

# Ongoing Inconsistencies in Weight Loss Reporting Following Bariatric Surgery: a Systematic Review

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## Abstract

Weight loss is the primary outcome following bariatric surgery; however, its documentation within current literature is heterogeneous and poorly defined, limiting meaningful comparison between studies. Randomized controlled trials from 2012 to 2016 were identified using the Medline database through “Gastric bypass OR sleeve gastrectomy AND weight” search terms. A total of 73 studies with 5948 patients were included. Reporting of preoperative weight was done primarily using mean body mass index (BMI) (87.7%) and mean weight (65.8%). Postoperative weight reporting was more variable, with the most frequently reported measure being mean postoperative BMI (71.2%). Overall, nearly one third of all bariatric literature contained discrepancies that precluded meaningful meta-analysis. Reporting of weight loss following bariatric surgery is becoming increasingly diverse for both pre- and post-operative outcomes. Ongoing heterogeneity will continue to act as a barrier to meaningful comparison of bariatric outcomes until standardized reporting practices become adopted.

**Keywords** Obesity · Bariatric surgery · Weight reporting

## Introduction

Obesity is a chronic disease associated with a variety of health complications driven by excess weight gain and metabolic dysfunction [1–3]. Rates of obesity continue to rise, with over 650 million people diagnosed worldwide as of 2016 [3]. Bariatric surgery is currently the most effective treatment for severe obesity due to its proven efficacy for inducing and sustaining long-term weight loss [4, 5]. Accordingly, the number of bariatric surgeries have increased dramatically over the last decade with Roux-en-Y gastric bypass (RYGB) and sleeve gastrectomy (SG) currently the most commonly performed procedures [6–8].

While weight loss is the primary outcome following bariatric surgery, its documentation within current literature is heterogeneous and poorly defined, limiting effective comparison between studies [9–13]. Multiple studies have recently drawn attention to this lack of consistency and have identified a need for unified outcome reporting strategies [11]. Notably, in 2005, the American Society for Metabolic and Bariatric Surgery advocated for standardized weight loss reporting due to the evolving complexity of outcome reporting. In 2009, the UK Health Technology Assessment review further stressed the need to standardize outcome collection following bariatric surgery [10, 11]. However, despite these pleas, the reporting of primary outcomes in bariatric surgery remains as diverse as it was over a decade ago.

The aim of our current study is thus to perform a systematic review of current literature to examine how weight loss following bariatric surgery is reported.

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## Methods

A comprehensive search was performed for articles published between January 1, 2012 and December 31, 2016 on weight loss reporting following bariatric surgery using the Medline

database. Search terms included “Gastric bypass OR sleeve gastrectomy AND weight.” Literature was limited to human studies in the English language. Additional manual searches of reference lists were performed to identify potentially missed articles. Gray literature was also assessed and added no additional titles to the study.

Abstracts and titles were first screened for inclusion by two independent reviewers (AN and MJ). Unrelated papers based on their titles and abstract were not included for full-text evaluation. Abstracts were then further screened based on the following inclusion criteria: (1) adult participants ( $\geq 18$  years old), (2) RYGB or SG procedures, (3) randomized controlled trials (RCTs), (4) weight loss reporting, (5) studies with  $> 5$  subjects, and (6) studies published in the English language. Discrepancies were resolved by consensus or through a third independent reviewer (JD) if required. Exclusion criteria included non-randomized controlled studies as we wanted to assess only the highest quality of evidence for weight loss reporting. Other exclusion criteria included duplicate studies or studies published solely as abstracts.

Pertinent data was collected independently by two reviewers (AN, MJ), and data was cross referenced for accuracy. The primary outcomes of interest included methods of reporting pre- and post-operative weight. Secondary outcomes included study follow-up duration, procedure type, and region of publication. Descriptive categorical data was expressed as percentages, and continuous data was expressed as weighted mean  $\pm$  standard deviation (SD). This was a qualitative descriptive study and a meta-analysis was not performed.

## Results

Preliminary literature search yielded 109 articles after duplicates were removed (Fig. 1). All 109 studies received full-text assessment for eligibility. Of those, 73 randomized controlled studies were included in the final systematic review (Fig. 1).

A total of 73 studies [13–86] with 5948 patients were included for systematic review (Table 3). Studies were conducted worldwide, ranging from Europe (36%), North America (34%), Asia (12%), South America (11%), and the Middle East (7%). Overall, subjects ranged from 18 to 65 years with a weighted mean age of 41.8 years. The majority of patients were female (71.6%) with a mean follow-up of 23.2 months. Of included studies, 31.5% examined SG, 82.2% examined RYGB, and 25% examined both procedures (Table 1).

Data was extracted from a total of 26 journals from a variety of backgrounds (Table 2). Interestingly, studies from the two most cited journals had the least consistent weight loss reporting when assessed for a minimum weight loss reporting parameters: (1) both pre- and post-operative BMI, and either pre- or post-operative weight and (2) both pre- and post-operative weight, and either pre- or post-operative BMI.

From these core variables, all other data could be fully extrapolated.

