Published in final edited form as:

Semin Pediatr Surg. 2014 February ; 23(1): 5–10. doi:10.1053/j.sempedsurg.2013.10.020.

Adolescent Bariatric Surgery Program Characteristics: The Teen Longitudinal Assessment of Bariatric Surgery (Teen-LABS) Study Experience

M.P. Michalsky^a, T.H. Inge^b, S. Teich^a, I. Eneli^a, R. Miller^b, M.L. Brandt^c, M. Helmrath^b, C.M. Harmon^d, M.H. Zeller^b, T.M. Jenkins^b, A. Courcoulas^e, and C.R. Buncher^f for the Teen-LABS Consortium

M.P. Michalsky: Marc.Michalsky@nationwidechildrens.org; T.H. Inge: Thomas.Inge@cchmc.org; S. Teich: Steve.Teich@nationwidechildrens.org; I. Eneli: lhuoma.Eneli@nationwidechildrens.org; R. Miller: Rosemary.Miller@cchmc.org; M.L. Brandt: Mary.brandt@bcm.edu; M. Helmrath: Michael.Helmraht@cchmc.org; C.M. Harmon: Mac.Harmon@childrensal.org; M.H. Zeller: Meg.Zeller@cchmc.org; T.M. Jenkins: Todd.Jenkins@cchmc.org; A. Courcoulas: courcoulasap@upmc.edu; C.R. Buncher: ralph.buncher@uc.edu

^aNationwide Children's Hospital, Columbus OH

^bCincinnati Children's Hospital Medical Center, Cincinnati OH

^cTexas Children's Hospital, Baylor College of Medicine, Houston TX

^dUniversity of Alabama at Birmingham, Birmingham AL

^eUniversity of Pittsburgh Medical Center, Pittsburgh PA

^fUniversity of Cincinnati, Cincinnati OH

Abstract

Background—The number of adolescents undergoing weight loss surgery (WLS) has increased in response to the increasing prevalence of severe childhood obesity. Adolescents undergoing WLS require unique support, which may differ from adult programs. The aim of this study was to describe institutional and programmatic characteristics of centers participating in Teen-Longitudinal Assessment of Bariatric Surgery (Teen-LABS), a prospective study investigating safety and efficacy of adolescent WLS.

Methods—Data were obtained from the Teen-LABS database and site survey completed by Teen-LABS investigators. The survey queried (1) institutional characteristics, (2) multidisciplinary team composition, (3) clinical program characteristics, and (4) clinical research infrastructure.

Results—All centers had extensive multidisciplinary involvement in the assessment, preoperative education and post-operative management of adolescents undergoing WLS.

© 2013 Elsevier Inc. All rights reserved.

CONFLICT OF INTEREST:

Thomas H. Inge has received research grant funding from Ethicon Endosurgery

Marc P. Michalsky has received research grant funding from Allergan Medical Corporation and serves as a proctor and speaker for Covidien

Carroll M. Harmon has served on an Advisory Panel for Stryker Corporation.

Anita Courcoulas has received research grants from Allergan, Pfizer, Covidien, EndoGastric Solutions, Nutrisystem and is on the Scientific Advisory Board of Ethicon J & J Healthcare System.

Publisher's Disclaimer: This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Eligibility criteria, pre-operative clinical and diagnostic evaluations were similar between programs. All programs have well developed clinical research infrastructure, use adolescent-specific educational resources, and maintain specialty equipment, including high weight capacity diagnostic imaging equipment.

Conclusions—The composition of clinical team and institutional resources are consistent with current clinical practice guidelines. These characteristics, coupled with dedicated research staff, have facilitated enrollment of 242 participants into Teen-LABS.

