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University of California, Berkeley

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Abstract

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Master of Science in Health and Medical Sciences

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Background: National evidence-based recommendations rely on referral to specialty obesity clinics for the treatment of childhood and adolescent obesity. A major shortcoming of current recommendations is lack of evidence regarding the effectiveness of clinic-based interventions.

Objective: To examine the effectiveness of a clinic-based lifestyle intervention to reduce overweight and improve nutrition and physical activity behaviors in obese children and adolescents.

Design: Quasi-experimental single group pre/post design.

Setting: Pediatric obesity clinic in outpatient clinic attached to a large tertiary care hospital.

Main Outcome Measure: Body Mass Index (BMI) was assessed at four time points: 1) Primary Care Provider (PCP) record, 2) home visit, 3) intervention, 4) follow-up visit. The main outcome was change in BMI z-score per month. A secondary outcome was behavior change in subjects and parents indicated by a 12-item Healthy Habits (HH) questionnaire, with Nutrition (8 items) and Physical Activity (4 items) subscores.

Subjects: Sixty-six severely obese children and adolescents aged 6 to 19 years and their parents.

Intervention: Before the intervention, BMI was obtained from the study subjects' PCP. Subjects were then visited in their homes while on a 1-4 month waiting list. They attended the clinic for a half-day intervention including an individual visit with the clinician, and 45-minute interactive group nutrition and physical activity sessions. Subjects returned to the clinic for follow-up in 3-6 months.

Results: BMI z-score was increasing prior to contact with the clinic. Following the home visit, it decreased significantly by 0.02 units per month ($p=0.000$). After the intervention, BMI z-score continued to decrease by 0.01 units per month, however this was not significant ($p=0.116$). Subjects' HH scores significantly worsened after the home visit ($p=0.012$), while scores improved in subjects ($p=0.003$) and their parents ($p=0.035$) after the intervention. Subjects' HH

Physical Activity scores were significantly inversely correlated with change in BMI z-score per month ($r=-0.54$, $p= 0.004$).

Conclusion: The decrease in BMI z-score per month in response to this low-intensity interdisciplinary weight management intervention in severely obese children and adolescents was not significant despite improved self-reported behaviors in subjects and their parents. There was a significant decrease following the home visit, which may reflect other weight loss strategies in anticipation of coming to the clinic, and that was maintained after the intervention. Thus, this intervention helped reverse the weight gain trajectory in severely obese youth but did not result in significant overall losses. These findings underscore the need for more intensive interventions in severely obese youth.

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Part I: Clinical Treatment of Severe Childhood and Adolescent Obesity

Introduction

The high prevalence of childhood and adolescent obesity highlights the need for effective treatment in the clinical setting. Data from NHANES surveys (1976–1980 and 1991–2008) show that the prevalence of obesity (Body Mass Index (BMI) ≥ 95th percentile[1-3]) has undergone an unprecedented doubling to tripling over the last 25 years: for children aged 2–5 years, prevalence increased from 5.0% to 10.4%, from 6.5% to 19.6% for those aged 6–11 years, and from 5.0% to 18.1% for those aged 12-19 years.[4, 5] However, the most recent NHANES data suggests that the prevalence of childhood obesity began to level off between 1999 and 2008.[4] In California, newer data from 2001 to 2008 on over 8 million public school children and adolescents show declining rates of obesity in white and Asian youth and a plateau for Hispanic youth. These findings are promising and may reflect the early success of anti-obesity policies, such as banning the sale of machine-dispensed snacks and drinks in elementary schools and prohibiting soda sales in high schools. However, rates among Black and American Indian girls have continued to increase, especially among those in the severely obese category.[6] For both genders and all races/ethnicities, the greatest proportional increase in prevalence from 2001 to peak year was seen for those with BMI ≥ 99th percentile: from 2001 to 2008 (peak year) prevalence among girls ages 8 to 17 increased by 0.5%, representing a 23.9% proportional increase; prevalence among boys ages 8 to 17 increased by 0.9% between 2001 and 2005

(peak year), representing a proportional increase of 26.0%. The fact that the greatest proportional increases were seen for BMI >99th suggests that any success in our efforts has been limited to primary prevention and that treating those who are already obese remains elusive.

In contrast to evidence of stabilizing overall rates of obesity, the increasing rates of severe obesity are striking and underscore the need for effective treatment. Severely obese children and adolescents are at significantly higher risk of developing multiple comorbidities in adulthood.[7-9] Recent childhood obesity efforts have shifted attention to primary prevention. While these efforts are critical to fighting the obesity epidemic, the needs of children and adolescents who are already obese and struggling with the medical and psychological side effects cannot be ignored. These young people will need intensive treatment programs in specialty clinics equipped to address their acute need for intensive weight management and lifestyle change.

Treatment Guidelines

Over the past 13 years the US Preventive Services Task Force (USPSTF) has reviewed the evidence on prevention, assessment, and treatment of obesity, and released guidelines to assist health care providers and health care systems in addressing the problem of childhood and adolescent obesity.[1, 10, 11] The USPSTF committee has been primarily funded by the Centers for Disease Control and

Prevention, the American Medical Association, and the Health Resources and Services Administration.[2] Between 1997, when the original practice guidelines were released, and 2007, when an updated version was published, the USPSTF recommendations have been adopted by a number of major organizations including the American Academy of Pediatrics, the American Heart Association, American Dietetic Association, American College of Sport Medicine, National Association of Pediatric Nurse Practitioners, and the Obesity Society.[2] Thus, the USPSTF guidelines represent a consensus among practitioners, as many organizations recognize the need for evidence-based treatment for obese children and adolescents as a critical health care issue.

The USPSTF guidelines categorize the treatment for overweight (between the 85th and 95th percentiles) and obesity (≥95th percentile) into four stages, titled: 1.) Prevention plus, 2.) Structured weight management, 3.) Comprehensive multidisciplinary intervention, and 4.) Tertiary care intervention.[1, 10] Stages 1 and 2 are appropriate to implement in primary care settings for children and adolescents who are overweight (85th-95th percentile) and who may benefit from basic nutrition and activity goals. All children, regardless of BMI, begin the intervention at stage 1 and move forward as needed. Comprehensive approaches (stages 3 and 4) are meant for obese children and adolescents who are at risk for severe obesity (≥99th percentile) and who need more intensive treatment aimed at reducing body fat. They are intended for implementation in

specialized or tertiary care clinics where treatment approaches move beyond basic healthy lifestyle changes.[1, 10] Treatment in these settings increases the intensity of the behavior change, the frequency of the visits, and the specialists involved. They may include medications, a very-low calorie diet, and/or weight control surgery.

Comprehensive care (stage 3) requires a multidisciplinary team, including physicians who specialize in treating pediatric obesity.[1] The need for formalized behavioral therapy and a multidisciplinary treatment team exceeds the capacity of services most primary care providers can supply; therefore, this stage usually includes referral to established pediatric weight management program with a trained staff.[1, 2, 10] The comprehensive team should include a behavioral scientist (for example a psychologist), a registered dietitian, and an exercise specialist. Treatment should include structured behavior modification, monitoring of diet and physical activity patterns and creating a supportive home environment (e.g. no soda in the house) by involving the families in the treatment.[1] The intensity of treatment for stage 3 programs is higher than it is for stage 1 and 2 programs, requiring weekly office visits for a minimum of 8-12 weeks. Group visits should also be considered as they have been shown to be cost-effective with therapeutic benefit.[1, 12, 13] The weight loss goals of stage 3 are modest decrements in BMI until it is $\leq 85^{th}$ percentile. Weight loss should not exceed 1lb/month for children 2 to 5 years of age or 2 lb week for older obese children and adolescents.

