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Psychological Outcomes and Predictors of Initial Weight Loss Outcomes among Severely Obese Adolescents Receiving Laparoscopic Adjustable Gastric Banding

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Abstract

Objective—Elevated rates of psychopathology are noted among severely obese youth presenting for weight loss surgery. The role of mental health providers in this population is not well defined, and the selection of candidates is often the result of clinical judgment alone. The purpose of this study was to comprehensively evaluate psychiatric symptoms among a large sample of adolescents receiving laparoscopic adjustable gastric banding (LAGB) by: (1) examining changes in depressive symptoms and quality of life in the year following surgery, (2) evaluating the interaction between patterns of change in depression, quality of life, and weight post-surgery, and (3) identifying pre-surgical psychological predictors of initial weight change.

Method—Participants were 101 severely obese adolescents aged 14 to 18. Measures of height, weight, depressive symptoms, and quality of life were obtained in the first year following surgery. Changes in the Beck Depression Inventory (BDI), Pediatric Quality of Life Inventory (PedsQL), and body mass index were analyzed using latent growth curve modeling.

Results—Significant changes in total BDI [β_{slope}=−0.885 SE=0.279, p<0.01; $\beta_{quadratic}$=0.054 SE=0.021, p<.001] and PedsQL [β_{slope}=−0.885 SE=0.279, p<0.001] scores were observed following LAGB, and comparable post-operative changes between psychosocial variables and body mass index were also noted [BDI: COV=0.21, SE=0.06, p<0.001; PedsQL: COV=−0.41, SE=0.10, p<0.01]. Two variables (family conflict/loss of control eating) were found to be significant predictors of weight change over the year following surgery (p<0.05).

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Conclusion—Adolescents experienced notable improvements in initial depressive symptoms and quality of life after LAGB, and measures of pre-operative binge eating and family conflict affected post-surgery body mass index among youth.

Overweight and obesity among children and adolescents in the United States have reached epidemic proportions. With available studies suggesting limited efficacy of behavioral treatments for severely obese adolescents[1-3] and mounting evidence that bariatric surgery is safe and effective among younger populations (e.g., 1); surgical interventions have become a reasonable option. Best practice guidelines have recommended the inclusion of a mental health professional on multidisciplinary teams evaluating adolescents prior to bariatric surgery[4,5] due to elevated rates of depression, anxiety, eating pathology, stigmatization, and social isolation[6-10]. However, the role of mental health providers is not well defined, and the selection of adolescent surgical candidates is often the result of clinical judgment alone, as few empirical data are currently available to evaluate post-surgery psychosocial functioning or the relationship between pre-operative psychiatric symptoms and weight outcomes among youth.

Initial reports have identified significant decreases in depressive symptoms and improved quality of life for younger patients one or two years post-Roux-en-Y gastric bypass (RYGB)[11,12], and significant improvements in post-surgery quality of life have been noted among adolescents two to five years after receiving laparoscopic adjustable gastric banding (LAGB) [1,13,14]. These data suggest psychosocial benefits for adolescents receiving RYGB and LAGB; however, notable differences in weight loss are observed with different procedures (e.g., average body mass index (BMI) change= 24.1 kg/m^2 for RYGB[11] and 12.7 kg/m^2 for LAGB[1]). Further, significant variability occurs within samples of adolescents receiving LAGB (e.g., a range from a gain of 24.2% to a loss of 89.6% of excess weight[15]). Although LAGB is not currently approved for the treatment of individuals under the age of 18, this procedure may be an appropriate choice for adolescents because it is effective, adjustable, reversible, safer than RYGB, and limits risk of vitamin deficiencies post-surgery[1,5]. Substantial growth in the number of adolescents receiving LAGB has occurred in recent years,[16,17] and it is therefore timely to identify predictors of outcomes with this form of bariatric surgery.

