XXVIII IFSO World Congress

9-12 September 2025 | Santiago, Chile

Multimodal Treatment

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Maurizio De Luca Disclosures

Company Name	*Honoraria/ Expenses*	*Consulting/ Advisory Board*	*Funded Research*	*Royalties/ Patent*	*Stock Options*	*Ownership/ Equity Position*	*Employee*	*Other (please specify)*
Novo Nordisk	x	x	x					
Lilly	x	x						
JnJ	x	x						

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Life Expectancy Decreases as BMI Increases[1]

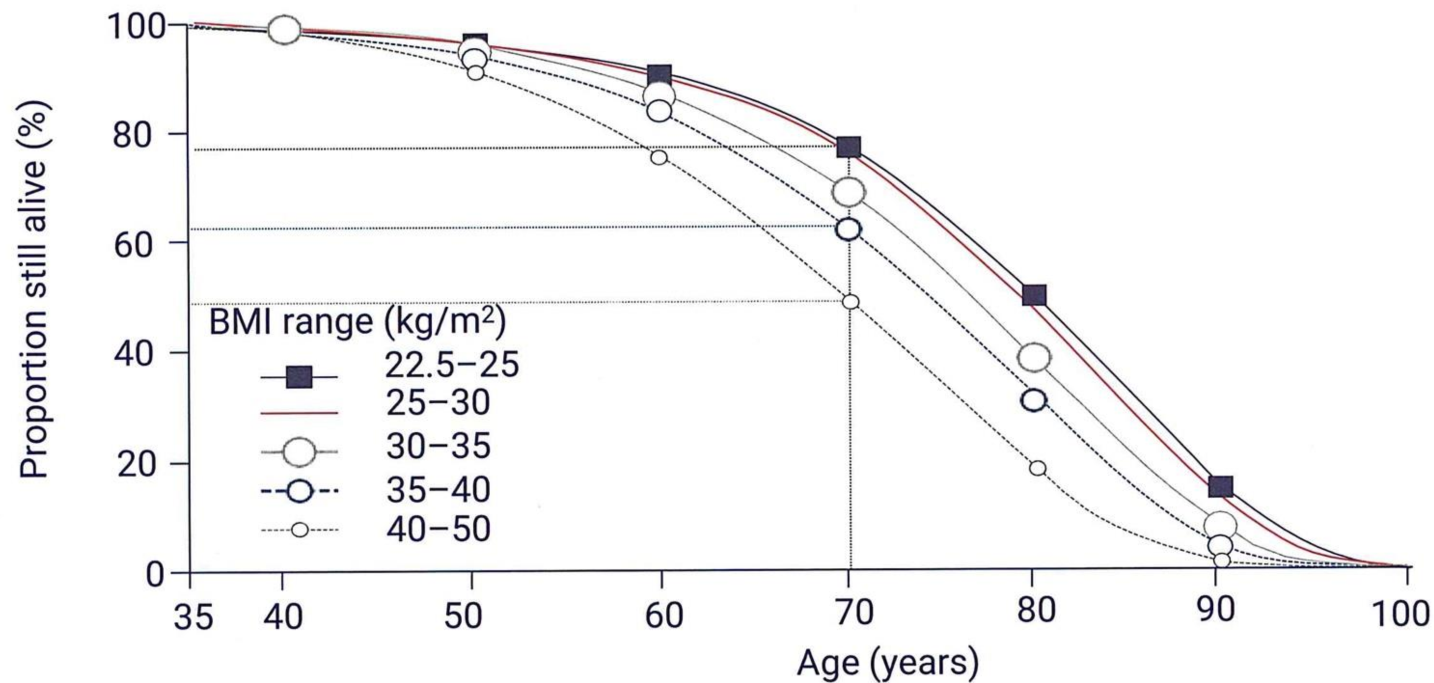

Figure modified from Prospective Studies Collaboration. 2009.[1]

Normal BMI* = almost 80% chance of reaching age 70

BMI 35–40 kg/m² = ~60% chance of reaching age 70

BMI 40–50 kg/m² = ~50% chance of reaching age 70

*Normal BMI was defined as a BMI between 22.5–25 kg/m². Data are based on male subjects; n=541,452.
BMI=body mass index.