Keywords

Adolescent; obesity; bariatric surgery; program; guidelines

INTRODUCTION

The prevalence of childhood obesity in the U.S. has increased exponentially with 4–7% of the pediatric population being affected by severe obesity (i.e. BMI ≥120% of the 95th percentile).[1] In addition, a mounting body of evidence demonstrates a parallel increase in the prevalence of obesity-related comorbid diseases (e.g. type 2 diabetes mellitus, insulin resistance, hypertension, dyslipidemia, obstructive sleep apnea, and fatty liver disease) within the affected population.[2–8] Life-style interventions such as diet, exercise and counseling for the severely obese pediatric patient are generally not effective. [9, 10]. In addition, there is strong evidence linking severe childhood obesity with an increased probability of becoming a severely obese adult.[11] These factors have led to an increase in the consideration of weight loss surgery (WLS) for the treatment of severe adolescent obesity.[12], [13, 14] In support of such measures, recent studies, including peri-operative outcome data from the Teen-Longitudinal Assessment of Bariatric Surgery (Teen-LABS) consortium (NCT00465829), [15] have demonstrated encouraging results related to the short-term safety and longitudinal efficacy of adolescent WLS.[2, 3, 7, 8, 16–18]

While consensus-based “best practice” guidelines have highlighted clinical and programmatic components that distinguish adolescent bariatric care from established adult models, [19–22] specific details about the structure, composition, and function of adolescent bariatric centers is lacking. The goal of this report is to describe institutional and WLS program characteristics of the five centers that are participating in the Teen-LABS study and are routinely engaged in the evaluation and surgical management of severely obese adolescents.

METHODS

The Teen-LABS site investigators completed a 69-item cross sectional survey about their site characteristics and clinical pathways in 2013. Specific questions were divided into four domains: (1) institutional characteristics, (2) multidisciplinary team composition (3) clinical program characteristics and (4) institutional research program characteristics. “Core” members of the multidisciplinary team were defined as individuals who participate in the assessment of all WLS candidates during the preoperative evaluation.

In addition to the site survey, demographic and anthropometric data about the Teen-LABS study population were obtained from the consortium’s data coordinating center. The study methodology used to obtain these data has been previously published. [15]

RESULTS

The majority of Teen-LABS centers (four of the five facilities) are free-standing tertiary care pediatric hospitals in major metropolitan areas with dedicated adolescent-only WLS programs while a single center is an adult tertiary facility with an integrated adolescent WLS program. All centers have equipment, facilities, and furnishings that are designed to withstand the high weights, now more commonly needed for routine medical and surgical care of the U.S. population. The Teen-LABS participants, recruited between 2007 and 2012, are representative of the patients encountered at these adolescent WLS programs (Table 1).

Multidisciplinary Team Composition

All five centers employ a multidisciplinary clinical care model for the assessment and treatment of severely obese adolescents (Table 2). Surgical team member composition was different between the centers. WLS is performed by a team of pediatric surgeons at two programs, a pediatric surgeon and an adult bariatric surgeon at two programs, and an adult bariatric surgeon with a bariatric surgery fellowship trainee at one program. Although all surgeons have extensive experience performing various adolescent bariatric procedures, only one surgeon has completed a minimally invasive surgery (MIS) and/or bariatric surgery fellowship training program. Analysis of non-surgeon “core” team members shows that all programs have a dedicated psychologist, registered dietitian, physical activity specialist, and a bariatric administrative program coordinator. Additional core team members, not present at all sites, include a registered nurse, nurse practitioner and social worker at four centers as well as a physician assistant and gastroenterologist at two centers. Non-surgical physicians serving in the capacity of “medical director” (four of the five centers) have heterogeneous post-graduate training (i.e. pediatric gastroenterology, general pediatrics and adult bariatric medicine). The role of medical director varies among centers, especially in the post-operative phase, with responsibilities ranging from routine longitudinal management (i.e. post-operative follow-up in bariatric clinic) to “as-needed” post-operative management.

Clinical Program – Eligibility Criteria and Surgical Procedures

All Teen-LABS centers receive patient referrals from primary care providers (PCP). While PCP referrals are considered mandatory to initiate the bariatric evaluation process at two of the five centers, the remaining three WLS programs allow initial entry by self-referral with the expectation that a PCP is identified in order to provide optimal clinical care both before and after WLS.

