions attended. Independent variables in the model were gender, age, ethnicity, years of education, marital and work status, BMI, weight, weight gain liability of antipsychotic medication, and treatment site. The overall model was not significant ($F = 1.3, p = 0.3$), and none of the independent variables were significant.

Change in Weight and BMI from First to Last Weight Session

Study participants were weighed at each group wellness session. Of the 55 people who received services, five attended only one session and were, therefore, dropped from these analyses. Participation in the wellness program resulted in an average weight loss of 2.4 (SD = 10.6) pounds and an average BMI decrease of 0.3 (SD = 1.5). Paired *t*-tests indicated that neither of these changes were significant ($t = 1.6, p = .12$ and $t = 1.5, p = .13$ respectively).

Weight Outcomes Compared to the Control Group

Because weekly weights were not available for those who did not participate in the wellness program, comparisons with the control group were based on data from the baseline and follow-up interviews (see Table 2). The wellness group lost an average of 2.3 (SD = 18.0) pounds, and the control group lost an average of 2.2 (SD = 11.9) pounds. When examining only those individuals who were categorized as obese at baseline (excluding those who were overweight), individuals in the wellness group lost an average of 4.8 (SD = 19.7) pounds, and the control group lost an average of 0.7 (SD = 9.8) pounds. A different pattern emerged when examining only those individuals who were categorized as overweight at baseline (excluding those who were obese). Those in the wellness group *gained* an average of 1.6 (SD = 14.6) pounds, and those in the control group lost an average of 3.2 (SD = 13.2) pounds.

The results were similar in regard to BMI. BMI in the wellness group decreased an average of 0.3 (SD = 2.6), and BMI in the control group decreased an average of 0.3 (SD = 1.7). When examining only those individuals who were categorized as obese at baseline (excluding those who were overweight), BMI in the wellness group decreased an average of 0.7 (SD = 2.9), and BMI in the control group decreased an average of 0.1 (SD = 1.4). Again, a different pattern emerged when examining only those individuals who were categorized as overweight at baseline (excluding those who were obese). BMI in the wellness group *increased* an average of 0.2 (SD = 2.0), and BMI in the control group decreased an average of 0.4 (SD = 1.9).

Mixed model, repeated measures analysis controlling for site and medication weight gain liability were conducted to examine group difference (wellness program versus control) in treatment outcomes of weight and BMI. Fixed effects of treatment, site and medication were entered into the model as well as the random effects of subjects. Although there was a significant decrease in weight in both groups over time [$F(1, 94) = 5.2, p < .05$], the interaction between time and treatment group was insignificant [$F(1, 94) = 1.2, p > .05$], indicating the groups did not differ in their weight loss over time. There was, however, a significant interaction between time and site such that participants at Clinic A lost weight over time while clients at Clinic B gained weight over time [$F(1, 94) = 6.3, p < .05$]. The results were similar in regard to BMI. Although there was a significant decrease in BMI in both groups over time [$F(1, 94) = 5.7, p < .05$], the interaction between time and treatment group was insignificant [$F(1, 94) = 1.3, p > .05$], indicating the groups did not differ in BMI reduction over time. There was also a significant interaction between time and site such that participants at Clinic A had a decrease in BMI over time while clients at Clinic B had an increase in BMI over time [$F(1, 94) = 7.1, p < .01$].

Conclusions

The Schizophrenia PORT ⁴⁵ is a national set of psychosocial treatment recommendations for schizophrenia which has recently undergone revision incorporating recent advances in knowledge. This update of treatment guidelines now includes psychosocial interventions for weight as an evidence-based practice. Hence, it is becoming increasingly important to develop and implement effective weight management programs for this population. This report examines the effectiveness of a psychosocial weight loss program for individuals with schizophrenia in routine care.