1. Prospective Studies Collaboration. Lancet. 2009;373(9669): 1083–1096.

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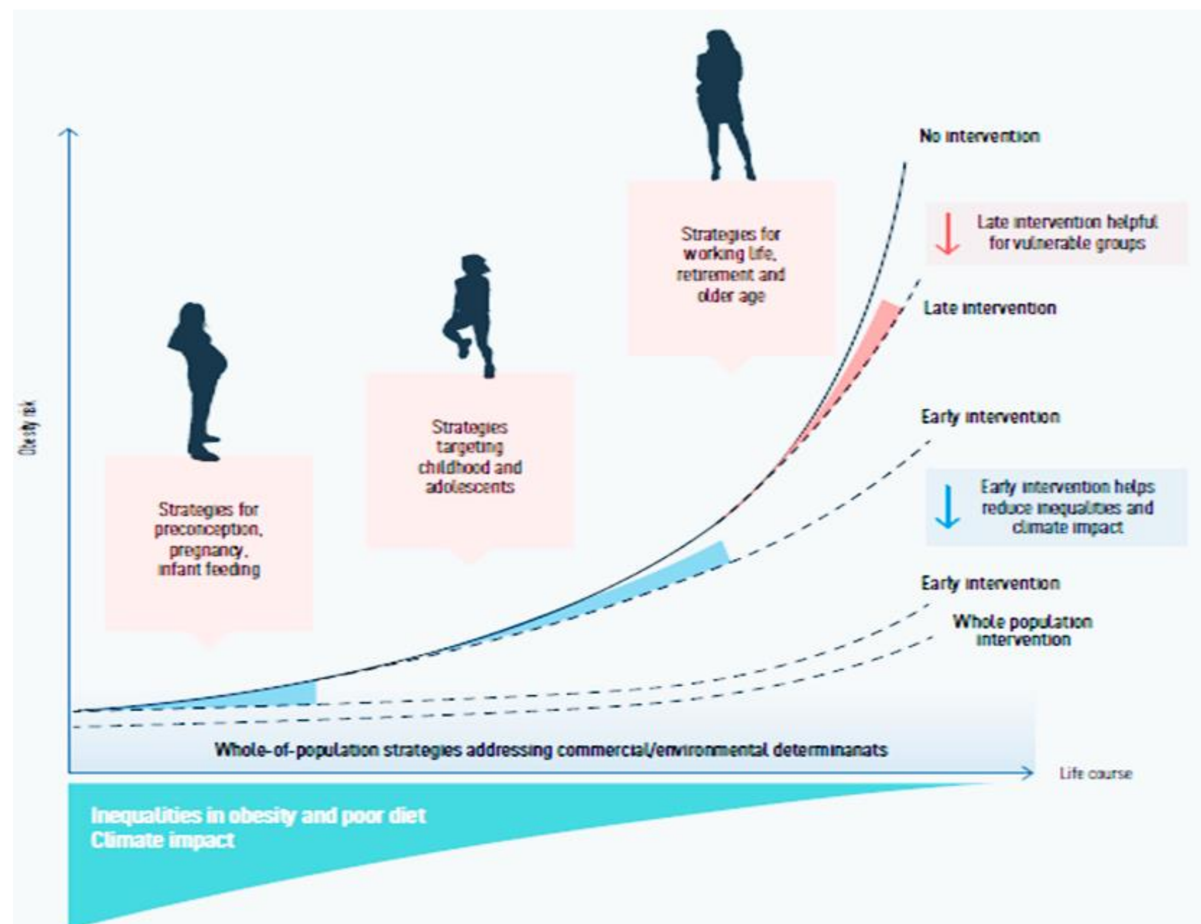
Life course and obesity risk



Godfrey KM, Gluckman PD, Hanson MA. Developmental origins of metabolic disease: life course and intergenerational perspectives. Trends Endocrinol Metab. 2010;21(4):199–205.