Age-related surgical eligibility criteria vary among the centers. As shown in Table 3, the majority limit the initiation of adolescent bariatric surgical care to patients within the second decade of life (upper age limit range 18 to 19 years) while two centers allow for upper age limits that exceed late adolescence (i.e. 25 and 30 years respectively). The “extended” upper age limit, resulting in the treatment of young adults, is only considered where individual surgical candidates have pre-existing pediatric disorders and/or conditions that require continued care within a pediatric healthcare system. All centers use assessment of physiological status (including Tanner staging) and emotional maturity as eligibility criteria for consideration of WLS. In addition, two of the five centers also have a defined lower age limit (age 13 and 14 years). Surgical eligibility criteria are based on BMI in combination with obesity-related comorbid disease assessment which largely mirrors the accepted “adult” eligibility criteria based on the 1991 National Institutes of Health consensus conference with exception of patient management in the absence of comorbid disease. Specifically, consistent with Pratt et al., the majority of centers assume a more “conservative” position, meaning that BMI of 40 kg/m² or greater without obesity-related comorbid disease is not considered an indication for WLS.[21] All five centers perform laparoscopic Roux-en-Y

gastric (RGYB) bypass and vertical sleeve gastrectomy (VSG). In addition, two centers also perform adjustable gastric banding (AGB) procedures, although this has been offered less frequently over time.

Clinical Program – Patient Educational Resources

An adolescent WLS “support group” is routine at all centers, with mandatory attendance required at four of the five centers (Table 4). Two centers conduct regularly scheduled adolescent-specific WLS “information sessions” designed to provide an educational overview for patients and associated family members. Most centers provide printed education materials describing fundamental components of adolescent WLS.

Clinical Program – Selected Pre-operative Requirements

As seen in Table 5, estimation of the “average” time required from initial entry into the bariatric clinic to completion of the evaluation process is approximately 10 months (range 7.5 to 13.5 months) and is at least 6 pre-operative clinic visits in all but one program. Although the overall time frame is fairly similar among the five WLS programs, review of pre-operative programmatic algorithms demonstrate a number of differences.

In addition to variation in the number of scheduled visits with the registered dietitian, designed to assess nutritional intake and set appropriate post-operative goals (range 1 to 8 visits), the number of pre-operative mental health visits varies substantially. Across all five centers, a licensed clinical psychologist conducts a pre-operative psychological evaluation to aid in determining candidacy for WLS program entry and potential adjunctive mental health needs (e.g., on-going therapy, medication, etc.). In three programs, patients typically participate in three additional pre-operative meetings with a mental health provider, either the team psychologist or, at one site, the team licensed social worker. All patients are also evaluated by a certified activity specialist.

Routine pre-operative diagnostic testing and interventions vary by center. None of the centers require weight loss prior to undergoing a bariatric procedure, but two utilize a liquid diet regimen during the immediate pre-operative period with the goal of shrinking the liver and improving visualization in the left upper quadrant at the time of operation. Evaluation of serum vitamin levels and prescription of pre-operative vitamin supplementation differ among centers (Table 5), as do pre-operative cardiac evaluations. ECG is universally employed either alone or in combination with echocardiography (two centers) and/or cardiac magnetic resonance (CMR) (one center). One center also performs gallbladder ultrasound evaluation and two centers obtain upper gastrointestinal contrast imaging prior to WLS.

Clinical Program –Long Term Follow-up

Post-operative follow-up treatment protocols are very similar with multiple planned visits during the first post-operative year (range 4–8 visits). Following the first post-operative year, patients are scheduled to be seen every six months and then annually by the third post-operative year. As patients age into young adulthood and desire to transition their bariatric care to an adult provider or institution, staff at the four pediatric centers coordinate the orderly transfer of care.

Equipment Requirements

Delivery of health care to severely obese adolescents requires appropriate infrastructure to ensure safety, including instruments, equipment, tables/platforms, and bathrooms. As shown in Figure 1, the pediatric patients who presented for clinical evaluation and were enrolled in Teen-LABS were remarkably overweight (Figure 1). High weight capacity operating tables (weight limit range 318 to 455 kg), chairs and examination tables in both the clinic and

inpatient settings, and bariatric inpatient hospital beds are available in all five centers (Table 6). Some or all high weight capacity equipment was not available at the four pediatric institutions initially and was subsequently purchased prior to the initiation of a dedicated adolescent WLS program. Comparison of the weight capacity of diagnostic imaging instruments at the sites is informative (Table 6). Some but not all of the centers have high weight capacity instruments (250–300 kg). Indeed, based on the weights that are seen in the adolescent bariatric referral population, appreciable numbers of individuals may not be accommodated by important diagnostic imaging instruments in many institutions (Figure 2). This is an important consideration for hospitals that are seeing an increasing volume of severely obese patients irrespective of whether bariatric services are being offered.