Although the observed heterogeneity post-LAGB is likely multi-factorial, psychological factors could contribute to differences in weight losses. Homogeneous subgroups with distinct patterns of psychopathology were found among youth pre-surgery[9], suggesting that variability in psychiatric symptoms could influence weight change following LAGB. The purpose of the current study was to comprehensively examine psychiatric symptoms in a large sample of adolescents in the year following LAGB by evaluating changes in depressive symptoms and quality of life and the interaction between patterns of change in depression, quality of life, and weight. On the basis of extant data[1,11] we hypothesized that adolescents would demonstrate significant initial improvements in depressive symptoms and quality of life, and that adolescents experiencing the most notable changes in weight would experience comparable changes in psychosocial functioning. As to our knowledge there are no studies assessing the impact of pre-operative psychosocial impairments on short-term post-operative weight change in youth post-LAGB, our second aim was to evaluate pre-surgical psychological predictors of weight change during the first year following surgery. We hypothesized that poor pre-operative psychosocial adjustment would negatively impact subsequent weight loss, although inconsistent findings have been observed in research on predictors of weight loss outcomes among adults receiving LAGB, with some studies suggesting a role of psychological factors and others failing to observe a relationship between these variables and outcome[18]18.

METHOD

Participants

Participants included 101 severely obese adolescents receiving LAGB at the Center for Adolescent Bariatric Surgery at the Morgan Stanley Children's Hospital of New York Presbyterian/Columbia University Medical Center (CUMC) between August 2006 and December 2009. This procedure was performed by one surgeon (JZ) under an FDA approved Investigational Device Exemption. The main eligibility criteria included: 1) 14-17 years old at enrollment, 2) BMI > 40 kg/m^2 or > 35 kg/m^2 with serious comorbid conditions (e.g., Type II diabetes, hypertension); 3) history of obesity (≥ five years with failed attempts at weight loss ≥ one year and followed at CUMC ≥ six months); 4) for females, appropriate contraception and no plans to become pregnant over one year post-surgery, 5) absence of medical contraindications for surgery, and 6) no current self-induced vomiting. Adolescents and their parent(s) provided written informed assent and consent, respectively, to receive LAGB. The protocol was approved by the CUMC Institutional Review Board.

Procedures

Pre-Surgery Assessments—Detailed psychometric information about the pre-surgery assessments has been published elsewhere[9]. The Beck Depression Inventory (BDI)[19], Eating Disorders Examination-Questionnaire (EDE-Q)[20] or Questionnaire on Eating and Weight Patterns-Revised[21], Family Environment Scale (FES)[22], Multidimensional Anxiety Scale for Children[23], Pediatric Quality of Life Inventory (PedsQL)[24], and Youth Self-Report[25] were administered to adolescents by bachelor's-level research assistants. Adolescents and parent(s) met with a psychologist or psychiatrist for a clinical interview[26], which assessed demographic characteristics and psychiatric diagnoses. Median household income was obtained from the 2000 US Census Bureau American Factfinder program (http://factfinder.census.gov) using the zip code for the participants' primary home address.

Post-Surgery Assessments—The BDI and PedsQL were collected as part of a prospective research study on psychosocial outcomes at one, three, six, nine, twelve, and fifteen months following LAGB. Higher scores on the BDI indicate greater depressive symptoms while higher scores on the PedsQL designate better quality of life. Routine appointments with or without band adjustments were scheduled to occur at one, two, four, six, and twelve weeks after LAGB and monthly thereafter for the initial 12 months, and at 15 months. Height, weight, and self-report questionnaires were obtained during these visits with surgical staff. Adolescents who completed assessments during routine visits were not provided with monetary compensation. When adolescents failed to attend appointments with surgery staff, questionnaires were sent by mail and if returned, a $25 gift card was provided.

Statistical Analyses

Latent growth curve models—Short-term changes in psychiatric symptoms and weight were analyzed using latent growth curve modeling (LGCM)[27], which is a superior analytic technique for maximizing statistical power and simultaneously modeling both within- and between-subject differences. Several models were tested in Mplus 5.2[28], including (a) change in BMI as a function of pre-operative psychiatric and demographic variables, (b) the post-operative changes in BDI and PedsQL controlling for pre-operative psychological status, (c) and BMI change with parallel growth of BDI and PedsQL. Total scores on the BDI or PedsQL and subscales of the PedsQL (Physical Functioning, Emotional Functioning, Social Functioning, School Functioning) were utilized in the analyses described below.

To maximize available data, pre- and post-surgery BMI, BDI, and PedsQL scores were collapsed into: the visit closest to two weeks pre-surgery, day of surgery (BMI only), and

one, three, six, nine, and twelve months post-surgery. Missing data were modeled using the expectation maximization algorithm and a maximum likelihood estimator, which assumes data were missing at random[29]. Pre-operative covariates hypothesized to relate to either post-operative psychological symptoms or BMI were evaluated in all models using baseline levels of the respective independent variables.