Reporting of preoperative weight (Fig. 2) was done primarily using mean body mass index (BMI) (87.7%) and mean weight (65.8%). To a lesser extent, studies reported the following: median BMI (9.6%), median weight (8.2%), mean excess weight (5.5%), mean excess BMI (1.4%), lean BMI (1.4%), and median excess body weight (EBW) (1.4%).

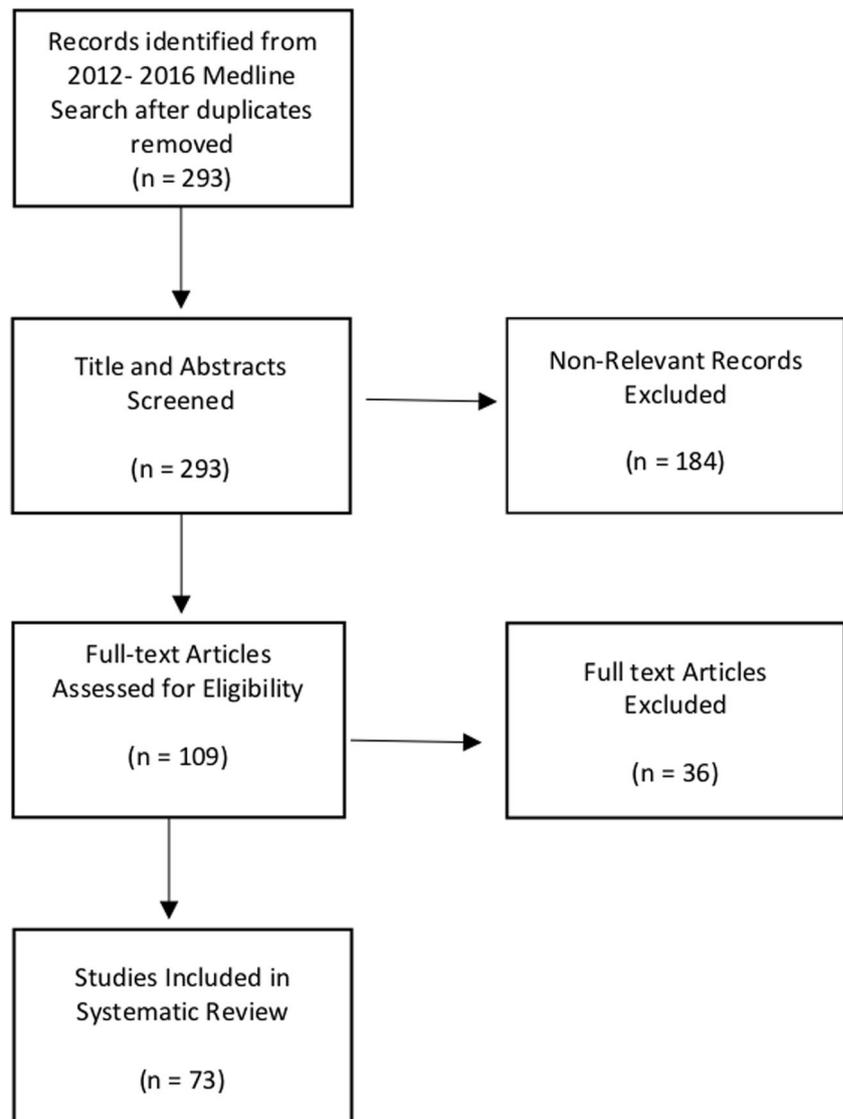
Postoperative weight reporting (Fig. 3) was more variable, with the most frequently reported measure being mean postoperative BMI (71.2%). Other reported measures included mean postoperative weight (32.9%), mean percentage of excess weight loss (%EWL) (30.1%), mean percentage of total weight loss (43.8%), mean weight loss (32.9%), and percentage of excess BMI loss (%EBL) (11%). A minority of studies further reported weight loss using median %EWL (5.5%), median weight loss (2.7%), median BMI loss (2.7%), percentage of BMI change (17.6%), median postoperative weight (1.4%), proportional weight loss percentage (1.4%), and median proportional weight loss (1.4%).

## Discussion

To our best knowledge, this is the first systematic review solely assessing the modern reporting of weight outcomes following bariatric surgery. We identified 73 randomized controlled trials, from 26 journals, with a total of 5948 patients that met inclusion criteria. Results of our systematic review reveal that mean BMI was the most common method of reporting both pre-operative (87.7%) and post-operative (71.2%) weight. More diversity was seen in reporting of postoperative weight than preoperative reporting. Importantly, we found that nearly one third of studies continue to report data in methods prohibiting meta-analysis when assessing for core variables of weight reporting. Despite multiple pleas for uniformity, it is clear that the reporting of weight is becoming increasingly more diverse for both pre- and post-operative variables. This ongoing heterogeneity will continue to act as a barrier to meaningful comparison of bariatric surgery outcomes until adoption of standardized reporting becomes reality.