Study results indicate a great need for weight loss programs given the high prevalence of overweight and obese clients at these clinics (75%). Only half of individuals who were overweight or obese chose to enter the program, and those who did enroll attended sporadically, utilizing approximately 25% of the program. They attended an average of four

of the 16 group sessions available to them and had an average of four individual sessions with the nurse care coordinator. Treatment utilization was lower than seen in most efficacy studies of psychosocial weight interventions. However, the vast majority of published studies in this area do not report utilization or drop out rates, and those that do report drop out rates show great variation (10–90%).²⁶

Further, the utilization rates seen in efficacy studies are probably not generalizable to usual care. Although treatment dropout is substantial in efficacy studies as well, participants enroll and make an initial commitment to a certain number of sessions presumably because they are interested in losing weight. In contrast, the present study examined clients in usual care who did not make any commitment to participate in a weight loss program beyond attending one time. They could attend the weight loss program even if they were ambivalent about their weight, and hence, were more likely to drop out of treatment or attend sporadically.

The intervention had only a small effect on weight in usual care. Participation in the program resulted in an average weight loss of 2.4 pounds and a BMI decrease of 0.3. These changes were not significant and did not differ from the control group. The effect of the intervention was not of the magnitude previously seen in efficacy studies. One potential reason for this may be differences in exclusion criteria between this study and prior efficacy studies. Prior studies excluded participants who had physical conditions that may complicate weight loss (e.g., a thyroid condition). Those with physical conditions were not screened out in this study as they would be in a rigorous efficacy study. A study limitation in regard to outcomes is the lack of outcome data prior to the 1 year follow-up. The EQUIP Wellness Program began approximately halfway through the larger clinical trial when it became clear that weight gain was a significant problem. The larger study from which this data are drawn was designed to collect data at baseline and 1 year. Hence, weight data is only available for the control group at those times.

An encouraging finding is that obese individuals who participated in the wellness program lost an average of 4.8 pounds compared to the 0.7 pound reduction seen in the control group. The study lacked the sample size and the power to conduct subset analyses of only overweight individuals and only obese individuals. Although motivation to lose weight was not examined in this study, we hypothesize that individuals who were obese rather than overweight had greater motivation to engage in the program and may have received more encouragement from their clinicians to participate. These possible distinctions in engagement between obese and overweight clients warrant further investigation in future studies.

Although implementation science was in its infancy at the time of this study, the research team utilized a number of strategies that have subsequently been found to maximize uptake and delivery of evidence-based practices.⁴⁶ Examples of these strategies include engagement of mental health leadership from the very beginning of the project, monthly calls with clinicians and research staff to discuss and problem-solve barriers to implementation, and the provision of regular feedback to clinicians via patient reports that included weight outcomes. Organizational barriers addressed included a lack of staff time and expertise to provide wellness services to individuals with schizophrenia. Staff time was negotiated with leadership, resulting in a release of time for nurses to conduct the weight loss group. Lack of competency to provide wellness services was addressed with general education about weight problems in schizophrenia and training in the wellness intervention.

Compared to Clinic B, Clinic A was significantly more likely to enroll clients in the weight loss program and had better weight outcomes. Although clinician attitudes regarding weight loss programs were not formally assessed, it was clear from the beginning of this study that

opinion leaders and clinicians at Clinic A were more invested in implementing a weight loss program for schizophrenia. In fact, it was clinicians at Clinic A who initially asked for weight loss services to be provided and who were interested in weight outcomes in response to the poor quality of care reports they received. Further, the opinion leader at Clinic A volunteered to conduct a thorough literature review as part of the development of the EQUIP Wellness Program. In contrast, clinicians at Clinic B did not express concern that their reports indicated a suboptimal quality of care nor did they express an interest in weight outcomes. It is possible that these differences in the organizational contexts where implementation took place affected treatment outcomes.

Previous research and the current study indicate the importance of getting administrative and frontline staff buy-in early and throughout the implementation process to improve implementation success.⁴⁷ Further, leadership needs to be consistent in emphasizing the importance and value of implementing weight loss services so that frontline staff receive a clear message about expectations for the program. Future research should examine the impact of clinician attitudes and knowledge regarding the effectiveness of weight loss services on utilization and outcomes.