Two separate series of LGCMs were built for post-surgery BDI (total) and PedsQL (total/subscales). Goodness of fit for models assuming linear growth, nonlinear growth (i.e., addition of a quadratic term), piecewise growth, and the combination of nonlinear and piecewise growth were compared. The best fitting model, evaluated by Akaike Information Criteria (AIC), sample-size adjusted Bayesian Information Criteria (aBIC), and Comparative Fit Index (CFI), subsequently examined post-surgery changes in a series of conditional LGCMs. Lower AIC and aBIC indicate better fitting models. Chi-square tests for nested models examined the significance of linear versus nonlinear models and unconditional versus conditional models.

RESULTS

Demographic Characteristics

The sample included 28 males (27.7%) and 73 females (72.3%) with a mean age of 15.8 ±1.1 years. The adolescents were of diverse ethnic and racial backgrounds, with 34.7% classified as Caucasian (n=35), 39.6% classified as Hispanic/Latino (n=40), 20.8% classified as African American (n=214), and 5.0% classified as of another race (n=58). Average median household income by zip code was $47,608 ± $23,592 (range $14,896 to $140,222).

Change in Depressive Symptoms and Quality of Life Pre- and Post-Surgery

A series of LGCMs were fit to examine linear and nonlinear changes in depressive symptoms and quality of life over time, and Table 1 summarizes the goodness of fit statistics. Linear models provided the best fit to all of the PedsQL subscales, with the exception of the Emotional Functioning subscale, where the quadratic model provided a better fit. Improvements in total PedsQL scores were statistically significant [$X^2(4)= 8.83$, $p< 0.05$], and change in PedsQL-Emotional Functioning scores were significant [$\beta_{slope}= 1.09$, $SE= 0.27$, $p< 0.05$], with a gradual deceleration of the linear increase in scores over time[$\beta_{quadratic}= -0.05$, $SE= 0.02$, $p< 0.05$]. Non-significant variance estimates (VAR) for the linear (VAR= 0.39, $SE= 1.11$, $p= 0.73$) and quadratic slopes (VAR= 0.002, $SE= 0.004$, $p= 0.65$) indicated little difference in the rate of change in PedsQL Emotional Functioning over time. Conversely, the significant intercept variance (VAR= 243.03, $SE= 53.32$, $p< 0.001$) suggested substantial differences in baseline levels of PedsQL Emotional Functioning. Improvement in PedsQL Emotional Functioning over time was independent of baseline scores on this subscale, as the covariance between intercept and quadratic slope (COV= 0.06, $SE= 0.73$, $p< 0.97$) and linear slope (COV= −8.63, $SE= 7.58$, $p= 0.25$) were not significant.

A similar pattern was evident for total scores on the BDI, with the linear and quadratic model results summarized in Table 2. A chi square difference test indicated a superior fit of the quadratic model [$X^2(4)= 11.32$, $p< 0.05$], and the significance of the slope and positive quadratic term suggest an improving level of depression that decelerates over the course of follow-up. The variance terms are also comparable, which indicates significant variability in baseline total BDI, but with no evidence of this initial score affecting the magnitude or trajectory of post-operative change.

Model-estimated means and standard errors from the LGCMs for total BDI and PedsQL scores (total and subscales) at two weeks pre-surgery, and one, three, six, nine, and twelve

months post-surgery are presented in Table 3. Figure 1 displays the changes in total scores on the PedsQL and BDI for pre- and post-surgery time points.

Parallel Model Examining Changes in Psychological Symptoms and BMI Post-Surgery

To examine the correspondence between changes in total BDI scores and changes in BMI trajectory, a parallel growth curve model was estimated. Even after controlling for initial BDI and BMI, the latent change in BDI was significantly associated with change in BMI (COV= 0.21, SE= 0.06, $p< .001$). The variance estimates for the quadratic terms were not significant, which signifies that the deceleration in BMI and BDI was comparable across individuals. A similar pattern emerged in the parallel model estimated for change in total Peds-QL scores and BMI post-surgery. When initial levels of both variables were controlled, latent change in Peds-QL was significantly related to change in BMI (COV= −0.41, SE= 0.10, $p< 0.01$). The variance components of both quadratic terms were not significant, which suggested similar decelerations post-surgery. Model estimated means and standard errors for BMI pre- and post-surgery from the parallel LGCM are listed in Table 3.