Clinical Research Programs

All Teen-LABS centers are academic tertiary care facilities with well-developed clinical research infrastructure. For example, the capacity to use dedicated research space for study visits including evening and week-end hours to accommodate participants' busy schedules. In addition, the ability to obtain clinically relevant information as a component of research-related data during a "research visit" (i.e. which precludes insurance charges) is possible at all centers. Finally, the majority of centers maintain an institutional review board (IRB)-approved tissue repository within the dedicated research facility, which is used to store routinely collected bio-specimens (i.e. liver, central and peripheral adipose tissue specimens, urine and blood) for ongoing and future research analyses.

DISCUSSION

Accepted recommendations for evaluation and post-operative management of adolescent WLS patients suggest a multidisciplinary team approach with widely ranging expertise that is both pediatric and family centered. [19, 20, 22–24] There are no data as of yet to allow one to describe the optimal surgical training and bariatric experience for surgeons who offer bariatric services to adolescents. However, as demonstrated in the Teen-LABS sites and by institutions that submit data to various national administrative databases, [13, 25] bariatric surgeons with and without specific pediatric surgical training credentials are caring for the WLS needs of adolescents. Irrespective of the exact training backgrounds of these individuals, excellence in clinical outcomes must be the goal and, therefore, monitoring and analysis of outcomes through data collected for national accreditation programs, institutional quality assurance programs, or through prospective research studies is critical.

Teen-LABS centers use similar age, BMI, and comorbidity-related eligibility criteria for surgery. Since there are no data as of yet to determine which operation(s) are best suited for adolescent patients, some diversity regarding available WLS procedures is expected. Review of peri-operative algorithms demonstrates several center-specific similarities and differences with regards to the use of routine vitamin supplementation, pre-operative radiological imaging (gallbladder and upper gastrointestinal series) and pre-surgical cardiac assessment (ECG, echocardiography and/or CMR). An important issue related to both adult and adolescent WLS is long-term follow-up and management of associated comorbidities of obesity and post-operative complications. Although literature examining optimal strategies designed to improve long-term follow-up among adolescent WLS patients is currently lacking, a recent review of data from the Bariatric Outcomes Longitudinal Database registry (BOLD - NCT01002352) raises significant concerns related to successful long-term monitoring. Of the 692 adolescent WLS subjects eligible for longitudinal analysis at the 12 month time period in the BOLD registry, data on only 37% (n=259) were available in the registry. The remaining 63% were "lost to follow-up". While factors influencing the probability of long-term follow-up are poorly defined and undoubtedly complex, clinicians caring for these patients should recognize this important issue and facilitate chronic

management either through the bariatric center or through partnership with provider(s) at the patient's medical home.

Some of the institutional infrastructure that is important for management of adolescent bariatric candidates is also relevant for the optimal treatment of severely obese adolescents who are not undergoing WLS. Specifically, the presence of high weight capacity furniture (including examination tables and patient seating in both the ambulatory and inpatient setting), operating tables, hospital beds, scales, extra-large blood pressure cuffs, wheel chairs, walkers, and reinforced patient commodes are needed to accommodate for the increased prevalence of obese patient presenting for treatment of general medical and other surgical conditions. A major concern regarding the safe and effective administration of bariatric care within a pediatric facility relates to the crucial role of radiological evaluation in the medically and surgically complex bariatric population. Since bariatric patients often exceed the weight limits of key radiological instruments (e.g., CT scan), institutions treating severely obese patients must take into consideration the weight capacity of all available diagnostic equipment (CT, MRI, fluoroscopy, etc.) and may have to develop "work-around" protocols in the event a patient exceeds specific weight limits.[26] Examples of alternative strategies may include the need to perform upright fluoroscopic examinations in order to avoid fluoroscopic table weight limit restrictions or the use of diagnostic laparoscopy instead of CT to diagnose or exclude anastomotic leak or other intra-abdominal crises. Although acquisition of all high weight capacity imaging devices characterized in this report is not inherently mandatory to provide adolescent bariatric care, institutions performing adolescent WLS should establish clearly defined diagnostic imaging algorithms consistent with the institutional resources available.[19, 25]

CONCLUSION

This report serves to describe the programmatic and institutional characteristics of the five adolescent WLS centers that constitute the Teen-LABS research consortium. In addition to serving as a potential guide for other centers contemplating the initiation of adolescent-specific bariatric services, these data may also help pediatric centers develop strategies to accommodate the increased prevalence of severe obesity within the general pediatric population.