Systematic evaluation of body measurements, diet and physical activity should be performed at baseline and at specified intervals throughout the program.[1]

Tertiary care (stage 4) intervention is the most intensive level of care and would be appropriate for severely obese youths who have been unable to improve their degree of adiposity and morbidity risks with a comprehensive multidisciplinary intervention (stage 3). The key difference between stage 4 and lower levels of care is that it includes options for additional therapies including restrictive dietary therapy (e.g. meal replacement), drug therapy, or bariatric surgery.[1, 2, 10] Patients should have the maturity to understand possible risks of treatment and be willing to maintain physical activity and a healthy diet with behavior monitoring.[1] Beyond the general pediatricians, a registered dietitian, a behavioral scientist, and an exercise specialist trained in treating obesity, the team should include physician specialists such as pediatric endocrinologists and gastroenterologists. The intervention should operate under an established protocol and should also be implemented in pediatric weight management centers with comprehensive services.[1]

In theory, both stages 3 and 4 could be accomplished in an outpatient specialty clinic. However, outpatient clinics are traditionally configured according to a medical model designed to treat acute problems, where patients are seen infrequently, and care is directed by a physician who can prescribe medication

and perform procedures as needed. Obesity, on the other hand, is now recognized as a chronic disease that requires long-term, intensive behavioral treatment with trained physicians and multidisciplinary care members.[1] To date, stage 3 and 4 programs for a pediatric population have been implemented only to a limited extent. However, a few successful clinic-based interventions have been identified.

Clinic-based interventions for severely obese children and adolescents

The USPSTF's most recent statement on screening and treatment in 2010 reviewed the emergent evidence to identify characteristics of successful comprehensive weight management programs.[11] Out of 2786 abstracts and 369 articles, only 13 treatment-focused behavioral intervention trials and 7 successful pharmacological trials in overweight or obese children and adolescents aged 4 to 18 years were qualified to review because they evaluated the effects of treatment on weight, weight-related comorbidities, and side effects.[14] Success was defined as improved weight status, meaning an absolute or relative decrease in the BMI within 12 months of beginning the intervention.

For behavioral interventions, medium-to-high intensity interventions (>25 hours of contact with the child and/or family over a 6-month period) were most effective, with 1.9 to 3.3 kg/m^2 decrease in BMI at 12 months.[14] Successful program components included behavioral management techniques to assist in behavior

change, a focus on younger children, and promoting parental involvement. Out of four medium-to-high comprehensive interventions that showed promising results, only one of them was conducted in a clinical setting with severely obese children and adolescents. The other three studies either did not target the severely obese or were not conducted in the clinic. The intervention that did meet these criteria, called Bright Bodies, was a 1-year randomized controlled trial at the Yale Pediatric Obesity Clinic with 174 children and adolescents ages 8-16 with a mean BMI of 36 kg/m^2.[15] The program was high intensity, including a total of 97.5 hours of contact over a 12-month period. The intervention included dietary counseling, organized physical activity sessions, behavioral modification principles, diet changes, and family involvement. Visits were conducted biweekly for the first six months and bimonthly for the last six months. Twelve months after the intervention there was a statistically significant difference between the control group and intervention group in all body composition measures including weight, BMI, percent body fat, and estimated body fat mass. The mean BMI change for the intervention group after 12 months was -1.7 ± 3.1 kg/m^2.[15] One concern highlighted by this review is the limited evidence that these improvements can be maintained past 12 months.[14] For this reason, the USPSTF has suggested formal maintenance programs after high-intensity treatment.[3] This recommendation takes into account the need to frame obesity treatment within a chronic disease model. Since this was a research study, it was funded by a grant and does not follow the typical reimbursement model that impedes many obesity clinics from

seeing their patients frequently. While the program piloted in this study was successful, the costs and time required to maintain this program were substantial. There is a follow up study currently being conducted on cost-benefit analysis to assess whether this is a realistic program for obesity clinics across the nation.[15] Finally, there are few providers with the same expertise as those in this clinic and with time needed to run an intensive program. At this point this program comes at high cost and therefore it is difficult to replicate in different areas due to funding limitations.

Four comprehensive low-intensity interventions were reviewed; only one was conducted in the clinical setting on severely obese children and adolescents. In a randomized controlled trial, Mellin et al. (1987) showed a decrease in percent overweight (-9.9 ± 15.0 vs. -0.1 ± 13.2) in adolescents aged 12-18 years after 15 months (12 months after treatment was complete) in the intervention group as compared to control. The intervention included 24 hours contact over a 3 month treatment period.[16] The intervention group received dietary counseling, organized physical activity sessions, and behavioral modification principles used to address diet and physical activity changes while the control group received no treatment. Despite the promising results, this has been difficult to replicate over the past 20 years. It is likely that this study population, which was 79% female, predominantly white and higher income, is not typical of obesity clinics. Additionally, this clinical intervention was successful in decreasing overweight, but not to the same degree

of efficacy as the medium-to-high intensity intervention discussed above.[14] The primary reason for this discrepancy is likely the difference in contact hours, as low intensity interventions simply do not have enough contact with the patient to successfully modify behavior change.

As expected, very-low intensity interventions carried out in health care settings with less than 10 hours of patient-provider contact over 6 months have been less successful in reducing BMI in children and adolescents.[17-19] Although these programs include dietary counseling, organized physical activity sessions, and behavioral modification, their lack of family involvement and limited contact hours have been shown to limit efficacy.

Regardless of intensity, lifestyle interventions that combine multiple modalities are more successful than programs targeting just diet or physical activity separately.[20] One meta-analysis of obesity interventions geared toward minority U.S. obese children and adolescents found that interventions with three or more components were more efficacious in reducing overweight than those with two or fewer components. They also found that parent involvement, lifestyle change, and culturally-based application showed promised in reduction of overweight.[21] For example, in one program, parents were asked to select one nutrition and physical activity goal and engage in physical activity with their children instead of watching TV. They were also taught how to select healthy foods consistent with

cultural preference and were encouraged to attend treatment sessions.[21] The consensus among these studies appears to fall in line with the theme of 'more is better': more comprehensive, more frequent visits, more targets of behavior change, and more family involvement.

Pharmacotherapy

As the challenges of implementation and maintenance of lifestyle interventions have become clear, pharmacological therapies have been coupled with lifestyle interventions in an attempt to achieve better outcomes. A leader in guidelines for pharmacotherapy of obese adolescents, the Endocrine Society suggests pharmacotherapy in combination with lifestyle modification be considered if obese children have failed other lifestyle programs and have severe comorbidities that persist after completion of the program.[3] Only two medications have been approved by the FDA for use in adolescents: sibutramine, a serotonin re-uptake inhibitor that suppresses appetite, and Orlistat, a lipase inhibitor that causes fat malabsorption. These medications are intended to be used in conjunction with diet and exercise. The FDA has approved sibutramine for patients ≥ 16 years of age and Orlistat for patients ≥ 12 years of age. Metformin, an insulin sensitizer, is traditionally used to treat Type II Diabetes but is also used off label to treat pediatric obesity. The Glaser Pediatric Research Network Obesity Study Group recently published findings from a randomized, double-blind, placebo controlled trial showing a small but statistically significant decrease

in mean BMI (-0.9 kg/m^2, P=.03) among adolescents ages 13-18 on metformin and a lifestyle intervention program for 48 weeks.[22] However, it should be noted that after 12-24 weeks after the 48-week intervention, the intervention group quickly regained weight to match the control group, suggesting the benefit is temporary. The USPSTF reviewed 7 successful pharmacological trials in obese children and adolescents aged 4 to 18 years, all on severely obese children and adolescents.[14] Successful results were seen with two medications when combined with behavioral interventions, resulting in moderate (2.6 kg/m^2 for sibutramine) or small (0.85 kg/m^2 for Orlistat) BMI reduction in obese adolescents on active medication for 6 to 12 months.[14] Four studies were reviewed and all on sibutramine reported favorable reductions in waist circumference among patients taking sibutramine compared with placebo. In addition, one study reported greater improvements in high-density lipoprotein cholesterol, and reductions in triglycerides, and serum insulin. Low-density lipoprotein cholesterol and fasting serum glucose levels were not different between treatment and control groups for any of the sibutramine trials. It is noteworthy that sibutramine, in addition to being off label for those under 16, is not covered by most insurance companies and requires individual negotiation on behalf of each patient, making its utility questionable. Among the three Orlistat trials, one reported that both waist circumference and hip circumference decreased more in those who were receiving active treatment compared with a placebo at 12 month. Gastrointestinal adverse effects were common among patients taking Orlistat. In this study up to