Psychological Predictors of Post-Operative Change in BMI

To model post-operative change in BMI, linear and non-linear models were fit to the data. Conditional LGCMs examined baseline predictors with linear and nonlinear models fit to post-surgery BMI trajectory. A linear model was inferior (free parameters= 10, AIC= 1947.26, aBIC= 1941.83) to the quadratic model (free parameters= 12, 1942.72, aBIC= 1936.77). The quadratic model indicated a deceleration in BMI over time ($\beta_{slope}= -0.390$, $SE= 0.060$, $p< 0.001$; quadratic term M= 0.009, $SE= 0.004$, $p< .05$). Rate of change in BMI was independent of initial (pre-surgery) BMI, as indicated by the failure of the covariance between intercept and slope to reach statistical significance (COV= 0.418, $SE=0.307$, $p= 0.172$). The variance estimates for intercept and slope indicated a significant degree of variability in initial BMI (VAR= 66.99, SE= 9.51, $p< .001$) and linear change (VAR= 0.093, SE= 0.019, $p< 0.001$).

Conditional LGCMs examined baseline predictors of initial and post-surgery BMI, including: gender, age, race/ethnicity, median household income, distance from treatment center, clinically significant symptoms (self-injurious behavior, loss of control over eating, BDI, PedsQL), family factors (involvement with social services, FES), DSM-IV diagnoses, current psychiatric treatment (therapy or medication), and past psychiatric treatment (hospitalization, suicide attempts). Significant predictors of BMI intercept were identified (see Table 4), indicating that male candidates and adolescents who reported involvement with social services in the past, reported loss of control over eating, or lived in zip codes with a lower median family income had significantly higher BMIs at the time of surgery [males: 6.5 kg/m^2; social services: 8.0 kg/m^2; loss of control: 0.29 kg/m^2; median family income: 0.88 kg/m^2].

Separate models were estimated for each cluster of predictors (e.g., demographic variables, etc.), and significant predictors from each cluster were added to a final model of weight change. Table 4 summarizes the results of this final model predicting BMI slope. Only loss of control over eating by EDE-Q (subjective or objective bulimic episodes) and the conflict subscale of the FES were significant predictors of rate of weight change over time. Both measures predicted a reduced rate of change in BMI post-surgery. Baseline Peds-QL subscale scores and total BDI scores were not predictive of initial BMI of rate of BMI change when accounting for demographic characteristics, loss of control over eating, and FES conflict. No predictors were significant in the quadratic term.

DISCUSSION

The results of this study supported our hypothesis that adolescents would experience significant short-term changes in depressive symptoms and quality of life following LAGB. Previous research on adolescents also documented decreases in depressive symptoms in the first year post-RYGB[10,11] and improvements in quality of life for both RYGB and LAGB from one to five years following surgery[1,13,14,30,31]. Our models suggested parallel post-operative changes between psychosocial variables and BMI, which contrasts one previous study examining initial changes in quality of life among a small sample of adolescents receiving RYGB[31]31. It is not possible to determine the direction of the effect noted in these analyses (e.g., whether changes in BMI precede or influence psychosocial changes or the converse); however, bariatric surgery teams may need to devote particular attention to adolescents failing to lose weight following LAGB, as these youth may be at greater risk for continued psychosocial problems. The short-term post-operative psychosocial improvements found in this study and others[1,13,14], in combination with the safety, efficacy, and reversibility of LAGB (e.g., 1), suggest that this bariatric procedure may be appropriate for the treatment of younger patients.

Supporting our second hypothesis, family conflict and loss of control eating were significant predictors of weight change over the year following surgery. For each 1 unit increase in family conflict on the FES (e.g., the amount of openly expressed anger and conflict among family members), adolescents had a higher average BMI of 0.1 kg/m^2 at each of five post-surgery time points. Lower median family income and involvement with social services were also significantly associated with higher BMIs at the time of surgery. These findings suggest that family functioning, socioeconomic status, and involvement with social services may have an important role for both baseline weight and initial post-surgery weight loss among adolescents receiving LAGB. Limited additional data are available to evaluate the importance of family factors for adolescents receiving bariatric surgery, and additional studies are needed to replicate these findings. One study of adolescents undergoing RYGB failed to identify high rates of dysfunction among female caregivers, and did not observe significant changes in the caregiver's psychosocial status or perception of family functioning in the first year following bariatric surgery[32]32. However, the effect of "caseness" for psychological distress among caregivers (12.5%) on subsequent weight outcomes was also not evaluated[32]. As family-based behavioral treatment for overweight and obese children and adolescents is generally beneficial[2,33], the development of pre- or post-operative interventions to improve family conflict should be considered.