Acknowledgments

The Teen-LABS consortium was funded by cooperative agreements with the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK), through grants: U01DK072493 (CCHMC), UM1DK072493 (CCHMC), and UM1DK095710 (University of Cincinnati). The study was also supported by grants UL1 TR000077-04 (Cincinnati Children's Hospital Medical Center), UL1RR025755 (Nationwide Children's Hospital), M01-RR00188 (Texas Children's Hospital/Baylor College of Medicine), UL1 RR024153 and UL1TR000005 (University of Pittsburgh), UL1 TR000165 (University of Alabama, Birmingham).

References

1. Flegal KM, Wei R, Ogden CL, et al. Characterizing extreme values of body mass index-for-age by using the 2000 Centers for Disease Control and Prevention growth charts. *Am J Clin Nutr.* 2009; 90:1314–1320. [PubMed: 19776142]
2. Treadwell JR, Sun F, Schoelles K. Systematic Review and Meta-Analysis of Bariatric Surgery for Pediatric Obesity. *Ann Surg.* 2008; 248:763–776. [PubMed: 18948803]
3. Teeple EA, Teich S, Schuster DP, et al. Early metabolic improvement following bariatric surgery in morbidly obese adolescents. *Pediatr Blood Cancer.* 2012; 58:112–116. [PubMed: 22021118]
4. Michalsky MP, Raman SV, Teich S, et al. Cardiovascular recovery following bariatric surgery in extremely obese adolescents: preliminary results using Cardiac Magnetic Resonance (CMR) Imaging. *J Pediatr Surg.* 2013; 48:170–177. [PubMed: 23331811]