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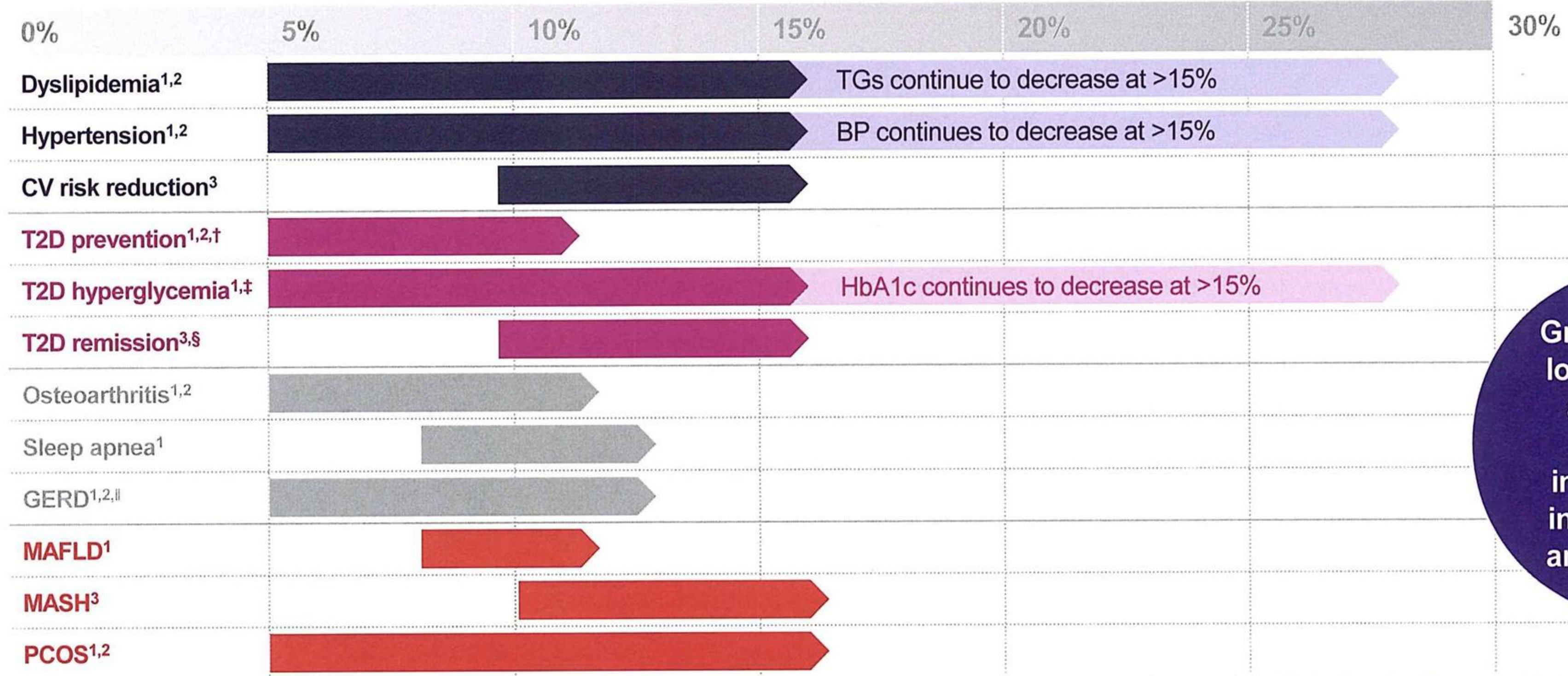
Obesity Is a Chronic Disease That Can Impact Diverse Obesity-Related Complications*

Reversing Obesity May Improve or Prevent Significant Detrimental Effects[1–3]



Greater weight loss has been associated with improvement in risk factors and diseases[2]

*"Obesity-related complications" are used as synonymic to "weight-related complications and/or comorbidities." †Weight loss to prevent progression to overt diabetes in patients with obesity and prediabetes or metabolic syndrome.[1,2] ‡Reductions in fasting glucose and HbA1c.[1] §Achieving HbA1c ≤6.5%.[3] ‖Females 5%–10%; males 10%.[1]

BP=blood pressure; CV=cardiovascular; GERD=gastroesophageal reflux disease; HbA1c=glycated hemoglobin; MAFLD=metabolic dysfunction-associated fatty liver disease; MASH=metabolic dysfunction-associated steatohepatitis; PCOS=polycystic ovarian syndrome; T2D=type 2 diabetes; TGs=triglycerides.