50% reported fatty or oily stools compared with 8% of those on placebo.[14] The other two studies had inconsistent results.[14]

While the combination of behavioral and pharmacologic interventions have been effective in the short-term, there are still concerns regarding the cardiovascular and gastrointestinal side effects of metformin, Orlistat, and sibutramine in particular, especially in children for whom long-term effects have not been tested. Additionally, metformin lacks evidence of persistence of weight reduction after treatment ends. Finally, while all studies paired the medications with lifestyle interventions, it is hard to know what these interventions included and if patients were actually able to follow them in addition to taking medications. For these reasons, pharmacotherapy requires an experienced physician trained in treating obese children and adolescents with medications over a lifetime and more long-term follow-up studies must be done.

Bariatric Surgery

Recently, bariatric surgery has become an option for adolescents as the severity of the obesity epidemic continues to grow in this population without clear effective interventions. In a randomized trial on adolescents published in 2010, gastric banding was found to be more effective in reducing weight versus the control group who received a lifestyle intervention only.[23] After two years, the gastric banding group lost 50% of excess weight when controlling for age, while only 3

out of the 25 subjects in the control group lost the equivalent amount. The Endocrine Society recommends bariatric surgery for adolescents with BMI above 50 kg/m^2 or BMI above 40 kg/m^2 with severe comorbidities and for whom lifestyle program and pharmacotherapy have failed.[3] The decision to undergo bariatric surgery requires the input of a multidisciplinary team with expertise in the field of childhood obesity that are well suited to make this life changing decision with the family and patient, again highlighting the need for pediatric specialty clinics. Given the current demand of severely obese children and adolescents who have been unsuccessful with all other treatment approaches, bariatric surgery is a viable option. However, it comes with the high risks of surgery and adverse effects of recovery such as symptoms of heartburn, reflux, vomiting, or spontaneous abortion. Also, a long-term follow up of these preliminary studies must be done to see if improved weight status is maintained into adulthood.

Limitations of current evidence for best practices

The USPSTF review and other studies have provided direction by identifying successful strategies to treat severely obese pediatric patients in specialized clinics, but they are not without limitations. First, although it is clear that more frequent patient contact is better, there was inadequate evidence to judge the effectiveness of low-intensity and very-low intensity interventions.[14] Second, both the USPSTF review and one other large systematic review concluded that most of the intervention studies on treatment of childhood and adolescent obesity were

of fair to poor quality. Studies have been characterized by small sample sizes and lack of intention-to-treat analyses, and therefore provided limited information on changes in risk factors.[14, 20, 24] Third, although some interventions appeared promising, most were performed in the context of research studies. Study populations were primarily Caucasian children in selected age ranges, and findings may not be generalized to other racial/ethnic, age and non-study clinical populations.[2, 14, 24] This is a major shortfall considering the evidence that severe obesity is increasing specifically among racial and ethnic minority groups.[6] In addition, specialized interventions used for research are unlikely to be reproduced until the weight management curricula are made widely available.[14, 20, 24] These reviews illuminate a number of gaps in studies of evidence-based clinical interventions.

Barriers to treatment of severely obese

For the treatment of severely obese children and adolescents, the current guidelines rely on referral to specialized obesity treatment programs. Such treatment programs face multiple barriers to providing the comprehensive and intensive care required to effectively treat this group.[6, 14, 24] The most documented barriers include insufficient clinician training, lack of funding and access, and lack of patient motivation.

Lack of training

As a chronic disease with few medical treatment options; severe obesity requires behavior modification in the patient and family. Paradoxically, the most common area of self-perceived low proficiency among pediatric health care providers was use of behavior management strategies.[25] These topics are seldom covered in medical, nursing, or dietetic school curricula, and postgraduate training opportunities are limited.[26] Most pediatricians who treat obesity report little confidence in their ability to help patients change behaviors.[27] In fact, in a recent survey, over half of practitioners requested additional training in use of behavioral management strategies.[25] Those practitioners with > 10 years of practice reported the greatest interest in training.[25]

There are several specific areas where clinicians must increase skill in order to maximize the help they are providing to the patient.[20] First, they must begin with sensitivity to the social stigmatization that accompanies the disease and the blame and/or shame that sometimes characterizes obesity within families. The inclusion of the family, and sensitivity to stigmatization of the patient are realistic aspects that can be addressed by every provider. However two of the most common areas of self-perceived low proficiency among health care providers are guidance in parenting techniques and addressing family conflicts.[25] Second, clinicians must have a working knowledge of nutrition. There is also evidence highlighted by the guidelines to support targeting specific nutrition and physical

activity behaviors.[10, 28-31] The most promising targets, and the behaviors with strongest links to obesity, are soda, fast food and TV.[31-33] These target behaviors are too frequently not addressed by pediatricians. In a recent study of eighty pediatricians and seven nurse practitioners a minority correctly identified the guidelines for exercise (39%) and juice consumption (44%).[34] Although the study found that >95% of providers discussed juice, fruits and vegetables, sippy cups, and finger foods during the first year, over 35% never discussed fast food, TV, or candy, and 55% never discussed exercise.[34] Lack of clinician time to address every healthy behavior has been reported as a major barrier for almost 60% of pediatricians.[25] The combination of lack of training and time make it difficult for the provider to delivery a consistent and clear message to their patients. Finally, few clinicians have the training to address self-efficacy rather than just imparting knowledge.[10] While knowledge is important, and education can be delivered in a clinical setting, knowledge is usually insufficient to significantly change health behavior.[35] There are factors beyond education that mediate the relationship between knowledge and behavioral change. Self-efficacy, or confidence to accomplish a task, is a key mediator in this pathway.[2] Increasing self-efficacy requires mastery and repeated exposure, yet neither can feasibly be accomplished in most clinical settings. The USPSTF acknowledges that most health care providers lack the time and training to adequately address these factors and facilitate real behavior change.[10]

When done correctly, behavior modification has been demonstrated to be highly successful. Epstein et al. used behavioral modification with 158 children and families over 10 years in a series of four studies of moderately overweight children.[36-41] The intervention included weekly meetings for the first 8-12 weeks, and monthly follow-up meetings for 6-12 months after the start of the program. Parents and children met separately, and meetings of the child with the parent occurred with a therapist. The "stop-light" diet was the foundation of the dietary intervention and classifies food by color based primarily on fat content.[36-41] The studies were highly successful, showing > 20% weight loss over 5 years time, and this weight loss was sustained for 10 years in one-third of the patients. True behavioral modification of this intensity does not appear to be feasible in the current primary care settings or even in most specialty obesity clinics.[2]

Even with adequate training, patients face individual barriers that prevent them from engaging in care. The most frequent barriers are lack of parent involvement, lack of patient motivation, and lack of support services.[25] Severe obesity combined with low motivation or lack of concern creates a distressing situation for clinicians, especially when the child has an urgent medical condition. Particularly challenging are situations in which the child is young and the parents, on whom the child relies for healthy eating and physical activity structure, are unwilling to make changes. Drop-out rate is also reported to be high amongst obesity clinics that do not heavily screen patients before admission into the

program.[27, 42, 43] In practice, treatment is time-consuming, frustrating, difficult, and expensive.[10] Once again, the barriers of training, access, cost and individual barriers increase as each level of treatment increase.