Client barriers to implementation included enrollment and inconsistent attendance. A limitation of the study is the lack of systematic assessment of client barriers, attitudes, and motivation to use weight loss services. However, the monthly meetings with research and clinical staff revealed that clients were often ambivalent regarding their need for weight loss, reluctant to participate in a group-based intervention, or had limited transportation options. These issues have been previously highlighted as barriers to utilization of weight loss services.^{48, 49} Although the Wellness Program sessions were scheduled on days and at times when many clients had clinic visits, several clients still mentioned it was difficult for them to come to the clinic at the times that groups were held. Future research should focus on addressing barriers that may be associated with client utilization of wellness services, such as client self-efficacy, motivation, and readiness for change.

Methods to either increase the effect size of the intervention itself and/or change the implementation strategy need to be considered to improve the effectiveness of weight loss interventions in usual care. A prior study with individuals with schizophrenia reported a lack of knowledge about the health benefits of exercise among participants.⁵⁰ Education regarding the benefits of diet and exercise and the addition of motivational interviewing techniques may improve motivation and increase treatment retention, and warrant further study in this population. Given the reported reluctance to use a group-based, weight loss program, the addition of individual sessions may also improve attendance.

Further modifications to the program would include content that is tailored to the individual's living situation and ability to control his/her food intake (i.e., whether or not the majority of meals are prepared for them by a caregiver or a residential facility). Innovative approaches may also improve access. These may include providing a part of the intervention in community settings such as board and care homes or drop-in programs, adding *in vivo* activities such as shopping, cooking, plating, and paced eating, and making greater use of technology to augment in-person services, such as telephone, video, or computer-based learning. An assessment of patient preferences regarding the services offered and incorporation of their preferences into the intervention may also improve treatment adherence.

Another strategy that may potentially increase the effect size of the intervention is to improve implementation. Given the significant outcome differences and clinician attitudes between the sites, there is reason to believe that improvements in implementation at the

provider level may impact patient outcomes. A better understanding of clinician attitudes and knowledge and better marketing of the intervention to staff may improve effectiveness.

Implications for Behavioral Health

The high prevalence of overweight and obese individuals at these clinics highlights the importance of weight monitoring and management in this population. Improved awareness of the efficacy of psychosocial weight loss programs and training in administering these interventions is needed among mental health clinicians. Given the challenges in implementation of such programs in routine care, weight loss is likely to be modest with existing interventions. Hence, strategies that improve implementation and increase treatment utilization and the effect size of weight loss services in usual care are needed.