1. Cefalu WT, et al. Diabetes Care. 2015;38(8): 1567–1582. 2. Horn DB, et al. Postgrad Med. 2022;134(4): 359–375. 3. Garvey WT. J Clin Endocrinol Metab. 2022;107(4): e1339–e1347.

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Updating obesity management strategies: an audit of Italian specialists

2022

Luca Busetto[1] · Maria Grazia Carbonelli[2] · Antonio Caretto[3] · Annamaria Colao[4] · Claudio Cricelli[5] · Maurizio De Luca[6] · Francesco Giorgino[7] · Lucio Gnessi[8] · Gerardo Medea[9] · Giovanni Pappagallo[10] · Ferruccio Santini[11] · Paolo Sbraccia[12] · Marco Antonio Zappa[13]

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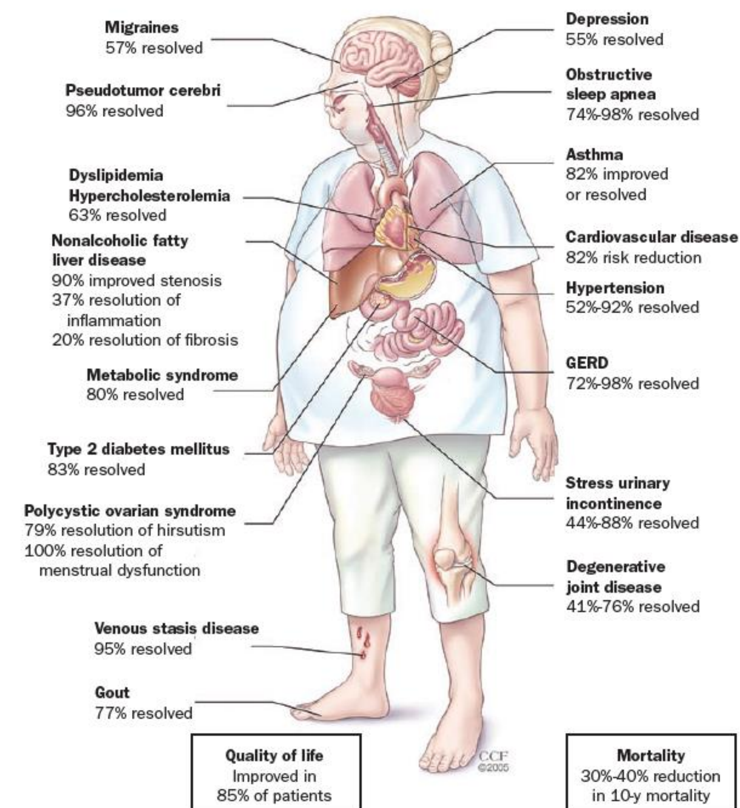
- In clinical practice, it seems **inappropriate to delay an intervention that could avoid progression to a more severe level of obesity** and/or prevent the onset of obesity-related medical conditions.
- Obesity is increasingly being recognized as a **treatable chronic disease**. Although there is increasing interest in **early diagnosis and timely intervention**, several aspects of the current guidelines for clinical management of obesity are not at pace with a more advanced management of this disease.
- Clinicians should shift from **a stepwise approach focused on BMI alone to a more advanced approach in which the intensity of therapeutic intervention** is based on a complete evaluation of the obesity status and **promptly adjusted to the patient's needs and therapeutic targets.**



- Busetto L, Carbonelli MG, Caretto A, Colao A, Cricelli C, De Luca M, Giorgino F, Gnessi L, Medea G, Pappagallo G, Santini F, Sbraccia P, Zappa MA. Updating obesity management strategies: an audit of Italian specialists. Eat Weight Disord. 2022 Oct;27(7):2653-2663.
- Schwartz SS, Kohl BA. Glycemic control and weight reduction without causing hypoglycemia: the case for continued safe aggressive care of patients with type 2 diabetes mellitus and avoidance of therapeutic inertia. Mayo Clin Proc. 2010 Dec;85(12 Suppl):S15-26.