5. Ippisch HM, Inge TH, Daniels SR, et al. Reversibility of cardiac abnormalities in morbidly obese adolescents. *J Am Coll Cardiol*. 2008; 51:1342–1348. [PubMed: 18387434]
6. Kalra M, Inge T, Garcia V, et al. Obstructive sleep apnea in extremely overweight adolescents undergoing bariatric surgery. *Obesity Res*. 2005; 13:1175–1179.
7. Brandt ML, Harmon CM, Helmrath MA, et al. Morbid obesity in pediatric diabetes mellitus: surgical options and outcomes. *Nat Rev Endocrinol*. 2010; 6:637–645. [PubMed: 20842181]
8. Inge TH, Miyano G, Bean J, et al. Reversal of type 2 diabetes mellitus and improvements in cardiovascular risk factors after surgical weight loss in adolescents. *Pediatrics*. 2009; 123:214–222. [PubMed: 19117885]
9. Danielsson P, Kowalski J, Ekblom O, et al. Response of severely obese children and adolescents to behavioral treatment. *Arch Pediatr Adolesc Med*. 2012; 166:1103–1108. [PubMed: 23108856]
10. Treadwell JR, Sun F, Schoelles K. Systematic review and meta-analysis of bariatric surgery for pediatric obesity. *Ann Surg*. 2008; 248:763–776. [PubMed: 18948803]
11. Freedman DS, Mei Z, Srinivasan SR, et al. Cardiovascular risk factors and excess adiposity among overweight children and adolescents: the Bogalusa Heart Study. *J Pediatr*. 2007; 150:12–17. e12. [PubMed: 17188605]
12. Tsai WS, Inge TH, Burd RS. Bariatric surgery in adolescents: recent national trends in use and in-hospital outcome. *Arch Pediatr Adolesc Med*. 2007; 161:217–221. [PubMed: 17339501]
13. Kelleher DC, Merrill CT, Cottrell LT, et al. Recent National Trends in the Use of Adolescent Inpatient Bariatric Surgery: 2000 Through 2009. *Arch Pediatr Adolesc Med* 1-7. 2012
14. Jen HC, Rickard DG, Shew SB, et al. Trends and outcomes of adolescent bariatric surgery in California, 2005–2007. *Pediatrics*. 2010; 126:e746–753. [PubMed: 20855388]
15. Inge T, Zeller M, Jenkins T. Perioperative Outcome of Adolescents Undergoing Bariatric Surgery: The Teen Longitudinal Assessment of Bariatric Surgery (Teen-LABS) Study. *JAMA Pediatr*. 2013 (In press).
16. Dixon JB, O'Brien PE, Playfair J, et al. Adjustable gastric banding and conventional therapy for type 2 diabetes: a randomized controlled trial. *JAMA*. 2008; 299:316–323. [PubMed: 18212316]
17. Inge TH, Jenkins TM, Zeller M, et al. Baseline BMI is a strong predictor of nadir BMI after adolescent gastric bypass. *J Pediatr*. 2010; 156:103–108. e101. [PubMed: 19775700]
18. Nadler EP, Youn HA, Ren CJ, et al. An update on 73 US obese pediatric patients treated with laparoscopic adjustable gastric banding: comorbidity resolution and compliance data. *J Pediatr Surg*. 2008; 43:141–146. [PubMed: 18206472]
19. Michalsky M, Reichard K, Inge T, et al. ASMBS pediatric committee best practice guidelines. Surgery for obesity and related diseases: official journal of the Am Soc Bariatric Surg. 2012; 8:1–7.
20. Michalsky M, Kramer RE, Fullmer MA, et al. Developing criteria for pediatric/adolescent bariatric surgery programs. *Pediatrics*. 2011; 128 (Suppl 2):S65–70. [PubMed: 21885647]
21. Pratt JS, Lenders CM, Dionne EA, et al. Best practice updates for pediatric/adolescent weight loss surgery. *Obesity (Silver Spring)*. 2009; 17:901–910. [PubMed: 19396070]
22. Apovian CM, Baker C, Ludwig DS, et al. Best practice guidelines in pediatric/adolescent weight loss surgery. *Obesity Res*. 2005; 13:274–282.
23. Inge TH, Krebs NF, Garcia VF, et al. Bariatric surgery for severely overweight adolescents: concerns and recommendations. *Pediatrics*. 2004; 114:217–223. [PubMed: 15231931]
24. Inge TH, Lawson L. Treatment considerations for severe adolescent obesity. Surgery for obesity and related diseases: official journal of the Am Soc Bariatric Surg. 2005; 1:133–139.
25. Messiah SE, Lopez-Mitnik G, Winegar D, et al. Changes in weight and co-morbidities among adolescents undergoing bariatric surgery: 1-year results from the Bariatric Outcomes Longitudinal Database. *Surg Obesity Related Dis*. 2012
26. Inge TH, Donnelly LF, Vierra M, et al. Managing bariatric patients in a children's hospital: radiologic considerations and limitations. *J Pediatr Surg*. 2005; 40:609–617. [PubMed: 15852267]

Figure 1.
Weight (kg) distribution of Teen-LABS participants (N=242)

Figure 2.
Categorical depiction (percentage) of weight (kg) classes observed in Teen-LABS participants (N=242)

Table 1

Age groups enrolled at each site

N (%)	Center 1 (N=94)	Center 2 (N=37)	Center 3 (N=59)	Center 4 (N=18)	Center 5 (N=34)
Age at WLS (years)					
13–15	30 (31.9)	9 (24.3)	16 (27.1)	4 (22.2)	6 (17.7)
16–17	39 (41.5)	12 (32.4)	26 (44.1)	6 (33.3)	8 (23.5)
18–19	25 (26.6)	16 (43.2)	17 (28.8)	8 (44.4)	20 (58.8)