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References

1. Allison DB, et al. Antipsychotic-Induced Weight Gain: A Comprehensive Research Synthesis. *Am J Psychiatry*. 1999; 156:1686–1696. [PubMed: 10553730]
2. Homel P, Casey D, Allison DB. Changes in body mass index for individuals with and without schizophrenia. *Schizophr Res*. 2002; 55:277–284. [PubMed: 12048151]
3. Marder SR, Essock SM, Miller AL, Buchanan RW, Casey DE, Davis JM, et al. Physical health monitoring of patients with schizophrenia. *Am J Psychiatry*. 2004; 161(8):1334–1349. [PubMed: 15285957]
4. Sokal J, Messias E, Dickerson FB, Kreyenbuhl J, Brown CH, et al. Comorbidity of medical illnesses among adults with serious mental illness who are receiving community psychiatric services. *J Nerv Ment Dis*. 2004; 192:421–427. [PubMed: 15167405]
5. Mukherjee S, Decina P, Bocola V, Saraceni F, Scapicchio P. Diabetes mellitus in schizophrenic patients. *Compr Psychiatry*. 1996; 37:68–73. [PubMed: 8770530]
6. Reist C, Mintz J, Albers LJ, Jamal MM, Szabo S, Ozdemir V. Second-generation antipsychotic exposure and metabolic-related disorders in patients with schizophrenia: an observational pharmacoepidemiology study from 1988 to 2002. *J Clin Psychopharmacol*. 2007; 27:46–51. [PubMed: 17224711]
7. McIntyre RS, McCann SM, Kennedy SH. Antipsychotic metabolic effects: weight gain, diabetes mellitus and lipid abnormalities. *Can J Psychiatry*. 2001; 46(3):273–281. [PubMed: 11320682]
8. Davidson MH, Hauptman J, DiGirolamo M, Foreyt JP, Halsted CH, et al. Weight control and risk factor reduction in obese subjects treated for two years with orlistat: a randomized controlled trial. *JAMA*. 1999; 281:235–242. [PubMed: 9918478]
9. Gordon A, Price LH. Mood stabilization and weight loss with topiramate. *Am J Psychiatry*. 1999; 156:968–969. [PubMed: 10360144]
10. Heck AM, Yanovski JA, Calis KA. Orlistat, a new lipase inhibitor for the management of obesity. *Pharmacotherapy*. 2000; 20:270–279.
11. McMahon FG, Fujioka K, Singh BN, Mendel CM, Rowe E, et al. Efficacy and safety of sibutramine in obese white and African American patients with hypertension: a 1-year, double-blind, placebo-controlled, multicenter trial. *Arch Intern Med*. 2000; 160:2185–2191. [PubMed: 10904462]
12. Sjostrom L, Rissanen A, Andersen T, Boldrin M, Golay A, et al. Randomised placebo-controlled trial of orlistat for weight loss and prevention of weight regain in obese patients. *Lancet*. 1998; 352:167–172. [PubMed: 9683204]