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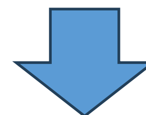
2014

Bariatric, Metabolic, and Diabetes Surgery

What's in a Name?

Francesco Rubino, MD,‡ Alpana Shukla, MD,* Alfons Pomp, MD,† Marlus Moreira, MD,* Soo Min Ahn, MD,* and Gregory Dakin, MD†*

Βάρος (Baròs, from ancient Greek meaning weight)
Bariatric surgery



indicates a **variety of gastrointestinal surgical procedures primarily aimed at inducing durable weight reduction in morbidly obese patients**; in fact, since its outset, it has been synonymous with "weight loss surgery."

- The terms "**metabolic**" and "**diabetes surgery**" indicate a surgical approach whose primary intent is the control of **metabolic alterations/ hyperglycemia** in contrast to "bariatric surgery," conceived as a mere weight-reduction therapy.
- **Offering surgery to treat metabolic disease or diabetes rather than as a mere weight-reduction therapy** changes demographical and clinical characteristics of surgical candidates. This has important and practical ramifications for clinical care and support consideration of metabolic/diabetes surgery as a novel practice distinct from traditional bariatric surgery.

Rubino F, Shukla A, Pomp A, Moreira M, Ahn SM, Dakin G. Bariatric, metabolic, and diabetes surgery: what's in a name? Ann Surg. 2014 Jan;259(1):117-22.

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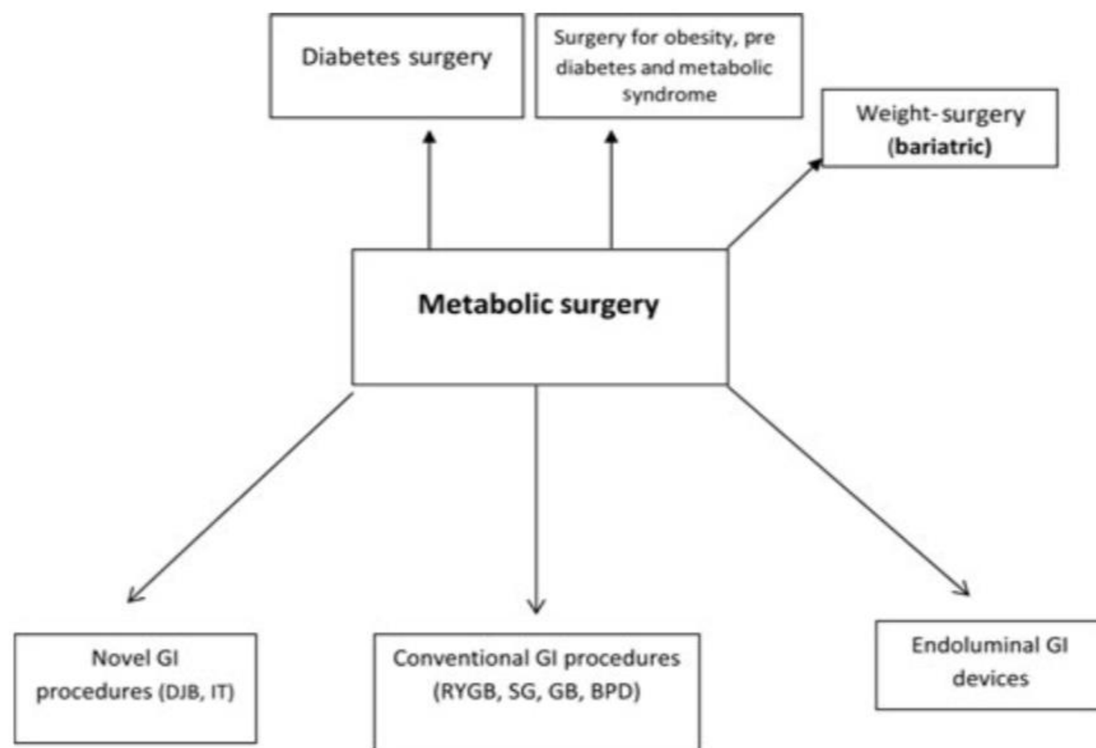