The CONSORT (Consolidated Standards of Reporting Trials) statement, first published in 1996, is an established reporting guideline developed to improve the quality and transparency of clinical trials [12]. CONSORT provides checklist-based recommendations developed by clinical investigators, journal editors, and methodologists. Part of these requirements include presenting a baseline demographic table identifying clinical characteristics for each study group (item no. 15) along with appropriate and consistent reporting of both primary and secondary outcomes (item no. 17) [12]. The ongoing failure of consistent data reporting, as we describe in

**Fig. 1** PRISMA diagram with search results for systematic review



our study findings, is in effect a violation of the CONSORT criteria and warrants further investigation.

Recent literature has addressed the ongoing diversity of outcome reporting in bariatric surgery [9–11]. Dixon et al. first described the lack of minimal reporting requirements for weight loss in 2005. They performed a systematic review of 65 surgical and 36 non-surgical studies, concluding that a “complexity and confusion in the reporting” of weight outcomes exists. Dixon et al. proposed a minimum reporting of BMI and weight to allow for future meta-analysis of primary outcomes [9]. Similarly, Coulman et al. performed a systematic review assessing standards of reporting with regard to bariatric patient reported outcomes (PROs). Eighty-six studies were included with 68 different PROs evaluated for completion and standardization. Of all PROs, 73% had missing documentation, with only 30% meeting required completion criteria. Coulman concluded that extreme variability in

PROs was associated with significant difficulty in synthesizing results that effectively inform clinical practice [10]. In addition, Hopkins et al. completed a systematic review to optimize the development of primary outcome reporting in bariatric surgery [11]. Ninety studies identified over 1000 outcomes across a variety of reporting themes. Importantly, almost 40% of weight loss outcomes were found to be heterogeneous and non-comparable. Hopkins similarly concluded that inconsistent variable reporting is a barrier to meaningful comparison between published bariatric studies.

Our study is also not the first to set a clinical precedent for emphasis of uniform variable reporting in medical research. In 2015, Brethaeur et al. published an executive review of the American Society for Metabolic and Bariatric Surgery (ASMBS) outcome reporting standards [87]. The ASMBS consensus addressed specific definitions and reporting for the following variables: follow-up, diabetes, hypertension,

**Table 1** Basic demographics of included studies

No. of patients	5948
Age (mean)	41.8
Gender	
Female	71.6%
Male	28.9%
Preoperative BMI range	30–60
Type of procedure	
SG	31.5%
RYGB	82.2%
Duodenal switch with biliopancreatic diversion	10.9%
Adjustable gastric banding	4%
Vertical banded gastroplasty	1.4%
Gastric plication	2.7%
Area of publication	
Europe	36%
North America	34%
South America	11%
Asia	12%
Middle East	7%

dyslipidemia, obstructive sleep apnea, major complications, and quality of life. The goal was to address the lack of standardized reporting of outcomes in bariatric literature. Overall weight reporting recommendations included mandatory reporting of mean initial cohort BMI, difference in BMI, and percent excess weight loss. These variables are limited in their ability to determine height, ideal body weight, and changes in waist circumference. Yet, even with these proposed strict definitions, we continue to observe significant deviation in current literature.

There were several limitations to our systematic review. The search strategy was limited to only a single database search performed over the last 5 years. This allowed for a snapshot of modern weight reporting practices in bariatric literature but limited our ability to describe trends over time. We also chose to include only RCTs in an effort to focus on reporting practices in studies with the highest quality of evidence. It is possible that by excluding cohort or case control studies, we could introduce selection bias and limit a holistic description of reporting practices. Our review also included multiple collaborative international multi-centered trials, mak-

**Table 2** Included journals and completeness of weight reporting

Journal	Number of citations	Completeness of weight reporting (%)
Obesity Surgery	19	47
Surgery for Obesity and Related Disease	13	38
Obesity	6	83
Surgical Endoscopy	3	67
JAMA Surgery	3	33
NEJM	3	100
JAMA	3	100
Diabetes	2	50
Diabetologia	2	100
Annals of Surgery	2	100
International Journal of Obesity	2	50
Journal of Hepatology	1	100
Journal of Clinical Gastroenterology	1	100
Diabetes Care	1	100
American Journal of Kidney Disease	1	100
Diabetes Obesity and Metabolism	1	100
Journal of the Academy of Nutrition and Dietetics	1	100
Lancet	1	100
Reproductive Sciences	1	100
Journal of Clinical Investigation	1	100
Gastroenterology	1	100
BMC Surgery	1	100
British Journal of Surgery	1	100
Diabetes Research and Clinical Practice	1	0
Clinical Journal of Pain	1	0
Metabolic Syndrome and Related Disorders	1	0