Currently, practitioners have few opportunities to learn the most current counseling strategies and behavioral management techniques for pediatric obesity treatment. There is a need for increased training opportunities related to obesity treatment that must be addressed. Continuing education along with developing curricula into pre-professional education programs could provide a readily accessible forum for training in these topic areas.

Funding

Funding for obesity treatment is insufficient. Lack of reimbursement by managed care and insurance companies is also a significant barrier to effective treatment, as cited by more than two thirds of registered dietitians and nearly half of pediatricians.[25] Terchakovec et al. (2003) found that pediatricians in an obesity referral clinic were reimbursed for the treatment of obesity only 11% of the time.[44] Furthermore, reimbursement is no more likely for severely obese patients; third-party reimbursement was denied even in cases of extremely obese youth with medical consequences.[44] In general, third-party payers do not reimburse physicians to provide specialized obesity treatment themselves or to employ multidisciplinary teams to provide the services.

While the private and public sectors are both devoting an increasing amount of resources to the pediatric obesity epidemic, lack of reimbursement for care is a major deterrent to the treatment of obesity.[45] Few clinics and programs can afford to provide intensive treatment. The lack of reimbursement affects frequency of care, as the number of clinic visits by obese children attending a weight management program differs by insurance type. For example, variation in how the Medicaid program reimburses for obesity-related services in wide-spread.[45] Depending on the state, some providers have reported that they are paid at least as well for obesity and its related comorbidities as they do for other conditions they treat, whereas other providers reported that all claims have been rejected.[45] Despite the USPSTF recommendations to refer children and adolescents for care, there are few clinics around the nation that can provide this. In fact, 35% of practitioners do not have pediatric obesity clinics available for referral.[43] Even fewer centers provide stages 3 and 4 care for severely obese youth. This may explain why only 12% of primary care physicians who see an obese child or adolescent refer to specialty clinics.[43] Those who are referred face long wait times for initial consultation[46] and potentially must travel long distances to reach the nearest treatment center. Transportation is a major barrier for high intensity treatment requiring weekly meetings. Although the USPSTF has called for the development of new clinics,[10] it is clear that insurance companies and managed care policies must first change, so that health care professionals have the incentives and ability to provide obesity services for children and adolescents.

Previous studies have highlighted the need for increased leadership and attention to pediatrics from the Medicaid and SCHIP programs.[45, 42] This is especially important as minority and low-socioeconomic-status groups are disproportionally affected by obesity at all ages.[47] Advocacy efforts and legislative initiatives are needed to ensure coverage for the delivery of treatment services.

Patient motivation

In addition to inadequate physician training and funding issues, physicians report barriers faced on the individual level with many patients. The most frequent barriers are lack of parent involvement, lack of patient motivation, and lack of support services.[25] Severe obesity combined with low motivation or lack of concern creates a distressing situation for clinicians, especially when the child has an urgent medical condition. Particularly challenging are situations in which the child is young and the parents, on whom the child relies for healthy eating and physical activity structure, are unwilling to make changes. Drop out rate is also reported to be high amongst obesity clinics that do not heavily screen patients before admission into the program.[1, 42]

Conclusions

Pediatric obesity is one of the most pressing health problems facing children and adolescents today. This problem is especially dire for an expanding population of

severely obese children that require specialized treatment. The extent of the childhood obesity epidemic and its short- and long-term effects on physical and psychological health have made treatment of childhood obesity a high priority.[48-51] Treatment of childhood and adolescent obesity is a daunting task for the patient, his/her family, and the provider. The current recommendations to treat severe obesity within specialized clinical settings require an enormous amount of resources, including specialized physician training, multidisciplinary team, and frequent visits. And all of this must occur knowing that, at least currently, only a small portion of these services will be reimbursed. It has been difficult to convince managed care and insurance companies to reimburse for care when there is so little evidence that severe obesity can be successfully treated in the clinic. The few studies that have been performed show 1-3 kg/m^2 decrease over a 12-month period, which is equivalent to 12 to 26 pounds in a 12-year-old boy who began at 200 pounds. This may seem clinically relevant in the short term, however is not likely to continue be sustainable into adulthood.

Studies show that pediatric practitioners view child and adolescent obesity with concern, and feel that intervention is important. To address barriers for clinicians, changes are needed in public health policy toward childhood and adolescent obesity. Training in obesity treatment for healthcare professionals must be expanded through continuing medical education and other venues. This training must include special attention to the needs of minority groups and groups of low

socioeconomic status with limited accesses to resources, as they are at higher risk of obesity. Securing reimbursement for a high-intensity approach is also necessary to apply the guidelines of the USPSTF in a clinic setting.

Childhood and adolescent obesity is a chronic widespread problem with no short term, simple solution. Due to the lack of specialty obesity clinics, the long-term treatment of childhood obesity requires further exploration into community-based treatment, outreach clinics or telemedicine to improve the availability of treatment. Up to this point, treatment of childhood obesity has fallen into the typical healthcare dogma of more is better. More resources, more training, and more patient contact time are continually being recommended. While this is important in the short term, it is likely a Band-Aid solution that could be unsuccessful and unsustainable because the needed resources are unlikely to become available anytime soon. For lifestyle interventions that do not include pharmacotherapy or surgery, it is time to try a new frontier in treatment of childhood obesity by exploring different options that do not follow a traditional medical model. There is promising preliminary research showing that taking the treatment out of the clinic and into the community could be successful.[52-55] New treatment models must be looked at that include the underlying contexts in which obesity occurs – communities, schools, and homes – rather than relying on clinic-focused medical models as the long-term solution to childhood obesity. In the

meantime, the children, families, and provider must be resilient and work together to optimize the results of the treatment.

Part II: Short-Term Effectiveness of a Clinic-Based Intervention for Obese Children and Adolescents

Introduction and Objective

The high prevalence of childhood and adolescent obesity highlights the need for effective treatment in the clinical setting.[4] Under the current U.S. presidential administration, focus on childhood obesity has intensified, however new efforts have been largely directed at primary prevention.[11] There is early evidence that some of these efforts, such as banning the sale of machine-dispensed snacks and drinks in elementary schools and prohibiting soda sales in high schools, may be taking effect. A study in over 8 million California public school children and adolescents show declining rates of obesity from 2001 to 2008.[6] Unfortunately, increasing prevalence was seen in those who are severely obese (BMI $\geq 99^{th}$ percentile). These youth are struggling with the medical and psychological consequences of obesity and need effective treatments. They carry the highest risk of multiple comorbidities in adulthood[7-9] and have an acute need for intensive treatment in specialty clinics.