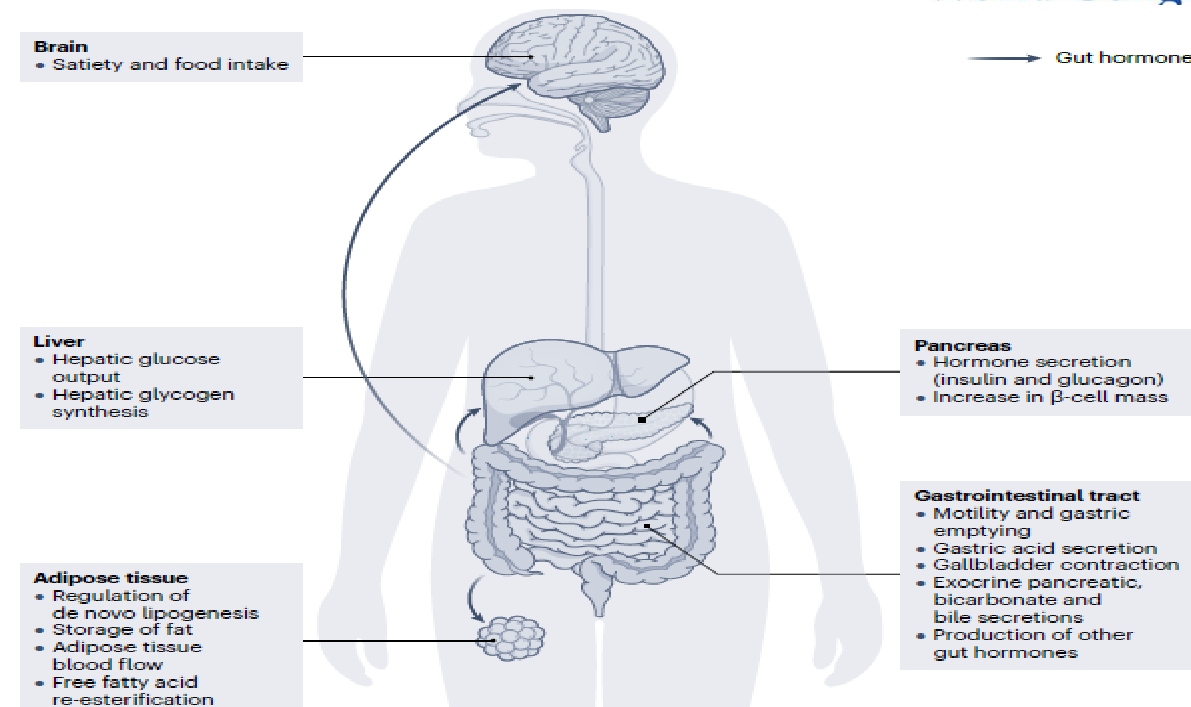

Rubino F, Shukla A, Pomp A, Moreira M, Ahn SM, Dakin G. Bariatric, metabolic, and diabetes surgery: what's in a name? Ann Surg. 2014 Jan;259(1):117-22.

Bany Bakar, R., Reimann, F. & Gribble, F.M. The intestine as an endocrine organ and the role of gut hormones in metabolic regulation. Nat Rev Gastroenterol Hepatol 20, 784–796 (2023).

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Bariatric, Metabolic, and Diabetes Surgery

2014

What's in a Name?