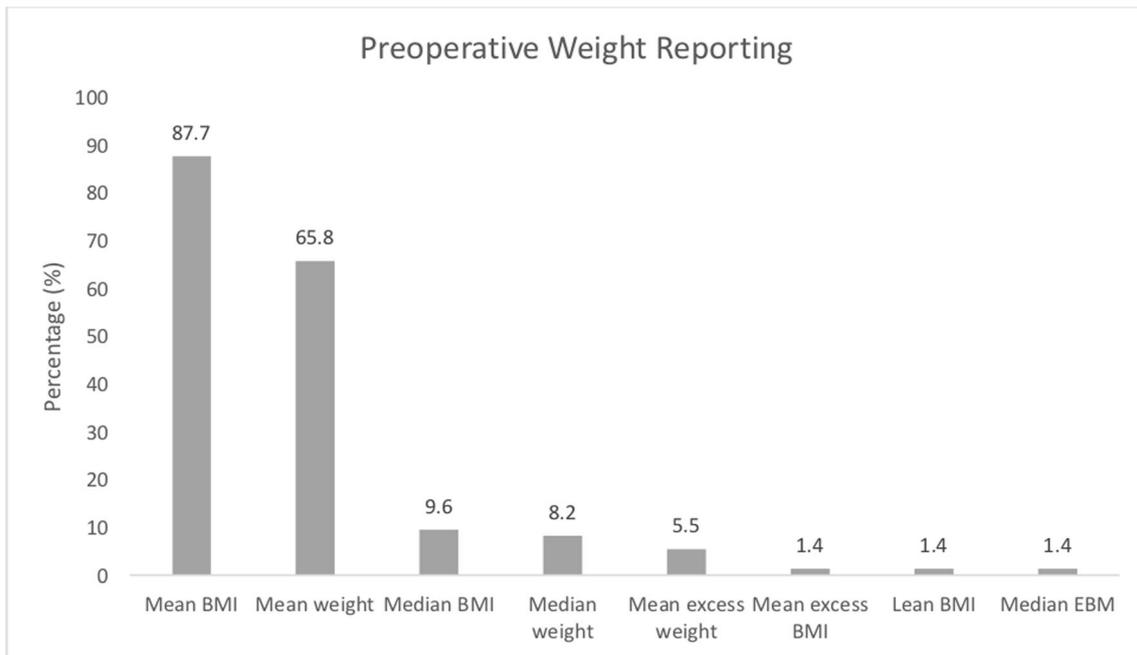


Fig. 2 Preoperative reporting of weight outcomes

ing it not possible to determine the presence of any bias between regional, geographic, academic, and non-academic centers. Lastly, a risk of bias assessment was not performed due to the heterogeneity of data and the descriptive nature of our study.

Despite these limitations, our study is novel in a variety of ways. To date, our review is the single largest comprehensive systematic review specifically addressing deficiencies in bariatric weight loss reporting. We identified discrepancies for primary outcome reporting in nearly one third of all published bariatric literature. Understanding these discrepancies will

allow for the development of future standardized reporting guidelines.

Based on our study’s findings, we propose the following recommendations to address current reporting discrepancies. At a minimum, we suggest mandatory root variable reporting of pre- and post-operative weight, BMI, and waist circumference (Table 3 in Appendix). From these core variables, all other variables of interest such as height, ideal body weight, and excess weight loss may be calculated. In addition to pre-surgical bodyweight performed at the first surgical