The expert evidence-based recommendations for the treatment of childhood and adolescent obesity rely on referral to obesity specialty programs to provide comprehensive weight management services for all obese children over the age of 6.[1, 3, 11] Successful interventions demonstrate an average weight reduction of

1-3 kg/m^2 over 12 months.[14, 15] Characteristics of these programs include behavioral management techniques to assist in behavior change, a focus on younger children, parental involvement and intensive patient contact time (> 25 hrs of contact with the child and/or family over a 6 month period).[14, 15] For three reasons, these interventions cannot be easily disseminated into clinical practice. First, most were performed as part of funded research protocols rather than functioning obesity clinics. In contrast, treatment clinics cannot ethically randomize children to receive no treatment. In addition, these research protocols are unlikely to be reproduced until the weight management curricula are made widely available.[14, 20, 24] Second, the study populations were primarily Caucasian children in selected age ranges. Obesity clinics draw a wider range of ages, racial and ethnic backgrounds and socioeconomic status.[2, 14, 24] The third reason that successful weight loss interventions are difficult to reproduce in clinical setting is funding. While research studies have been well funded to include the components above (such as parent groups), clinics depend on insurance reimbursement and cannot often afford to support a behavioral component.[44]

A previous study in our clinic by Madsen et. al. (2008) found a small but significant decrease in BMI z-score in response to intervention. The average decrease in BMI was 0.4 kg/m^2 in the first 3.2 months (0.13 per month).[56] The clinical significance of this change is difficult to assess because this study lacked a comparison group and therefore the weight trajectory without intervention is

unknown. Studies suggest that severely obese children and adolescents will continue to gain weight without intervention.[24, 57, 58] Thus, even a small reduction in response to intervention could be clinically meaningful. The aims of this study were to evaluate the effectiveness of a clinic-based intervention to reduce overweight and improve nutrition and physical activity behaviors in severely obese children and adolescents as compared to the same subjects prior to the intervention.

Design and Methods

Overview of Study Design: This study utilized a quasi-experimental repeated measures design comparing the same subjects during a waitlist period to an intervention period.

Setting: Pediatric obesity clinic in outpatient clinic attached to a large tertiary care hospital.

Subjects: This study included subjects age 6-19 years who attended a pediatric obesity clinic in outpatient clinic attached to a large tertiary care hospital between September 2009 and December 2010. Patients less than 21 years old, with a BMI greater than the 95th percentile for age and sex were referred to the pediatric obesity clinic by their Primary Care Provider (PCP). All patients with a scheduled appointment between the study dates were contacted via telephone to participate

in the study. As shown in **Figure 1**, of the 122 children and adolescents eligible for the study, 66 enrolled. Those who did not have the cognitive ability to understand the intervention (N=3), declined to participate (N=27) or were unable to be reached by phone (N=26) were excluded. This protocol was approved by the UCSF Committee on Human Research. Consent and assent were obtained at the home visit.

Measurements:

Data were collected at four time points (**Table 1**). At the home visit, height was measured using a calibrated stadiometer (Stadiometer Model #420 Measure All) and weight was measured using a calibrated electronic scale (Scale Tanita BWB 800). At the each clinic visit (intake visit and follow-up visit) height was measured using a calibrated, wall-mounted stadiometer and weight was measured using a calibrated electronic scale (Scale-Tronix Model 6002 Wheelchair Scale). Shoes and jewelry were removed, pockets were emptied, and clothes remained on for each measurement.

The Healthy Habits questionnaire (HH) is a 12-item self-administered questionnaire that asks about nutrition and physical activity behaviors in the previous weekend and weekday, adapted with permission from a validated diet and physical activity questionnaire developed by Patrick, et. al.[59-61] Answers to individual items are on a scale of 0-4 or 0-6. There are two sub-scores for

Nutrition and Physical Activity. The nutrition subscore consists of eight questions: servings of fruit, vegetables, whole grains, low fiber grains and sugar-sweetened beverages (in the previous day); number of times subjects had family dinners, fast food and breakfast (in the past seven days). The physical activity subscore includes 4 questions: hours of TV time (typical weekend and weekday), and hours of physical activity time (yesterday and past seven days). If the subject was under the age of 12 years, the parent completed the HH. Subjects 12 years and older and parents self-administered the HH.

Description of Time Points:

1.) *PCP Record:* Height, weight and Body Mass Index (BMI) records required for referral were obtained from the PCP office for a visit within two years prior to the home visit.

2.) *Home Visit:* A research assistant visited each subject's home while on the waiting list to obtain informed consent, measure height and weight of the child and administer the HH to both parent and child. The overall visit duration was about 15 minutes.

3.) *Intervention:* This was the initial visit to the clinic, scheduled approximately 1-4 months after the home visit. The interdisciplinary care team consisted of a pediatric endocrinologist, a pediatric gastroenterologist, general pediatricians, dietitians, and a physical therapist. The intervention began with a blood draw for fasting laboratory studies and an individual visit with the physician who spent

approximately 45 minutes with the patient and family, performed a thorough medical history and brief physical exam and reviewed key behavioral messages of the lifestyle intervention (see below).

The intervention is an interactive, group nutrition education session called the "Teaching Breakfast" modeled after the low glycemic load diet developed by Ludwig and colleagues.[62] This diet has been shown in a randomized trial to reduce BMI and fat mass among adolescents over a 1-year period.[63] A registered dietitian facilitates a 45-minute group educational session where patients and families eat breakfast. Key messages included in the session are: 1) eliminate all sugared beverages, including soda and juice, 2) reduce refined carbohydrates, substituting high-fiber whole grains instead, 3) increase fruits and vegetables, 4) include a lean protein or low-fat dairy product with meals and snacks. A visual plate model reinforces this lesson in which one quarter of the plate depicts whole grains, one quarter depicts lean protein, and one half of the plate depicts fruits and vegetables. Participants make a breakfast plate by selecting from a buffet of breakfast food to practice the key messages and model healthy eating behavior.

The physical activity portion of the intervention is also interactive and staged in a group. It includes education about physical activity in addition to free-play time. The primary goal is to have the parents sign their child or adolescent up for an adult-supervised group physical activity class or team, which has been shown to

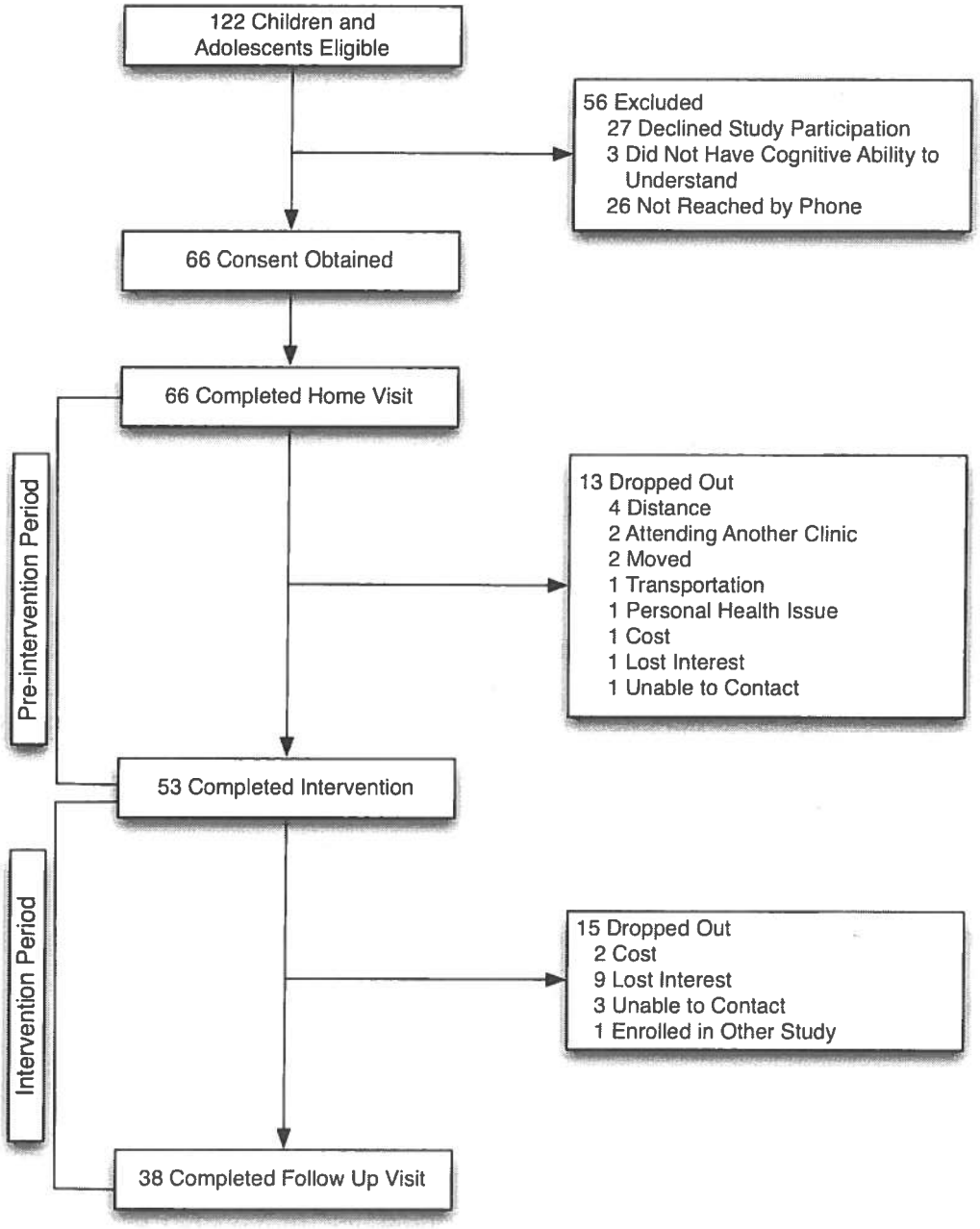
be associated with decreasing BMI.[10, 64, 65] The educational component emphasizes the multiple health benefits of physical activity, increasing physical activity, reducing television time to no more than 2 hours per day and removing televisions from the children's bedrooms. A 3-day recall of physical activity is recorded. Subjects and parents record exercise goals based on the youth's physical activity preferences. Finally, they participate in group free-play for 15 minutes.