Loss of control eating, the only other significant predictor of post-surgery BMI, referred to the consumption of an objectively or subjectively large amount of food while experiencing a sense of loss of control. Adolescents denying a loss of control over eating had a lower BMI (0.6 kg/m^2) at each post-operative time point in comparison to individuals with loss of control. Thus, problems controlling the amount or type of food consumed pre-LAGB led to a decreased rate of weight loss during the year following surgery. As with family functioning, little is known about loss of control over eating among adolescents receiving bariatric surgery. For adults, most studies have observed no relationship between pre-surgery binge eating and weight loss or weight regain[34]; but with few exceptions[35], this research focuses on the predictive power of binge eating episodes where an objectively large amount of food is consumed with a sense of loss of control. Due to anatomical changes in the digestive tract, the definition of post-surgery binge eating often includes the consumption of either an objective or subjective amount of food[34], and broader forms of loss of control eating are associated with less weight loss and greater weight regain following surgery[36]. A recent study of a 4-session cognitive-behavioral intervention for bariatric surgery candidates with broadly defined loss of control eating episodes found that

treatment responders had significantly better post-surgery percent excess weight losses in comparison to patients who continued to binge eat[37].

In general, loss of control over eating is an important clinical characteristic among obese youth[38,39]. Cross-sectional relationships have been observed between broadly defined forms of binge eating and depressive and anxiety symptoms, low self-esteem, and other eating pathology[40-42]. Loss of control eating may also decrease the short-term effectiveness of a family-based behavioral intervention among severely obese children[42]. Thus, programs addressing binge eating should be adapted for younger populations receiving LAGB, similar to the aforementioned intervention developed for adults. Additional data are needed to evaluate whether episodes of loss of control over eating should affect whether an adolescent can be approved to receive LAGB.

There are several important limitations in the design of this study. Data on BMI and psychosocial variables were only available for 15 months post-operatively. Weight regain and an increase in psychological symptoms were identified after the first post-RYGB year[12], and it is therefore possible that different patterns of change or predictors of BMI outcome would have been observed in this study with a longer follow-up. Although this study focused on initial outcomes, the first post-operative year is a clinically relevant period, as the maximum improvement in quality of life for adults occurs in the first years after surgery, with less change thereafter[43]. A control group was not included, which restricts our ability to draw conclusions about the relationships between changes in psychosocial symptoms and surgery among these adolescents. In addition, the primary pre-surgery predictors used in the analyses were patient-reported symptoms, which can be influenced by a response bias related to concerns about approval for surgery; however, adolescents pursuing weight-loss surgery may be less concerned with impression management than adults[44].

This study is a novel examination of initial post-operative psychosocial functioning and predictors of weight loss among adolescents receiving bariatric surgery, and suggests that adolescents demonstrate significant improvements in depressive symptoms and quality of life post-LAGB, and pre-operative binge eating and family conflict affect post-surgery BMI. Given the inconsistent findings in studies of psychosocial predictors of weight loss outcomes for LAGB in adults, and the limited data available for younger populations, replication of these results, especially over a longer follow-up period, is needed. Future research on adolescents should focus on other important post-surgery outcomes, including adherence to post-operative dietary and exercise recommendations and follow-up visits, as these factors may be particularly important among both individuals receiving LAGB[45] and in younger populations[46].

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Clinical Points

- Psychiatric symptoms improve among severely obese adolescents following laparoscopic adjustable gastric banding (LAGB).
- Changes in weight post-surgery and improvement in psychosocial functioning are correlated.
- Mental health professionals should assess loss of control eating and family functioning among adolescents seeking LAGB.