13. Newcomer JW. Antipsychotic medications: metabolic and cardiovascular risk. *J Clin Psychiatry*. 2007; 68(Suppl 4):8–13. [PubMed: 17539694]
14. Newcomer JW, Campos JA, Marcus RN, Breder C, Berman RM, et al. A multicenter, randomized, double-blind study of the effects of aripiprazole in overweight subjects with schizophrenia or schizoaffective disorder switched from olanzapine. *J Clin Psychiatry*. 2008; 69(7):1046–1056. [PubMed: 18605811]
15. Von Korff M, Gruman J, Schaefer J, Curry SJ, Wagner EH. Collaborative management of chronic illness. *Ann Intern Med*. 1997; 127(12):1097–1102. [PubMed: 9412313]
16. Brown AH, Cohen AN, Chinman MJ, Kessler C, Young AS. EQUIP: Implementing chronic care principles and applying formative evaluation methods to improve care for schizophrenia: QUERI Series. *Implement Sci*. 2008; 3:9. [PubMed: 18279505]
17. Young AS, Mintz J, Cohen AN, Chinman MJ. A network-based system to improve care for schizophrenia: the Medical Informatics Network Tool (MINT). *J Am Med Inform Assoc*. 2004; 11(5):358–367. [PubMed: 15187072]
18. Brown C, Goetz J, Van Sciver A, Sullivan D, Hamera E. A psychiatric rehabilitation approach to weight loss. *Psychiatric Rehabilitation Journal*. 2006; 29:267–273. [PubMed: 16689037]
19. Faulkner G, Cohn T, Remington G. Interventions to reduce weight gain in schizophrenia. *Schizophr Bull*. 2007; 33(3):654–656. [PubMed: 17449900]
20. Littrell KH, Hilligoss NM, Kirshner CD, Petty RG, Johnson CG. The effects of an educational intervention on antipsychotic-induced weight gain. *J Nurs Scholarsh*. 2003; 35(3):237–241. [PubMed: 14562491]
21. Menza M, Vreeland B, Minsky S, Gara M, Radler DR, Sakowitz M. Managing atypical antipsychotic-associated weight gain: 12-month data on a multimodal weight control program. *J Clin Psychiatry*. 2004; 65(4):471–477. [PubMed: 15119908]
22. Vreeland B, Minsky S, Menza M, Rigassio Radler D, Roemheld-Hamm B, Stern R. A program for managing weight gain associated with atypical antipsychotics. *Psychiatr Serv*. 2003; 54(8):1155–1157. [PubMed: 12883145]
23. Alvarez-Jimenez M, Hetrick SE, Gonzalez-Blanch C, Gleeson JF, McGorry PD. Non-pharmacological management of antipsychotic-induced weight gain: systematic review and meta-analysis of randomised controlled trials. *Br J Psychiatry*. 2008; 193(2):101–107. [PubMed: 18669990]
24. Faulkner G, Cohn TA. Pharmacologic and nonpharmacologic strategies for weight gain and metabolic disturbance in patients treated with antipsychotic medications. *Can J Psychiatry*. 2006; 51(8):502–511. [PubMed: 16933587]
25. Faulkner G, Soundy AA, Lloyd K. Schizophrenia and weight management: a systematic review of interventions to control weight. *Acta Psychiatr Scand*. 2003; 108(5):324–332. [PubMed: 14531752]
26. Loh C, Meyer JM, Leckband SG. A comprehensive review of behavioral interventions for weight management in schizophrenia. *Ann Clin Psychiatry*. 2006; 18(1):23–31. [PubMed: 16517450]
27. Brar JS, Ganguli R, Pandina G, Turkoz I, Berry S, Mahmoud R. Effects of behavioral therapy on weight loss in overweight and obese patients with schizophrenia or schizoaffective disorder. *J Clin Psychiatry*. 2005; 66(2):205–212. [PubMed: 15705006]
28. Brown S, Chan K. A randomized controlled trial of a brief health promotion intervention in a population with serious mental illness. *Journal of Mental Health*. 2006; 15:543–549.
29. Jean-Baptiste M, Tek C, Liskov E, Chakunta UR, Nicholls S, Hassan AQ, et al. A pilot study of a weight management program with food provision in schizophrenia. *Schizophr Res*. 2007; 96(1–3):198–205. [PubMed: 17628437]
30. Kwon JS, Choi JS, Bahk WM, Yoon Kim C, Hyung Kim C, Chul Shin Y, et al. Weight management program for treatment-emergent weight gain in olanzapine-treated patients with schizophrenia or schizoaffective disorder: A 12-week randomized controlled clinical trial. *J Clin Psychiatry*. 2006; 67(4):547–553. [PubMed: 16669719]
31. McKibbin CL, Patterson TL, Norman G, Patrick K, Jin H, Roesch S, et al. A lifestyle intervention for older schizophrenia patients with diabetes mellitus: a randomized controlled trial. *Schizophr Res*. 2006; 86(1–3):36–44. [PubMed: 16842977]