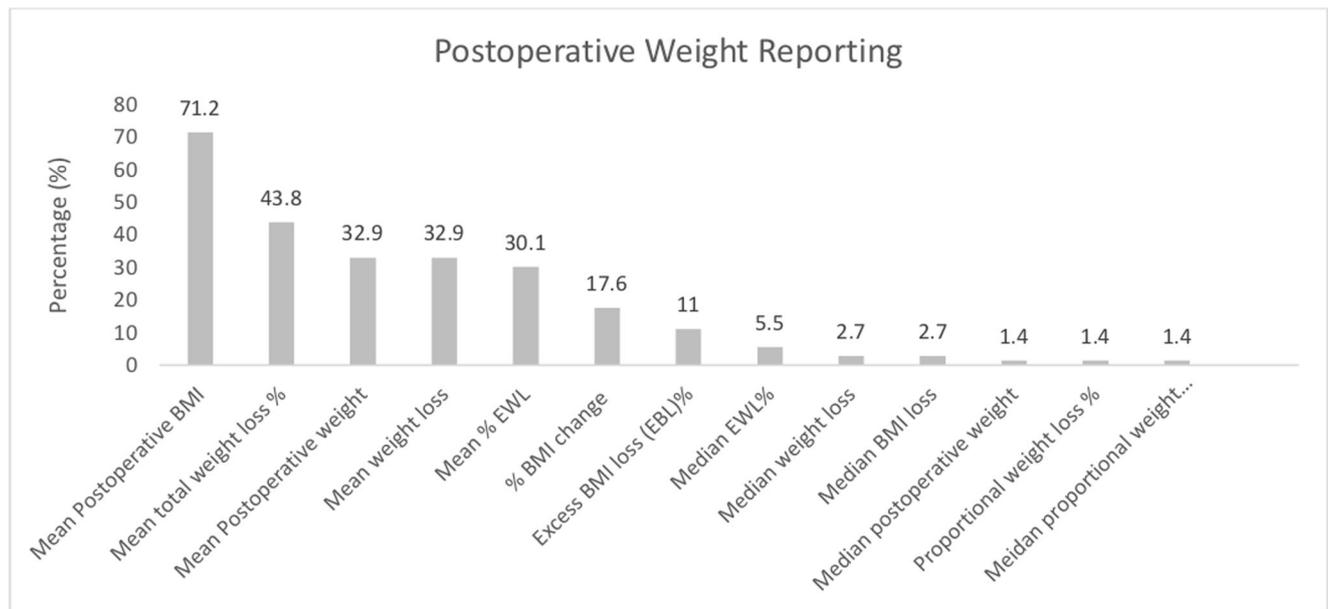


Fig. 3 Postoperative reporting of weight outcomes

appointment, we also suggest reporting of baseline body weight taken at a patient's first bariatric program assessment. This may provide a more robust understanding of post-operative weight loss, particularly when pre-operative pharmacologic weight loss due to novel agents is dramatic. We also propose enforcement of these core variables by medical journals at the time of publication. Until such guidelines are adopted, bariatric surgery will continue to stand alone as arguably the only surgical discipline unable to meaningfully compare its primary outcome.

## Conclusion

Reporting of weight loss following bariatric surgery is becoming increasingly diverse for both pre- and post-operative outcomes. Despite calls for data uniformity, nearly one third of all bariatric literature contained discrepancies that precluded

meaningful meta-analysis. Ongoing heterogeneity will continue to act as a barrier to meaningful comparison of bariatric outcomes until standardized reporting practices become adopted.

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## Compliance with Ethical Standards

**Conflict of Interest** Authors 1, 2, 3, 4, 5, and 6: None to declare.

Author 7 is a consultant and has received educational grants from Ethicon and Covidien, educational grants from Stryker, and teaching honoraria from Cook Surgery and Bard Davol.

Author 8 is a consultant for Gore Medical and Ethicon.

**Ethical Approval and Consent** This article does not contain any studies with human participants or animals performed by any of the authors. For this type of study, formal consent is not required. Informed consent does not apply.

## Appendix

**Table 3** Summary of included studies [15–89]

No.	Title	First author	Year	Country	Weight reporting method
1	Impact of extent of antral resection on surgical outcomes of sleeve gastrectomy for morbid obesity	Emad Abdallah	2014	Egypt	Preop: mean weight, mean BMI, mean excess weight Postop: mean %EWL, mean BMI
2	Stapling versus hand suture for gastroenteric anastomosis in Roux-en-Y gastric bypass	I. Abellán	2015	Spain	Preop: BMI Postop: %EWL
3	Laparoscopic adjustable gastric banding versus Roux-en-Y gastric bypass	Luigi Angrisani	2013	Italy	Preop: mean weight, mean BMI, Postop: mean %EWL, mean BMI
4	Does perioperative nutrition and oral carbohydrate load sustainably preserve muscle mass after bariatric surgery	D.E. Azagury	2015	Switzerland	Preop: mean BMI, lean BMI Postop: mean % weight loss, %EWL, mean BMI
5	Experience of excess skin after gastric bypass or duodenal switch in patients with super obesity	Christina Björserud	2014	Sweden, Norway	Preop: mean BMI, mean weight Postop: mean BMI, mean weight
6	Laparoscopic sleeve gastrectomy with 27 versus 39 Fr bougie calibration	Patricio Cal	2016	Argentina	Preop: BMI Postop: %EWL
7	Lower ghrelin levels and exaggerated postprandial peptide-YY, glucagon-like peptide-1, and insulin responses, after gastric fundus resection, in patients undergoing Roux-en-Y gastric bypass	Aikaterini Chronaiou	2012	Greece	Preop: mean BMI, mean weight Postop: %EWL, mean BMI, mean weight
8	Exercise and weight loss improve muscle mitochondrial respiration, lipid partitioning, and insulin sensitivity after gastric bypass surgery	Paul M. Coen	2015	USA	Preop: mean BMI, mean weight Postop: mean BMI
9	Clinical trial demonstrates exercise following bariatric surgery improves insulin sensitivity	Paul M. Coen	2015	USA	Preop: mean BMI, mean weight Postop: mean BMI
10	Three-year outcomes of bariatric surgery vs lifestyle intervention for type 2 diabetes mellitus treatment	Anita P. Courcoulas	2015	USA	Preop: mean BMI, mean weight Postop: mean BMI, mean weight, mean weight change
11	Surgical vs medical treatments for type 2 diabetes mellitus	Anita P. Courcoulas	2014	USA	Preop: mean BMI, mean weight