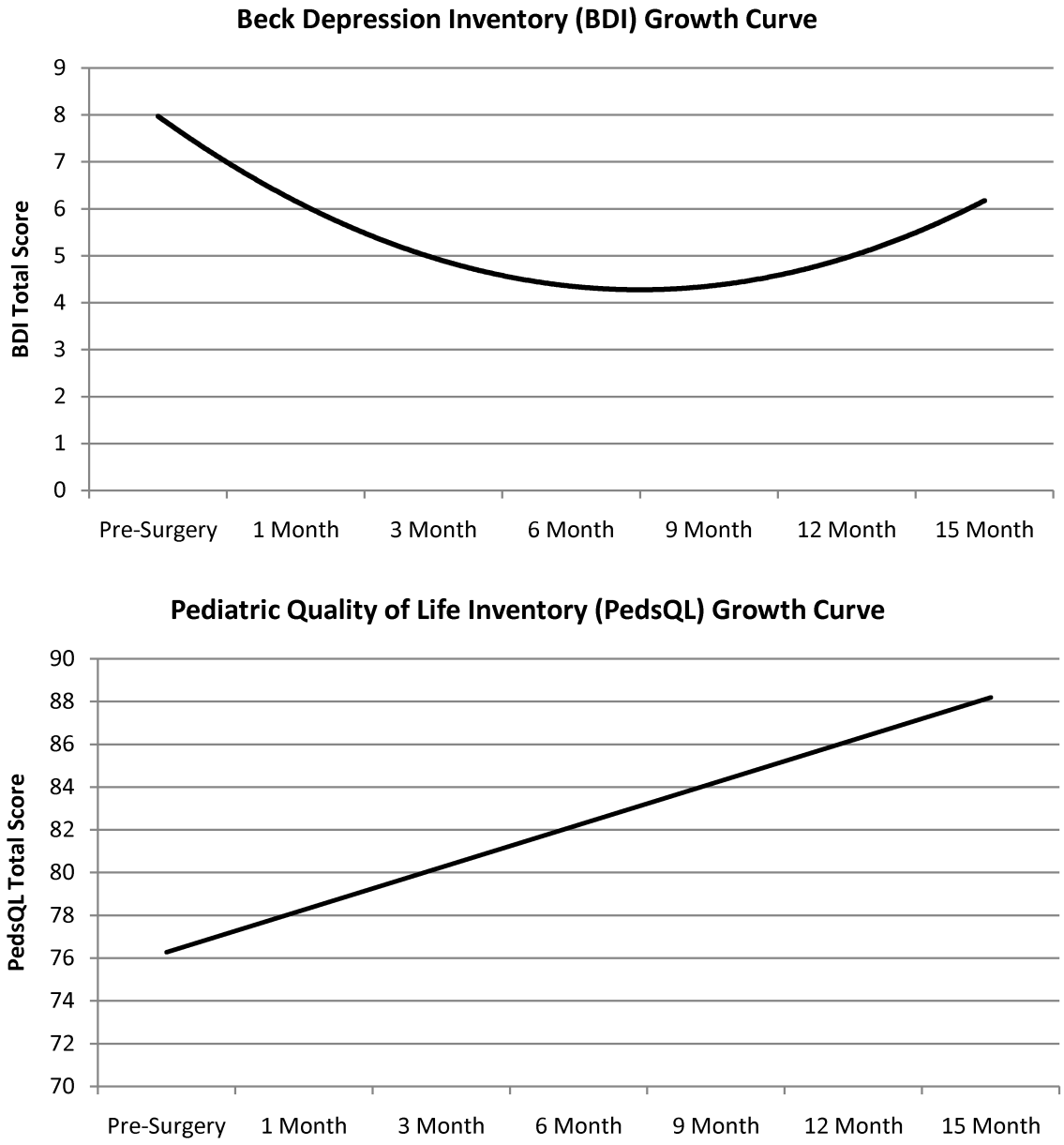

Figure 1. Model Estimated Change in Depressive Symptoms and Quality of Life pre- and Post-Surgery

Table 1
Summary of Goodness of Fit Statistics for BDI and PedsQL Data

	# Parameters	AIC	aBIC
Total BDI Linear	12	2045.763	2039.008
Total BDI Quadratic [a]	**16**	**2042.241**	**2033.234**
Total BDI Piecewise	16	2046.162	2037.155
Total PedsQL Linear	**12**	**2424.952**	**2418.315**
Total PedsQL Quadratic	16	2430.634	2421.784
Total PedsQL Piecewise	16	2433.743	2429.731
PedsQL Physical Functioning Subscale Linear	**12**	**2485.449**	**2478.812**
PedsQL Physical Functioning Quadratic	16	2487.188	2478.339
PedsQL Physical Functioning Piecewise	16	2492.322	2488.309
PedsQL Emotional Functioning Subscale Linear	12	2647.805	2641.168
PedsQL Emotional Functioning Quadratic	**16**	**2642.036**	**2633.187**
PedsQL Emotional Functioning Piecewise	16	2644.032	2636.234
PedsQL School Functioning Subscale Linear	**12**	**2608.935**	**2602.298**
PedsQL School Functioning Quadratic	16	2613.586	2604.737
PedsQL School Functioning Piecewise	16	2615.544	2608.842
PedsQL Social Functioning Subscale Linear	**12**	**2533.690**	**2527.053**
PedsQL Social Functioning Quadratic	16	2540.269	2531.420
PedsQL Social Functioning Piecewise	16	2544.098	2540.790

