



# Severe Obesity and Comorbid Condition Impact on the Weight-Related Quality of Life of the Adolescent Patient

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**Objectives** To assess links between comorbid health status, severe excess weight, and weight-related quality of life (WRQOL) in adolescents with severe obesity and undergoing weight-loss surgery (WLS) to inform clinical care.

**Study design** Baseline (preoperative) data from Teen Longitudinal Assessment of Bariatric Surgery, a prospective multicenter observational study of 242 adolescents with severe obesity ( $Median_{BMI} = 50.5 \text{ kg/m}^2$ ;  $Mean_{age} = 17.1$ ; 75.6% female; 71.9% white) undergoing WLS, were used to examine the impact of demographics, body mass index (BMI), presence/absence of 16 comorbid conditions, and a cumulative comorbidity load (CLoad) index on WRQOL scores (Impact of Weight on Quality of Life-Kids).

**Results** WRQOL was significantly lower than reference samples of healthy weight, overweight, and obese samples. Of 16 comorbid conditions, the most prevalent were dyslipidemia (74.4%), chronic pain (58.3%), and obstructive sleep apnea (56.6%). Male subjects had a greater CLoad ( $P = .01$ ) and BMI ( $P = .01$ ), yet less impairment in total WRQOL ( $P < .01$ ) than females. CLoad was a significant predictor of male WRQOL. For females, psychosocial (vs physical) comorbidities, BMI, and white race were significant predictors of WRQOL impairment. Less prevalent conditions (eg, stress urinary incontinence) also emerged as contributors to lower WRQOL.

**Conclusions** WRQOL impairment is substantial for adolescents with severe obesity undergoing WLS, with predictors varying by sex. These patient-data highlight targets for education, support, and adjunctive care referrals before WLS. Furthermore, they provide a comprehensive empirical base for understanding heterogeneity in adolescent WRQOL outcomes after WLS, as weight and comorbidity profiles change over time. (*J Pediatr* 2015;166:651-9).

A hallmark of the pediatric obesity epidemic is the increased prevalence and associated health burden of severe obesity (ie, body mass index [BMI]  $\geq 120\%$  of the BMI-for-age 95th percentile).<sup>1</sup> The Teen Longitudinal Assessment of Bariatric Surgery (Teen-LABS) Consortium recently reported that, before weight-loss surgery (WLS), 51% of severely obese adolescent participants concurrently managed 4 or more major medical comorbid conditions (eg, dyslipidemia, obstructive sleep apnea [OSA], hypertension, chronic back pain).<sup>2</sup> The psychosocial health of the adolescent with severe obesity undergoing WLS, however, is of equal concern yet less understood.

Health-related quality of life (HRQOL) is the patient's perspective on how his or her current health status impacts their day-to-day life across multiple domains (eg, physical, social, emotional).<sup>3</sup> HRQOL assessment provides clinicians with information regarding the patient's well-being within the context of their medical status, identifying targets for support, recommendations, and adjunctive care referrals.<sup>4</sup> Serial HRQOL assessment provides critical information on how change in symptoms and/or treatments impact daily functioning. Condition-specific

BED	Binge eating disorder	OSA	Obstructive sleep apnea
BMI	Body mass index	PAIN	Chronic back or joint pain
CKD	Chronic kidney disease	PCOS/MSI	Polycystic ovary syndrome
CLoad	Cumulative comorbidity load		and/or menstrual irregularities
DEP	Depressive symptom	PTC	Pseudotumor cerebri
FLD	Fatty liver disease	SUI	Stress urinary incontinence
GERD	Gastroesophageal reflux disease	Teen-LABS	Teen Longitudinal Assessment of Bariatric Surgery
HRQOL	Health-related quality of life	WLS	Weight-loss surgery
IWQOL-Kids	Impact of Weight on Quality of Life-Kids	WRQOL	Weight-related quality of life
LABS	Longitudinal Assessment of Bariatric Surgery		

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HRQOL measures capture unique aspects of a disease and demonstrate greater sensitivity to change in disease severity<sup>5</sup> (eg, weight-related quality of life [WRQOL]).<sup>6,7</sup> Finally, HRQOL measurement is regarded as a key patient-reported outcome for clinical trials and observational studies (eg, Food and Drug Administration,<sup>8,9</sup> CONSORT<sup>10</sup>) and has been identified as a new topic area for Healthy People 2020.<sup>11</sup>

It is well established that youth who are obese (BMI  $\geq$ 95th percentile) report greater impairment in HRQOL, whether general (ie, Pediatric Quality of Life Inventory<sup>12</sup>) or weight-related, as compared with “healthy youth.”<sup>7,13-17</sup> Furthermore, obese youth are characterized by lower HRQOL than youth with other chronic medical conditions with more immediate morbidity and mortality risk (eg, epilepsy, cystic fibrosis, type 1 diabetes, cancer).<sup>4,18</sup> Initial studies also suggest adolescents with severe obesity report the most severe impairments in HRQOL/WRQOL within the broader pediatric literature to date.<sup>19-21</sup>