**Table 3** (continued)

No.	Title	First author	Year	Country	Weight reporting method
					Postop: mean weight loss, mean % weight loss, mean BMI, mean weight
12	Gastric bypass surgery vs intensive lifestyle and medical intervention for type 2 diabetes	David E. Cummings	2016	USA	Preop: mean BMI, mean weight Postop: mean weight loss, mean % weight loss, mean BMI
13	Laparoscopic gastric plication versus mini-gastric bypass surgery in the treatment of morbid obesity	Sattar Darabi	2013	Iran	Preop: mean BMI, mean weight Postop: mean EWL%, mean BMI
14	Early endocrine and metabolic changes after bariatric surgery in grade III morbidly obese patients	Fernando de Barros	2015	Brazil	Preop: mean BMI, mean weight Postop: mean EWL%
15	Omentectomy added to Roux-en-Y gastric bypass surgery	Troy H. Dillard	2013	USA, Canada	Preop: mean BMI Postop: mean EWL%, mean BMI, % excess BMI loss
16	Sensory impairment in obese patients? Sensitivity and pain detection thresholds for electrical stimulation after surgery-induced weight loss, and comparison with a non-obese population	Pauline Dodet	2013	France	Preop: mean BMI Postop: mean BMI, mean weight loss
17	Hepatic and peripheral insulin sensitivity and diabetes remission at 1 month after Roux-en-Y gastric bypass surgery in patients randomized to omentectomy	Julia P. Dunn	2012	USA	Preop: mean BMI, mean weight Postop: mean BMI, mean weight loss
18	StomaphyX vs a sham procedure for revisional surgery to reduce regained weight in Roux-en-Y gastric bypass patients	George M. Eid	2014	USA	Preop: Postop: %EWL, mean BMI, % excess BMI loss
19	The effect of residual gastric antrum size on the outcome of laparoscopic sleeve gastrectomy	Ahmed ElGeidie	2015	Egypt	Preop: mean BMI, mean weight, median BMI Postop: mean weight loss, %EWL, mean BMI, % excess BMI loss
20	Effects of prebiotic and synbiotic supplementation on inflammatory markers and anthropometric indices after Roux-en-Y gastric bypass	Ricardo Fernandes	2016	Brazil	Preop: mean BMI, mean weight Postop: mean weight loss, mean % weight loss, median weight loss, mean % EWL, mean BMI,
21	Caloric intake capacity as measured by a standard nutrient drink test helps to predict weight loss after bariatric surgery	Beatriz Gras-Miralles	2014	Spain	Preop: median weight, mean BMI, median BMI, median EBW Postop: mean weight loss, mean % weight loss, median weight loss, median %EWL, mean %EWL, median BMI loss, mean BMI, proportional weight loss %, median proportional weight loss
22	Roux-en-Y gastric bypass surgery or lifestyle with intensive medical management in patients with type 2 diabetes	Florencia Halperin	2014	USA	Preop: mean weight, mean BMI Postop: mean% weight loss, mean weight
23	Superior weight loss and lower HbA1c 3 years after duodenal switch compared with Roux-en-Y gastric bypass	Jakob Hedberg	2012	Sweden	Preop: mean BMI Postop: % BMI loss
24	Banded Roux-en-Y gastric bypass for the treatment of morbid obesity	Helen M.Heneghan	2014	USA	Preop: mean BMI Postop: mean % EWL
25	Surgical results of single-incision transumbilical laparoscopic Roux-en-Y gastric bypass	Chih-Kun Huang	2012	Taiwan	Preop: mean weight, mean BMI Postop: mean weight loss, mean %EWL, mean BMI
26	Roux-en-Y gastric bypass vs intensive medical management for the control of type 2 diabetes, hypertension, and hyperlipidemia	Sayed Ikramuddin	2013	USA, Tiwan	Preop: mean weight, mean BMI Postop: mean BMI, % weight change