Abbreviations: AIC= Akaike Information Criteria (AIC); aBIC= sample-size adjusted Bayesian Information Criteria; BDI = Beck Depression Inventory; PedsQL = Pediatric Quality of Life Inventory;

[a] Bold text indicates best fitting model

Table 2
Comparison of Linear and Quadratic Models for BDI scores Post-Surgery

	Linear[a]	Quadratic[a]
Intercept (β)	6.33 (0.964)[b]	7.53 (1.083)[b]
Slope (β)	−0.171 (0.107)	−0.885 (0.279)[b]
Quadratic (β)		0.054 (0.021)[b]
$VAR_{intercept}$	17.61 (7.067)[b]	20.53 (10.027)[c]
VAR_{slope}	0.046 (0.092)	0.202 (1.691)
$VAR_{quadratic}$		0.002 (0.010)
COV (intercept, slope)	−0.770 (0.726)	−1.71 (3.891)
COV (intercept, quadratic)		0.104 (0.334)
COV (slope, quadratic)		−0.021 (0.130)

Abbreviations: VAR= variance; COV= covariance.

[a] Values in parentheses are standard errors.

[b] $p < 0.001$.

[c] $p < 0.05$.

Table 3

Model Estimated Means and Standard Errors for BMI, BDI, and PEDS-QL Scores (n=101)

	Pre-Surgery[a]	Post Surgery[a]				
		Month 1	Month 3	Month 6	Month 9	Month 12
BMI	47.23 (0.88)	46.85 (1.34)	46.09 (1.84)	44.94 (1.23)	43.80 (1.79)	42.57 (1.87)
BDI Total Score	7.53 (1.08)	6.70 (1.21)	5.36 (0.97)	4.18 (1.24)	3.97 (0.98)	4.74 (1.11)
PedsQL Total Score	77.22 (3.33)	77.98 (5.84)	79.51 (4.38)	81.79 (3.90)	84.08 (5.45)	86.36 (4.96)
PedsQL Physical Functioning	73.92 (0.99)	74.80 (1.22)	76.67 (2.19)	79.22 (1.83)	81.88 (1.29)	84.53 (1.83)
PedsQL Emotional Functioning	71.22 (2.04)	72.26 (1.00)	74.34 (1.11)	77.46 (0.96)	80.58 (1.76)	83.70 (1.44)
PedsQL Social Functioning	76.02 (0.95)	76.93 (1.22)	78.76 (1.05)	81.49 (1.11)	84.23 (1.77)	86.97 (1.28)
PedsQL School Functioning	70.09 (2.01)	70.74 (1.84)	72.04 (2.11)	74.00 (1.74)	75.96 (1.49)	77.86 (1.44)

Abbreviations: BMI=Body Mass Index; BDI = Beck Depression Inventory.

[a]Values in parentheses are standard errors.

Table 4
Summary of Baseline Predictors of Change in Body Mass Index over Follow-up

	Intercept[a]	Slope[a]
Gender	6.47 (3.09)[b]	0.100 (0.100)
Median Family Income by Zip Code	−0.880 (0.337)[c]	−0.008 (0.012)
Involvement with social services	7.98 (2.30)[d]	−0.087 (0.102)
Loss of control over eating by EDE-Q	0.288 (0.135)[b]	0.480 (0.078)[b]
Initial Total Score on the BDI	0.141 (0.110)	0.001 (0.005)
Conflict subscale of the FES	−1.81 (0.820)	0.211 (0.103)[b]

Abbreviations: EDE-Q = Eating Disorder Examination Questionnaire; FES = Family Environment Scale, BDI = Beck Depression Inventory

[a] Values in parentheses are standard errors.

[b] $p < 0.05$.

[c] $p < 0.01$.

[d] $p < 0.001$