4.) Follow-Up Visit: Members of the interdisciplinary team saw patients and families individually at follow-up visits, which were scheduled at 3-6 months. At the follow-up visit, the lifestyle intervention was reinforced, individualized nutrition and physical activity goals were refined and monitored, and barriers to implementation were addressed. A psychologist was available if deemed necessary by the interdisciplinary team.

Table 1: Data Collection

	PCP Record	Home Visit	Intervention	Follow Up Visit
Height and Weight (BMI)	X	X	X	X
Healthy Habits (child and parent)		X	X	X
Clinician Visit			X	
Nutritional Intervention			X	
Physical Activity Intervention			X	

Figure 1: Enrollment Chart



Statistical analysis:

BMI was converted to z-score using CDC growth reference data.[66, 67] BMI z-score allows comparison of BMI across age and sex. We performed the χ^2 test for

dichotomous variables, and the 2-sample *t* test for continuous measures to determine whether baseline variables of BMI z-score, age, gender, race and distance from clinic were associated with completion of the study. In a second set of analyses, we examined whether BMI z-score was associated with dropout before the following visit to determine whether weight loss success influenced retention.

The primary outcome was change in BMI z-score per month. Paired t-tests were used to determine whether average BMI was significantly different between time points. Repeated measures analysis on BMI and BMI z-score per month was performed using generalized estimating equations (GEE) to determine if change differed across three time periods: 1) PCP record to home visit, 2) home visit to intervention, 3) intervention to follow-up visit. Period 1 was used as the reference period. The GEE model made no assumptions about the correlation structure for observations on the same subject and was adjusted for sex, age and race/ethnicity.

HH questions were adjusted to a scale of 0-4. Negative questions were reverse scored such that a higher score represents healthier behavior. Paired t-tests were used to examine whether there was a significant difference in HH subscores at each time period. The relationship between health behaviors reported by the child/adolescent and parent and change in the child/adolescent's

BMI z-score per month was examined using linear regression with change in BMI z-score per month as the outcome and HH change scores as the predictor, adjusting for sex, age and race/ethnicity. All analyses were done using STATA (STATA 9.2, Statcorp LP, College Station, Texas) with $p<.05$ as the criterion for statistical significance.

Results

As shown in **Table 2,** this was an ethnically diverse study sample of severely obese children and adolescents, with an average BMI of 33.5 kg/m^2 at 12.1 yrs old.

Table 2: Characteristics at Home Visit

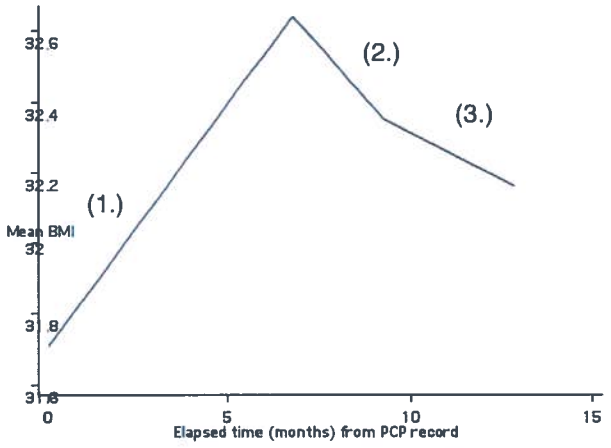
Sample Size	n=66
Race/ethnic group, No. (%)	
Hispanic	31 (46.2%)
Non-Hispanic White	12 (18.5%)
Non-Hispanic Black	10 (15.4%)
Asian	8 (12.3%)
Other	5 (7.6%)
Sex, No. (%)	
Female	32 (48.5%)
Male	34 (51.5%)
Age, yr, Mean (SD)	12.1 (3.15)
BMI, kg/m2, Mean (SD)	33.5 (7.65)
BMI z-score, Mean (SD)	2.4 (.33)

The 53 subjects who participated in the intervention following the home visit were more likely to be female and live closer to clinic. However they did not differ in age, BMI z-score or race/ethnicity. Thirty-eight subjects returned for follow-up

(Figure 1), yielding a completion rate of 58%. Subjects who completed the study where more likely to be female, but did not differ in BMI z-score at the home visit in age, race/ethnic group, or distance from clinic as compared to non-completers. We also compared BMI z-score at the time point before dropout and it was not associated with retention.

Figure 2 shows average BMI at each of the study time points. The PCP visit is shown as time 0, the home visit occurred around 6 months, the intervention occurred around 9 months, and the follow-up visit around 14 months. Average BMI during period 1.), from PCP record to home visit, increased from 31.7 kg/m2 to 32.8 kg/m2 ($p<0.001$). BMI decreased to 32.3 kg/m2 during period 2.), from the home visit to intervention visit ($p=0.051$). After the intervention (period 3.), BMI decreased to 32.1 kg/m2 ($p=0.410$).

Figure 2: Mean BMI over Time



(1.) PCP record to home visit, (2.) home visit to intervention, (3.) intervention to follow-up visit

Table 3 shows comparison of changes in BMI and BMI z-score per month during the 3 study periods using a GEE model. The change in BMI z-score from the home visit to intervention (period 2) was significantly different than the PCP record to home visit period (period 1) (p = 0.000). However, the decrease per month during the intervention to follow-up period (period 3) was not significantly different (p=0.116).