**Table 3** (continued)

No.	Title	First author	Year	Country	Weight reporting method
27	Effect of bariatric surgery on liver glucose metabolism in morbidly obese diabetic and non-diabetic patients	Heidi Immonen	2014	Finland	Preop: mean weight, mean BMI Postop: mean weight loss, mean BMI
28	Roux-en-Y gastric bypass vs sleeve gastrectomy for obese patients with type 2 diabetes	Andrei Keidar	2013	Israel	Preop: mean weight, mean BMI Postop: mean % weight loss, mean weight, mean BMI
29	Effects of Roux-en-Y gastric bypass or diabetes support and education on insulin sensitivity and insulin secretion in morbidly obese patients with type 2 diabetes	Chin Meng Khoo	2014	USA	Preop: mean weight, mean BMI Postop: mean weight, mean BMI
30	Randomized double-blind placebo-controlled study of leptin administration after gastric bypass	Judith Korner	2013	USA	Preop: mean weight, mean BMI Postop: mean % weight loss, mean weight, mean weight change
31	Improvements in glycemic control after gastric bypass occur despite persistent adipose tissue inflammation	Mario Kratz	2016	USA	Preop: mean BMI Postop: mean % weight loss, mean weight
32	Laparoscopic sleeve gastrectomy versus single anastomosis (mini-) gastric bypass for the treatment of type 2 diabetes mellitus	Wei-Jei Lee	2014	Taiwan	Preop: mean BMI Postop: mean % weight loss, mean BMI
33	Effect of laparoscopic Roux-en-Y gastric bypass surgery on type 2 diabetes mellitus with hypertension	Ziwen Liang	2013	China	Preop: mean BMI Postop: mean BMI, change in BMI
34	Visceral fat resection in humans: effect on insulin sensitivity, beta-cell function, adipokines, and inflammatory markers	Marcelo M. O. Lima	2013	Brazil	Preop: mean weight, mean BMI Postop: mean weight, mean BMI, % weight change, change in BMI
35	Weight loss, adipokines, and quality of life after sleeve gastrectomy in obese patients with stages 3–4 CKD	Helen L. MacLaughlin	2013	UK	Preop: median weight, median BMI Postop: mean weight, mean BMI
36	Two-year outcomes on bone density and fracture incidence in patients with T2DM randomized to bariatric surgery versus intensive medical therapy	Adam H. Maghrabi	2015	USA	Preop: median weight, mean BMI Postop: % weight change
37	Attenuated improvements in adiponectin and fat loss characterize type 2 diabetes non-remission status after bariatric surgery	S. K. Malin	2014	USA	Preop: median BMI, median weight Postop: mean BMI, mean weight change
38	Improved acylated ghrelin suppression at 2 years in obese patients with type 2 diabetes: effects of bariatric surgery vs standard medical therapy	S. K. Malin	2014	USA	Preop: mean weight, mean BMI Postop: weight loss
39	Radical resection of the pyloric antrum and its effect on gastric emptying after sleeve gastrectomy	David Michalsky	2013	Czech Republic	Preop: mean weight, mean BMI, median BMI, median weight Postop: mean % EWL, median % EWL, median BMI loss, mean weight, mean BMI, median weight
40	Bariatric surgery versus conventional medical therapy for type 2 diabetes	Geltrude Mingrone	2012	Italy	Preop: mean weight, mean BMI, mean % EWL Postop: mean BMI, mean weight change, change in BMI
41	Bariatric–metabolic surgery versus conventional medical treatment in obese patients with type 2 diabetes: 5 year follow-up of an open-label, single-centre, randomized controlled trial	Geltrude Mingrone	2015	Italy	Preop: mean weight, mean BMI Postop: mean weight, mean BMI, % weight change, % BMI change
42	Self-reported eating disorder symptoms before and after gastric bypass and duodenal switch for super obesity—a 5-year follow-up study	M. S. Morseth	2016	Norway	Preop: BMI, mean weight Postop: mean BMI
43	Gastric bypass with long alimentary limb or long pancreato-biliary limb—long-term results on weight loss, resolution of co-morbidities and metabolic parameters	Bent Johnny Nergaard	2014	Iceland	Preop: mean weight, mean BMI, median BMI Postop: % excess BMI loss

**Table 3** (continued)

No.	Title	First author	Year	Country	Weight reporting method
44	Preserved insulin secretory capacity and weight loss are the predominant predictors of glycemic control in patients with type 2 diabetes randomized to Roux-en-Y gastric bypass	Kim T. Nguyen	2015	USA	Preop: mean BMI Postop: mean % weight loss, mean weight, mean BMI
45	Comprehensive nutrition and lifestyle education improves weight loss and physical activity in Hispanic Americans following gastric bypass surgery: a randomized controlled trial	Monica Petasne Nijamkin	2012	USA	Preop: mean weight, mean BMI, mean excess weight Postop: mean % weight loss, mean % EWL, mean weight, mean BMI
46	The impact of psychological support on weight loss post weight loss surgery	Jane Ogden	2015	UK	Preop: mean weight, mean BMI, median BMI Postop: mean weight loss, mean weight, mean BMI, change in BMI
47	Early results of the Swiss Multicenter Bypass or Sleeve Study (SM-BOSS): a prospective randomized trial comparing laparoscopic sleeve gastrectomy and Roux-en-Y gastric bypass	Ralph Peterli	2013	Switzerland	Preop: mean weight, mean BMI Postop: mean weight loss, mean weight, mean BMI, % excess BMI loss
48	Metabolic and hormonal changes after laparoscopic Roux-en-Y gastric bypass and sleeve gastrectomy	Ralph Peterli	2012	Switzerland	Preop: mean weight, mean BMI Postop: mean weight, mean BMI, % excess BMI loss
49	Effect of duodenal–jejunal bypass surgery on glycemic control in type 2 diabetes	Tarissa Z. Petry	2015	Brazil	Preop: mean weight, mean BMI Postop: mean % weight loss, mean weight
50	Is laparoscopic duodenojejunal bypass with sleeve an effective alternative to Roux En Y gastric bypass in morbidly obese patients preliminary results	P. Praveen Raj	2012	India	Preop: mean BMI Postop: mean % EWL, mean BMI, EWL change
51	A comparative, prospective and randomized evaluation of Roux-en-Y gastric bypass with and without the silastic ring: a 2-year follow up preliminary report on weight loss and quality of life	I. Rasera Jr.	2016	Brazil	Preop: median BMI, Median weight Postop: median % EWL,
52	Bariatric surgery does not interfere with sperm quality: a preliminary long-term study	Leonardo Oliveira Reis	2012	Brazil	Preop: mean weight, mean BMI Postop: mean BMI
53	Effect of Roux-en-Y gastric bypass with different pouch size in Chinese T2DM patients with BMI 30–35 kg/m <sup>2</sup>	Yixing Ren	2015	China	Preop: mean weight, mean BMI Postop: mean weight loss, mean % EWL, mean weight, change in BMI
54	Five-year outcomes after laparoscopic gastric bypass and laparoscopic duodenal switch in patients with body mass index of 50 to 60	Hilde Risstad	2015	Sweden, Norway	Preop: mean weight, mean BMI Postop: mean weight, mean BMI, % total body weight loss
55	Mesenteric defect closure in laparoscopic Roux-en-Y gastric bypass	Ulysses Rosas	2015	USA	Preop: mean BMI Postop: mean BMI, mean %EWL, change in BMI
56	A pilot study investigating the efficacy of postoperative dietary counseling to improve outcomes after bariatric surgery	David B. Sarwer	2012	USA	Preop: mean weight, mean BMI Postop: mean % weight loss
57	Bariatric surgery versus intensive medical therapy for diabetes—3-year outcomes	Philip R. Schauer	2014	USA	Preop: mean weight, mean BMI Postop: mean % weight loss, mean weight, change in BMI
58	Bariatric surgery versus intensive medical therapy in obese patients with diabetes	Philip R. Schauer	2012	USA	Preop: mean weight, mean BMI Postop: mean % weight loss, mean weight, mean weight loss, median % EWL, mean weight, mean BMI, change in BMI
59	Effects of RYGB on energy expenditure, appetite and glycaemic control: a randomized controlled clinical trial	JB Schmidt	2016	Denmark	Preop: mean weight, mean BMI Postop: mean % weight loss, mean weight, mean BMI