32. Melamed Y, Stein-Reisner O, Gelkopf M, Levi G, Sivan T, Ilievici G, et al. Multi-modal weight control intervention for people with persistent mental disorders. *Psychiatr Rehabil J*. 2008; 31(3): 194–200. [PubMed: 18194946]
33. Weber M, Wyne K. A cognitive/behavioral group intervention for weight loss in patients treated with atypical antipsychotics. *Schizophr Res*. 2006; 83(1):95–101. [PubMed: 16507343]
34. Wu MK, Wang CK, Bai YM, Huang CY, Lee SD. Outcomes of obese, clozapine-treated inpatients with schizophrenia placed on a six-month diet and physical activity program. *Psychiatr Serv*. 2007; 58(4):544–550. [PubMed: 17412858]
35. Cutler J. Effects of weight loss and sodium reduction intervention on blood pressure and hypertension incidence in overweight people with high-normal blood pressure: The trials of Hypertension Prevention, Phase II. *Arch Intern Med*. 1997; 157:657–667. [PubMed: 9080920]
36. Knowler WC, Barrett-Connor E, Fowler SE, Hamman RF, Lachin JM, Walker EA, et al. Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. *N Engl J Med*. 2002; 346(6):393–403. [PubMed: 11832527]
37. Lean ME, Powrie JK, Anderson AS, Garthwaite PH. Obesity, weight loss and prognosis in type 2 diabetes. *Diabet Med*. 1990; 7(3):228–233. [PubMed: 2139394]
38. National Institutes of Health. Clinical Guidelines on the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults: The Evidence Report. Washington: National Institutes of Health; 1998. p. 98-4083.NIH Pub #
39. Sonne-Holm S, Sorensen T, Jensen G, Schnohr P. Independent effects of weight change and attained body weight on prevalence of arterial htn in obese and non-obese men. *BMJ*. 1989; 299:767–770. [PubMed: 2508915]
40. Tuomilehto J, Lindstrom J, Eriksson JG, Valle TT, Hamalainen H, Ilanne-Parikka P, et al. Prevention of type 2 diabetes mellitus by changes in lifestyle among subjects with impaired glucose tolerance. *N Engl J Med*. 2001; 344(18):1343–1350. [PubMed: 11333990]
41. Brown AH, Cohen AN, Chinman MJ, Kessler C, Young AS. EQUIP: Implementing chronic care principles and applying formative evaluation methods to improve care for schizophrenia. *Implementation Science*. 2008; 15:3–9.
42. First, M.; Spitzer, R.; Gibbon, M.; Williams, J. Structured Clinical Interview for the Diagnostic and Statistical Manual of Mental Disorders. New York, NY: New York State Psychiatric Institute; 1995. fourth ed, Patient Edition, Version 2.0 ed.
43. Ryan, S.; Littrell, K.; Sowers, C.; Peabody, C. Solutions for Wellness. Eli Lilly: Indianapolis, IN; 2000.
44. Schiefeler P. Partnership for Recovery. 2002 Available from Center for Excellence in Psychiatry, University Behavioral Healthcare, 151 Centennial Avenue, Suite 1500, Piscataway, NJ, 08854.
45. Dixon LB, Dickerson F, Bellack AS, Bennett M, Dickinson D, et al. The 2009 Schizophrenia PORT Psychosocial Treatment Recommendations and Summary Statements. *Schizophrenia Bull*. 2010; 36:48–70.
46. Damschroder LJ, Aron DC, Keith RE, Kirsh SR, Alexander JA, et al. Fostering implementation of health services research findings into practice: a consolidated framework for advancing implementation science. *Implementation Science*. 2009; 4:50. [PubMed: 19664226]
47. Backer TE, Liberman RP, Kuehnel TG. Dissemination and adoption of innovative psychosocial interventions. *J Consult Clin Psych*. 1986; 54:111–118.
48. Archie S, Wilson JH, Osborne S, Hobbs H, McNiven J. Pilot study: access to fitness facility and exercise levels in olanzapine-treated patients. *Can J Psychiatry*. 2003; 48:628–632. [PubMed: 14631884]
49. Beebe LH, Smith K. Feasibility of the Walk, Address, Learn and Cue (WALC) intervention for schizophrenia spectrum disorders. *Arch Psychiatr Nurs*. 2010; 24:54–62. [PubMed: 20117689]
50. Beebe LH, Tian L, Morris N, Goodwin A, Allen SS, et al. Effects of exercise on mental and physical health parameters of persons with schizophrenia. *Issues Ment Health Nurs*. 2005; 26:661–676. [PubMed: 16020076]

Table 1

Comparison of Overweight and Obese Individuals Who Entered the Weight Loss Program to Those Who Did Not Enter the Program