Table 3: Change in Weight Status Between Time Points

Time Period	1	2	3
	PCP Record to Home Visit (n=66)	**Home Visit to Intervention (n=53)**	**Intake Visit to Follow Up Visit (n=38)**
Average Length Between Visits, Mo	6.4 (5.3)	2.6 (2.1)	3.6 (1.0)
Change in BMI per month, kg/m2	0.10 (0.40)	-0.20 (0.47)*	-0.05 (0.37)
Change in BMI z-score per month	-0.00 (0.03)	-0.02 (0.03)*	-0.01 (0.03)

Data is presented as Mean (SD)
* P<.05, significantly different as compared to the PCP to home visit period

Average scores of children's and adolescents' reported healthy behaviors at home visit, intervention, and follow up visit are presented in **Table 4**. Total (p=0.012) and Nutrition (p<0.001) HH scores were significantly worse at intervention than at home visit. Total (p=0.003), Nutrition (p=0.043), and Physical Activity (p=0.011) HH scores improved between the intervention and follow-up visits. Subjects' Physical Activity scores from intervention visit to follow-up visit

were significantly inversely correlated with change in BMI z-score per month (r=-0.54, p= 0.004).

Table 4: Children and Adolescent Healthy Habits

	Home Visit	Intervention	Follow Up Visit
Total Score	2.56 (0.50)	2.34^ (0.44)	2.60* (0.56)
Nutrition Score	2.52 (0.45)	2.22^ (0.44)	2.47* (0.58)
Physical Activity Score	2.64 (0.91)	2.59 (0.92)	2.85* (0.80)

Data is presented as Mean (SD)
^ P<.05, significantly different than home visit
* P<.05, significantly different than intervention

Parents' average HH scores at home visit, intervention and follow up visit are presented in **Table 5**. Total, Nutrition and Physical Activity HH scores did not change after home visit. Total HH scores improved after the intervention (p=0.035). Parents' HH scores were not significantly associated with their child's change in BMI z-score per month at any time period.

Table 5: Parent Healthy Habits

	Home Visit	Intervention	Follow Up Visit
Change in Total Score	2.76 (0.61)	2.68 (0.61)	2.93* (0.67)
Change in Nutrition Score	2.93 (0.58)	2.84 (0.65)	3.04 (0.70)
Change in Physical Activity Score	2.42 (1.06)	2.36 (0.90)	2.72 (1.11)

Data is presented as Mean (SD)
* P<.05, significantly different than intervention

Comments

The decrease in BMI z-score per month in response to this low-intensity interdisciplinary weight management intervention in severely obese children and adolescents was not significant despite improved self-reported behaviors in subjects and their parents. This is most likely a result of a clinical intervention that is too low in intensity for severely obese children and adolescents.

BMI z-score did decrease significantly following a home visit. This finding suggests that the home visit itself could have acted as an intervention. In anticipation of this possibility, we designed the home visit to be as low impact as possible. For example, no education was provided and subjects and families were not told their weight after it was measured. Nevertheless, subjects' degree of overweight decreased significantly and this could indicate self-initiated weight management strategies in anticipation of their upcoming clinic visit. However, we did not capture any such changes with our HH, a questionnaire designed to examine key obesigenic behaviors such as fast food intake, soda drinking and screen time. In fact, these behaviors significantly worsened during the period after the home visit when the largest decrease in weight status was seen. It is possible that subjects changed behaviors that we did not ask about, such as reducing portion sizes. Another explanation, which has been shown in other studies,[68-70] is that subjects did not accurately report their behaviors. Neither of these possibilities can be ruled out by our finding that subjects reported improved

behaviors following the intervention even though weight remained stable. However, if these reports are accurate, then we would conclude that the behavior change they reported was only sufficient only to maintain the decrease in weight status achieved after the home visit. One indication that the HH reports were accurate is that subjects who reported more physical activity did decrease their degree of overweight more.

Although the intervention did not result in significant additional weight loss, it maintained the weight loss that occurred after the home visit. This is clinically meaningful in that it represents an overall change in weight trajectory. Subjects were gaining an average of 0.10 kg/m^2 per month prior to home visit. However, the average decrease in BMI after the intervention of 0.05 kg/m^2 per month over 3.6 months was less than we previously showed in response to our intervention. Madsen et. al. (2008) found an average decrease of 0.13 per month over 3.2 months.[56] The appearance of a weaker affect in this study with the same clinical intervention may be due to the weight loss following the home visit in this study. Subjects had already lost BMI when they started the intervention. The average BMI decrease across both the home visit and intervention periods of this study is 0.13 kg/m^2 per month, which is comparable to Madsen et. al.[56] This is speculation, of course, since we do not have a group that did not receive a home visit for comparison. Regardless, the present study and our previous study [56] show that the effect of our intervention is relatively weak compared to the

successful programs identified by the USPSTF, demonstrating decreases of 0.16-0.28 kg/m^2 per month (1.9 to 3.3 kg/m^2 over 12 months).[14]

Several issues pertaining to study design should be noted. Limitations of the study include a small sample size, the use of a comparison group rather than randomization, a high dropout rate and a short intervention period. Since weight can vary throughout the day, all clinic visits were scheduled in the morning but this was not possible when the home visits were scheduled. It is likely that there is selection bias in these subjects who agreed to be in the study; there was a higher proportion of Hispanics and a lower proportion of non-Hispanic Whites in this study when compared to the Madsen el. al. (2008) study, which was a larger chart review study and more closely reflected the true clinic population.[56] However, race/ethnicity was not significantly related to change in BMI z-score per month in our repeated measures analysis. Also, it is important to note that this study did not include children or adolescents on medications or who choose bariatric surgery, which are valuable options in some cases of severe pediatric obesity. Strengths of the study include an intervention with a well-defined conceptual framework to promote behavior change, measurement of a pre-intervention period for comparison and a severely obese diverse study population that reflects the typical population of many specialty obesity clinics.

The relatively weak effect of this intervention highlights the difficulty of treating severe pediatric obesity even in the setting of with a multidisciplinary team clinic. While studies show that pediatric practitioners view child and adolescent obesity with concern and feel that intervention is important,[25, 43] clinicians face many barriers at every turn such as insufficient clinician training,[25, 27, 43] and lack of funding.[25, 27, 43] The USPSTF recommends moderate- to high- intensity programs involving 25 hours of contact with the child and/or the family over a 6-month period for obese children and adolescents.[11] The clinic where this study was conducted is a low-intensity intervention. The clinic is running at full capacity and is able to offer 5 total hours of contact and 2-3 visits over a 6-month period. This is 20 hours of contact time less than what is recommended for the first 6 months. Significant increases in funding, either through higher reimbursement rates or supplementary research and grant funding, would be required to implement the recommendations widely in clinical settings. Further research is needed to develop novel strategies to treat severely obese adolescents and children within a traditional clinic setting with limited funds.

Conclusions

A medical model approach to the treatment of severe obesity, including multidisciplinary clinic visits with physical activity and nutrition education, did not result in decreased degree of overweight among severely obese children and adolescents. However, the intervention did serve to maintain the BMI lost

following a home visit. This represents a change in trajectory for these severely obese youth, who were gaining significant weight prior to contact with our program. Nevertheless, more intensive programs are needed to help these severely obese youth lose weight and this is likely to require more funding and resources than what can currently be afforded in medical models that depend on fee-for-service reimbursement or capitated payments.

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Appendix A: Questionnaire

Questionnaire Scoring

1) Reverse score questions 4, 5, 8, 10, and 11.

2) Cap each score at 4. Therefore, replace all 5 and 6 with 4.

HEALTHY HABITS QUESTIONNAIRE - Parents

Instructions: These questions ask about **your (the parent)** diet and activity history.

1. Yesterday, how many servings of fruit did you eat?

   A serving is equal to:

   1 medium piece of fruit

   ½ cup of fruit salad

   Mark the answer that is true for you.

   - O 0 servings
   - O 1 serving
   - O 2 servings
   - O 3 servings
   - O 4 or more servings

2. Yesterday, how many servings of vegetables did you eat? Do not count potatoes or corn.

A serving is equal to:

1 medium carrot or other fresh vegetable

1 small bowl of green salad

½ cup of fresh or cooked vegetables

¾ cup of vegetable soup

Mark the answer that is true for you.