**Table 3** (continued)

No.	Title	First author	Year	Country	Weight reporting method
60	A prospective randomized study comparing patients with morbid obesity submitted to sleeve gastrectomy with or without omentectomy	El. Sdralis	2013	Greece	Preop: mean BMI Postop: mean BMI
61	Randomized double-blinded trial of laparoscopic gastric imbrication v laparoscopic sleeve gastrectomy at a single Indian institution	Sunil Sharma	2015	India	Preop: mean BMI Postop: mean % EWL, mean BMI
62	Long-term results of a prospective comparison of Roux-en-Y gastric bypass versus a variant of biliopancreatic diversion in a non-superobese population (BMI 35–50 kg/m <sup>2</sup> )	George Skroubis	2014	Greece	Preop: mean BMI Postop: mean %EWL, mean BMI
63	Gastrointestinal function and eating behavior after gastric bypass and duodenal switch	Torgeir T. Søvik	2013	Norway, Sweden	Preop: mean BMI Postop: mean % weight loss
64	Endoscopic suturing for transoral outlet reduction increases weight loss after Roux-en-Y gastric bypass surgery	Christopher C. Thompson	2013	USA	Preop: mean weight, mean BMI Postop: mean % weight loss, mean weight loss, mean % EWL
65	Evolution of glycolipid profile after sleeve gastrectomy vs. Roux-en-Y gastric bypass: results of a prospective randomized clinical trial	Michel Vix	2013	France	Preop: mean weight, mean BMI Postop: mean % EWL
66	Impact of Roux-en-Y gastric bypass versus sleeve gastrectomy on vitamin D metabolism: short-term results from a prospective randomized clinical trial	Michel Vix	2014	France	Preop: mean weight, mean BMI Postop: mean % EWL, mean % BMI loss
67	Long-term results of a randomized clinical trial comparing Roux-en-Y gastric bypass with vertical banded gastroplasty	M. Werling	2013	Sweden	Preop: mean weight, mean BMI Postop: mean BMI, change in BMI, % BMI change
68	Dose response of exercise training following Roux-en-Y gastric bypass surgery: a randomized trial	Tracey L. Woodlief	2015	USA	Preop: mean weight, mean BMI Postop: mean % weight loss, mean weight, mean BMI
69	Long-term effects of laparoscopic sleeve gastrectomy versus roux-en-Y gastric bypass for the treatment of Chinese type 2 diabetes mellitus patients with body mass index 28–35 kg/m <sup>2</sup>	Jingge Yang	2015	China	Preop: mean weight, mean BMI Postop: mean % EWL, mean BMI, mean weight change, change in BMI, % total body weight loss
70	Comparison of the effects of Roux-en-Y gastrojejunostomy and LRYGB with small stomach pouch on type 2 diabetes mellitus in patients with BMI <35 kg/m <sup>2</sup>	Bo Yi	2015	China	Preop: mean BMI Postop: mean BMI, change in BMI
71	Impact of botulinum neurotoxin pyloric injection during laparoscopic sleeve gastrectomy on postoperative gastric leak: a clinical randomized study	Tamer Youssef	2016	Egypt	Preop: mean weight, mean BMI, mean excess BMI, mean excess weight Postop: mean %EWL, mean BMI
72	Long-term results of a randomized trial comparing banded versus standard laparoscopic Roux-en-Y gastric bypass	Xeily Zarate	2013	Mexico	Preop: mean weight, mean BMI, mean excess weight, Postop: mean % EWL
73	A randomized clinical trial of laparoscopic Roux-en-Y gastric bypass and sleeve gastrectomy for the treatment of morbid obesity in China: a 5-year outcome	Yong Zhang	2014	China	Preop: mean BMI Postop: mean % EWL, mean BMI

Variable definitions: preop—preoperative weight loss reporting; postop—postoperative weight loss reporting

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