	Total Sample (N = 109)	Weight Loss Program (n = 55)	No Weight Loss Program (n = 54)	t score or score²
Gender (% male)	99 (90.8)	52 (94.5)	47 (87.0)	1.8
Age (SD)	50.2 (9.7)	49.4 (8.8)	51.06 (10.6)	0.9
Ethnicity (%)				1.3
Black	18 (16.5)	10 (18.2)	8 (14.8)	
White	73 (67.0)	37 (67.3)	36 (66.7)	
Hispanic	11 (10.1)	5 (9.1)	6 (11.1)	
Asian	6 (5.5)	3 (5.5)	3 (5.6)	
Other	1 (0.9)	0 (0)	1 (1.9)	
Marital status (%)				3.9
Married/living together	20 (18.3)	8 (14.5)	12 (22.2)	
Divorced	25 (22.9)	10 (18.2)	15 (27.8)	
Separated	4 (3.7)	3 (5.5)	1 (1.9)	
Widowed	5 (4.6)	3 (5.5)	2 (3.7)	
Never married	55 (50.5)	31 (56.4)	24 (44.4)	
Work (% yes)	12 (11.0)	6 (10.9)	6 (11.1)	0.0
Education (%)				3.0
Less than HS	7 (6.4)	3 (5.5)	4 (7.4)	
HS grad	35 (32.1)	17 (30.9)	18 (33.3)	
Some college	60 (55.0)	33 (60.0)	27 (50.0)	
College grad	5 (4.6)	2 (3.6)	3 (5.6)	
Some grad school or advanced degree	2 (1.8)	0 (0)	2 (3.7)	
BMI (%)				4.0*
Overweight	52 (47.7)	21 (38.2)	31 (57.4)	
Obese	57 (52.3)	34 (61.8)	23 (42.6)	
BMI (SD)	31.5 (5.4)	32.3 (5.1)	30.7 (5.5)	1.6
Weight in pounds (SD)	215.7 (43.6)	222.93 (43.3)	208.41 (43.1)	1.7
Antipsychotic weight gain liability (%)				1.3
None or low	38 (34.9)	19 (34.5)	19 (35.2)	
Moderate	46 (42.2)	21 (38.2)	25 (46.3)	
High	25 (22.9)	15 (27.3)	10 (18.5)	
Clinic (%)				20.3**
Clinic A	58 (53.2)	41 (74.5)	17 (31.5)	
Clinic B	51 (46.8)	14 (25.5)	37 (68.5)	

*
p < .05;

**
p < .001

Table 2
Weight and BMI at Baseline and Follow-Up for Participants in the Weight Loss Program and in the Control Group

	Weight Loss Program ^a			Control Group ^a		
	Baseline Mean (SD)	Follow-up Mean (SD)	Mean Change (SD)	Baseline Mean (SD)	Follow-up Mean (SD)	Mean Change (SD)
All Overweight and Obese Individuals						
		(n = 54)			(n = 43)	
Weight	222.8 (43.7)	220.4 (43.4)	2.3 (18.0)	204.8 (39.4)	202.6 (42.2)	2.2 (11.9)
BMI	32.3 (5.1)	32.0 (5.3)	0.3 (2.6)	30.1 (5.1)	29.8 (5.6)	0.3 (1.7)
Overweight Individuals Only						
		(n = 21)			(n = 26)	
Weight	192.3 (20.6)	193.9 (23.9)	-1.6 (14.6)	182.5 (21.2)	179.3 (23.4)	3.2 (13.2)
BMI	27.6 (1.4)	27.8 (2.2)	-0.2 (2.0)	26.8 (1.4)	26.3 (2.3)	0.4 (1.9)
Obese Individuals Only						
		(n = 33)			(n = 17)	
Weight	242.1 (43.7)	237.3 (44.7)	4.8 (19.7)	238.8 (36.5)	238.2 (39.8)	0.7 (9.8)
BMI	35.3 (4.3)	34.6 (5.0)	0.7 (2.9)	35.2 (4.4)	35.1 (5.0)	0.1 (1.4)

^aOnly clients who had data at baseline and follow-up were included in these analyses.