- O 0 servings
- O 1 serving
- O 2 servings
- O 3 servings
- O 4 or more servings

3. Whole grains are things like whole grain bread, whole wheat pasta, brown rice, high fiber cereal, or whole wheat tortillas.

Yesterday, how many servings of whole grains did you eat?

A serving is equal to:

1 piece of whole wheat bread

½ cup rice or pasta

1 whole wheat tortilla

Mark the answer that is true for you.

- O 0 servings
- O 1 serving
- O 2 servings
- O 3 servings
- O 4 or more servings

4. "White fluffies" are grains with low fiber content like white bread, white rice, and regular tortillas.

   Yesterday, how many servings of "white fluffies" did you eat?

   A serving is equal to:

   1 piece of white bread

   ½ cup rice or pasta

   1 tortilla

   Mark the answer that is true for you.

- O 0 servings
- O 1 serving
- O 2 servings
- O 3 servings
- O 4 or more servings

5. Sweet drinks include fruit juices like orange juice (either whole juice or from concentrate), fruit drinks, punches, lemonade, sweet tea, regular soda (not diet), sports drinks (like Gatorade), and energy drinks (like Propell or vitamin water).

   Yesterday, how many servings of sweet drinks did you have?

   A serving is equal to:

   1 can of soda (not diet) or juice

   1 juice box

   * a bottle of soda or sports drink is 2 servings

   Mark the answer that is true for you.

   - O 0 servings
   - O 1 serving
   - O 2 servings

- O 3 servings
- O 4 or more servings

6. In the past 7 days, on how many days did you eat dinner at home with the family (when at least one parent or guardian was present)?

   Mark the answer that is true for you.

   - O 0 days
   - O 1 day
   - O 2 days
   - O 3 days
   - O 4 days
   - O 5 days
   - O 6 or more days

7. In the past 7 days, on how many days did you eat breakfast?

   Mark the answer that is true for you.

   - O 0 days
   - O 1 day
   - O 2 days
   - O 3 days

- O 4 days
- O 5 days
- O 6 or more days

8. In the past 7 days, on how many days did you eat fast food (like McDonald's, Taco Bell or Pizza Hut)?

   Mark the answer that is true for you.

   - O 0 days
   - O 1 day
   - O 2 days
   - O 3 days
   - O 4 days
   - O 5 days
   - O 6 or more days

9. Physical activity is any activity that makes you sweat or breathe hard. It can be done in sports, fitness center, or casual exercise. Some examples are running, brisk walking, biking, dancing and swimming.

   a. Yesterday, how many minutes did you spend doing physical activity?

Mark the answer that is true for you.

- O 0-15 minutes
- O 15-30 minutes
- O 30-45 minutes
- O 45-60 minutes
- O 60 minutes or more

b. In the past 7 days, on how many days did you do physical activity that made you sweat or breathe hard?

Mark the answer that is true for you.

- O 0 days
- O 1 day
- O 2 days
- O 3 days
- O 4 days
- O 5 days
- O 6 or more days

10. On the last weekday, how many hours did you spend watching TV, playing video games, or using the computer?

Mark the answer that is true for you.

- O 0 hours
- O 1 hour
- O 2 hours
- O 3 hours
- O 4 hours
- O 5 hours
- O 6 or more hours

11. On your last weekend day, how many hours did you spend watching TV, playing video games, or using the computer?

Mark the answer that is true for you.

- O 0 hours
- O 1 hour
- O 2 hours
- O 3 hours
- O 4 hours
- O 5 hours
- O 6 or more hours

HEALTHY HABITS QUESTIONNAIRE - Child

Instructions: These questions ask about **your** diet and activity history.

1. Yesterday, how many servings of fruit did you eat?

   A serving is equal to:

   1 medium piece of fruit

   ½ cup of fruit salad

   Mark the answer that is true for you.

   - O 0 servings
   - O 1 serving
   - O 2 servings
   - O 3 servings
   - O 4 or more servings

2. Yesterday, how many servings of vegetables did you eat? Do not count potatoes or corn.

   A serving is equal to:

   1 medium carrot or other fresh vegetable

1 small bowl of green salad

½ cup of fresh or cooked vegetables

¾ cup of vegetable soup

Mark the answer that is true for you.

- O 0 servings
- O 1 serving
- O 2 servings
- O 3 servings
- O 4 or more servings

3. Whole grains are things like whole grain bread, whole wheat pasta, brown rice, high fiber cereal, or whole wheat tortillas.

Yesterday, how many servings of whole grains did you eat?

A serving is equal to:

1 piece of whole wheat bread

½ cup rice or pasta

1 whole wheat tortilla

Mark the answer that is true for you.

- O 0 servings
- O 1 serving
- O 2 servings
- O 3 servings
- O 4 or more servings

4. "White fluffies" are grains with low fiber content like white bread, white rice, and regular tortillas.

   Yesterday, how many servings of "white fluffies" did you eat?

   A serving is equal to:

   1 piece of white bread

   ½ cup rice or pasta

   1 tortilla

   Mark the answer that is true for you.

   - O 0 servings
   - O 1 serving
   - O 2 servings
   - O 3 servings
   - O 4 or more servings

5. Sweet drinks include fruit juices like orange juice (either whole juice or from concentrate), fruit drinks, punches, lemonade, sweet tea, regular soda (not diet), sports drinks (like Gatorade), and energy drinks (like Propell or vitamin water).

   Yesterday, how many servings of sweet drinks did you have?

   A serving is equal to:

   1 can of soda (not diet) or juice

   1 juice box

   * a bottle of soda or sports drink is 2 servings

   Mark the answer that is true for you.

   - O 0 servings
   - O 1 serving
   - O 2 servings
   - O 3 servings
   - O 4 or more servings

6. In the past 7 days, on how many days did you eat dinner at home with your family (when at least one parent or guardian was present)?

   Mark the answer that is true for you.

- O 0 days
- O 1 day
- O 2 days
- O 3 days
- O 4 days
- O 5 days
- O 6 or more days

7. In the past 7 days, on how many days did you eat breakfast?

Mark the answer that is true for you.

- O 0 days
- O 1 day
- O 2 days
- O 3 days
- O 4 days
- O 5 days
- O 6 or more days

8. In the past 7 days, on how many days did you eat fast food (like McDonald's, Taco Bell or Pizza Hut)?

Mark the answer that is true for you.

- O 0 days
- O 1 day
- O 2 days
- O 3 days
- O 4 days
- O 5 days
- O 6 or more days

9. Physical activity is any activity that makes you sweat or breathe hard. It can be done in sports, playing with friends, or walking to school. Some examples are running, brisk walking, jumping rope, biking, skateboarding, dancing, swimming, soccer, basketball, and football.

   a. Yesterday, how many minutes did you spend doing physical activity?

   Mark the answer that is true for your child.

   - O 0-15 minutes
   - O 15-30 minutes
   - O 30-45 minutes
   - O 45-60 minutes
   - O 60 minutes or more

b. In the past 7 days, on how many days did you do physical activity that made you sweat or breathe hard?

Mark the answer that is true for you.

- O 0 days
- O 1 day
- O 2 days
- O 3 days
- O 4 days
- O 5 days
- O 6 or more days

10. On the last day you had school, how many hours did you spend watching TV, playing video games, or using the computer (outside of school)?

Mark the answer that is true for you.

- O 0 hours
- O 1 hour
- O 2 hours
- O 3 hours
- O 4 hours

- O 5 hours
- O 6 or more hours

11. On your last weekend day, how many hours did you spend watching TV, playing video games, or using the computer?

Mark the answer that is true for you.

- O 0 hours
- O 1 hour
- O 2 hours
- O 3 hours
- O 4 hours
- O 5 hours
- O 6 or more hours