It is unclear as to how comorbid conditions, severe excess weight, and WRQOL are linked, and how these difference might vary for males vs females. Previous studies suggest greater HRQOL/WRQOL impairment in obese youth (BMI  $\geq$ 95th percentile) with specific comorbidities (ie, chronic pain,<sup>22</sup> OSA,<sup>13</sup> depressive symptoms [DEPs],<sup>15,16</sup> binge eating disorder [BED]<sup>23</sup>) and for females relative to males.<sup>15</sup> In obese adults, WRQOL impairment is driven by the severity of excess weight (eg, BMI value), or a specific comorbidity (ie, gastroesophageal reflux disease [GERD]) relative to others, but also by the number of comorbidities present.<sup>24-27</sup> Preliminary pediatric evidence from adolescents surveyed at intake in a metabolic syndrome clinic lend additional support.<sup>28</sup> Specifically, when evaluating 4 specific comorbid conditions (triglycerides, systolic or diastolic blood pressure  $>$ 95th percentile, high-density lipoprotein cholesterol:  $<$ 5th percentile, fasting blood glucose:  $>$ 100/mg/dL), adolescents experiencing all 4 vs only 2 or 3 conditions, reported greater WRQOL impairment. This concept of cumulative vs individual comorbidity impact on WRQOL may have heightened implications for adolescent patients undergoing WLS, given the range of obesity-related comorbid conditions present at the time of surgery.<sup>2</sup>

The present study capitalizes on the breadth and scope of the multisite Teen-LABS Consortium to characterize the domains and extent of WRQOL impairment and evaluate how BMI and 16 different obesity-related comorbid conditions, both as a cumulative index and individually, are associated with WRQOL for adolescents with severe obesity before WLS, and whether this varies by sex. On the basis of the aforementioned literature, BMI, race, and 5 individual comorbid conditions (ie, OSA, GERD, BED, DEP, and chronic back or joint pain [PAIN]) as well as a cumulative comorbidity load (CLoad, range 1-16 comorbidities) index were hypothesized to be significantly associated with greater WRQOL impairment. Expanded analyses explored the independent impact of these specific comorbid conditions as well as 10 additional obesity-related comor-

bidities (11 for females) known to be present in this clinical population.

## Methods

Teen-LABS Consortium is a 5-site prospective observational study evaluating safety, efficacy, health, and WRQOL outcomes of WLS for severely obese adolescents<sup>29</sup> and is an ancillary study to the Longitudinal Assessment of Bariatric Surgery (LABS; registered with [ClinicalTrials.gov](https://clinicaltrials.gov): NCT00465829 and NCT00474318). Teen-LABS' rationale, inclusion criterion, and methodology were previously reported.<sup>2,29</sup> Teen-LABS was approved by each institution's Institutional Review Board with study conduct overseen by an independent Data and Safety Monitoring Board. The Teen-LABS Data Coordinating Center managed all deidentified data and conducted statistical analyses.

All adolescents (ages 13-19 years) approved for WLS at Teen-LABS centers and their primary caregivers were approached for study enrollment (February 2007-December 2011). Of the 277 eligible patients, 13 declined and 22 consented but did not undergo surgery by the study-imposed deadline, leaving a final cohort of 242. Participants did not differ from nonparticipants ( $n = 35$ ) in BMI, age, or race/ethnicity but were more likely to be female ( $P = .04$ ). Medical and surgical care was based on patient-care pathways at each institution. No attempts were made to standardize or alter standard care by this observational research protocol.

Teen-LABS modified the standardized methodology of the LABS consortium's LABS2 study<sup>30,31</sup> for this adolescent cohort. Adolescents and caregivers provided written assent/consent. Baseline assessments (eg, anthropometrics, blood and urine sampling, self-report forms) were completed at an in-person visit within 30 days before surgery and administered by Teen-LABS trained personnel. Participants were informed that responses on self-report measures were confidential, although the informed consent/assent form specified that investigators would take steps to address significant distress or risk of serious harm (eg, suicidal ideation). Presence/absence of each comorbid condition was determined by trained Teen-LABS personnel by the use of medical records, physical examination, patient interview, self-report forms, and laboratory values.

WRQOL was assessed via the Impact of Weight on Quality of Life-Kids (IWQOL-Kids),<sup>7</sup> a self-report instrument for youth (11-19 years) with 4 subscales (Physical Comfort, Body Esteem, Social Life, Family Relations) and a summary Total Score. Items begin with the stem “Because of my weight...” to orient a respondent to the condition-specific aspect of each question. Raw scaled scores were transformed to a 0-100 scale with greater scores reflecting better WRQOL (eg, less impairment). Psychometric evaluation of the IWQOL-Kids has demonstrated excellent psychometric properties, including discrimination among weight status groups and being responsive to weight change.<sup>7,32,33</sup> Internal consistencies of IWQOL-Kids Total and scale scores were strong for the current sample (Total Score  $\alpha = 0.92$ ; Physical

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