TABLE 2

Multidisciplinary team composition

	Center 1	Center 2	Center 3	Center 4	Center 5
Pediatric Bariatric Surgeon Only	✓	✓			
Adult Bariatric Surgeon Only					✓
Pediatric and Adult Bariatric Surgeon			✓	✓	
Medical Director	✓	✓		✓	✓
Post graduate training	Pediatric Gastroenteritis	Pediatrician		Pediatrician	Bariatric Medicine
Meets regularly with surgeon	✓	✓			
May see post-operative patients	✓	✓			✓
Psychologist	C	CN	C	C	C
Psychiatrist		N	N	N	N
Physician Assistant			N	C	C
Nurse Practitioner	C	C		C	C
Nurse Practitioner is certified bariatric nurse (CBN)	✓	✓			
Registered Nurse		C	C	C	C
Social Worker	C	C	N	C	C
Registered Dietician	C	CN	C	C	C
“Activity” Specialist	✓	✓	✓	✓	✓
Exercise Physiologist or equivalent	N		CN		C
Recreational Therapist			CN		
Physical Therapist		CN		CN	N
Gastroenterologist	C	N	N	C	N
Endocrinologist	N	N	N	N	N
Billing Expert	N	N	CN	N	
Administrative Assistant	C	C	C	C	C
Bariatric Program Coordinator	C	C	C	C	C

TABLE 3

Eligibility criteria and surgical procedures

	Center 1	Center 2	Center 3	Center 4	Center 5
Lower Age Limit (years) for WLS	None	None	14	None	13
Upper Age Limit (years) for WLS	30	25	19	19	18
Perform WLS for BMI 35 with serious comorbidity	✓	✓	✓	✓	✓
Perform WLS for BMI 40 with comorbidity	✓	✓	✓	✓	✓
Perform WLS for BMI 40 with NO comorbidity					✓
Gastric Bypass (RYGB)	✓	✓	✓	✓	✓
Vertical Sleeve Gastrectomy (VSG)	✓	✓	✓	✓	✓
Adjustable Gastric Band (AGB)		✓			✓

TABLE 4

Patient Educational Experience

	Center 1	Center 2	Center 3	Center 4	Center 5
Adolescent-specific WLS support group	✓	✓	✓	✓	✓
Mandatory WLS support group attendance (Pre-op)		✓	✓	✓	✓
WLS support group frequency	Every other month	One per month	One per month	One per month	Every other month
Adolescent-specific WLS information/education session		✓		✓	
WLS Information/education session frequency		Every other month		One per month	One per week
Printed educational material (adolescent WLS) available	✓	✓		✓	✓

TABLE 5

Selected Preoperative Requirements

	Center 1	Center 2	Center 3	Center 4	Center 5
Pre-op weight loss required	No	No	No	No	No
Pre-op liquid diet	✓	✓			
Number of clinical pre-op visits	6	6	6	6	3
Number of mental health visits pre-op	4	4	1	4	1
Number of dietician pre-op visits	6	8	6	6	1
Mandatory Social Service Evaluation	✓	✓	✓	✓	
Radiological Diagnostics		✓	✓		✓
Gallbladder ultrasound			✓		
Upper GI study		✓			✓
Cardiac Clearance	✓	✓	✓	✓	
Electrocardiogram (ECG)	✓	✓	✓	✓	
Echocardiogram	✓	✓			
Cardiac Magnetic Resonance (CMR)		✓			
Serum Vitamin Level (Pre-Op)		✓	✓	✓	
Pre-Op Vitamin Supplementation (routine)	✓	✓		✓	
Average time (months) from 1 st clinic visit to OR	9.5	8.0	7.5	11.0	13.5

TABLE 6

Infrastructure characteristics

	Center 1	Center 2	Center 3	Center 4	Center 5
Free Standing Children's Hospital	✓	✓	✓	✓	
Adult Only Institution					✓
Bariatric furniture in ambulatory waiting rooms, clinic space, etc.	✓	✓	✓	✓	✓
Bariatric furniture in hospital patient rooms	✓	✓	✓	✓	✓
Bariatric operating room block time	✓	✓	✓	✓	✓
Rent bariatric hospital beds	✓	✓	✓		
Own bariatric hospital beds				✓	✓
Weight Limit Operating Room Bed (kg)	455	455	455	318	455
Weight Limit CT scan (kg)	300	272	180	250	159
Weight Limit MRI scan (kg)	250	250	159	250	159
Weight Limit DEXA scan (kg)	159	182	136	159	159
Weight Limit Fluoroscopy Table (kg)	273	273	180	227	182