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TABLE 3. Bariatric Versus Metabolic Surgery

Comparative Features	Bariatric Surgery	Metabolic Surgery
Conditions or diseases	Severe obesity	'Metabolic' obesity, T2DM, the metabolic syndrome
Primary aim	Weight reduction	Glycaemic and metabolic control, cardiometabolic risk reduction
Criteria for surgical indication	Weight-centric (BMI)	Waist circumference and BMI; disease-specific parameters*; responsiveness to alternative, conservative treatments; associated conditions that increase CVD risk and are potentially responsive to surgery (hypertension, dyslipidaemia, sleep apnoea etc.)
Procedures	RYGB, sleeve gastrectomy, gastric banding, biliopancreatic diversion, duodenal switch	RYGB, sleeve gastrectomy, gastric banding, biliopancreatic diversion, duodenal switch; investigational surgical procedures (duodenal–jejunal bypass, ileal interposition); device-based interventions‡
Measures of treatment success	Excess weight loss >50%	Glycaemic control, lipid control, weight loss, reduction of CVD risk
Care team composition	Surgeon, nutritionist, psychologist	Surgeon, endocrinologist, cardiologist, obesity physician, diabetes educators, etc.
Putative mechanisms of action	Simple, primarily mechanical§	Complex, neuroendocrine and/or metabolic in nature‖

*HbA_{1c}, C-peptide levels for T2DM, fasting levels of insulin and glucose. ‡Endoluminal liners, electrophysiologic GI devices, etc. §Restriction and/or malabsorption of energy intake. ‖Changes in GI hormones, changes in appetite and/or hunger regulation, changes in GI nutrient sensing, microbiota, bile acids, etc. Abbreviations: CVD, cardiovascular disease; GI, gastrointestinal; RYGB, Roux-en-Y gastric bypass; T2DM, type 2 diabetes mellitus. Reprinted with permission from Rubino and Cummings.[39]

Rubino F, Shukla A, Pomp A, Moreira M, Ahn SM, Dakin G. Bariatric, metabolic, and diabetes surgery: what's in a name? Ann Surg. 2014 Jan;259(1):117-22.

- The realization that **mechanisms and benefits of bariatric surgery extend beyond weight loss** questions the appropriateness of the name and purpose of a surgical practice historically modeled around weight reduction.
- At the ***2007 Rome Diabetes Surgery Summit*,** a group of leading international scholars first recommended consideration of gastrointestinal surgery to intentionally treat type 2 diabetes ("**diabetes surgery**"). After that meeting, the concept of "metabolic surgery" has rapidly emerged to more broadly indicate a surgical approach **aimed at the control of metabolic illnesses, not just excess weight.**

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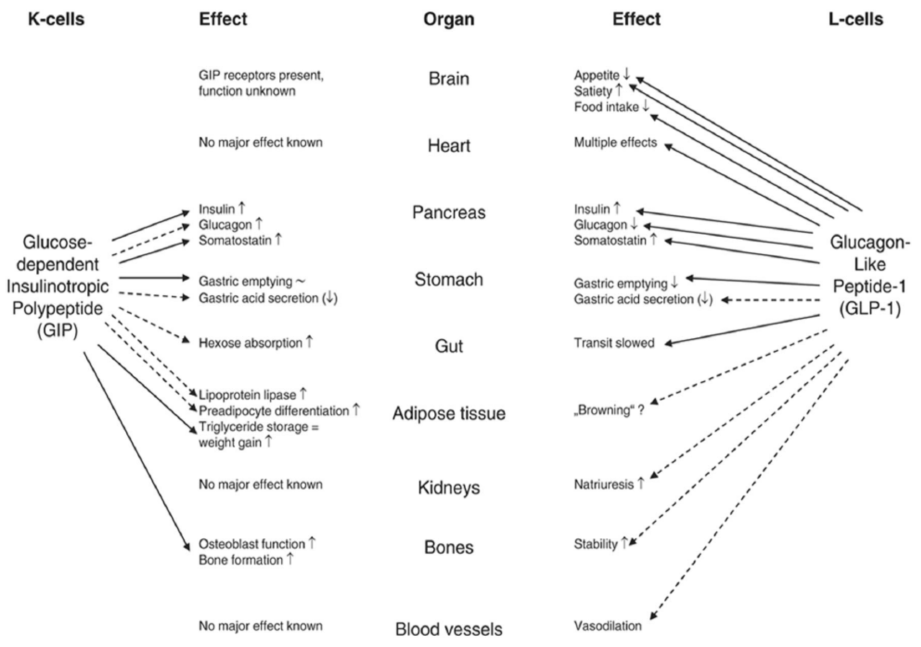

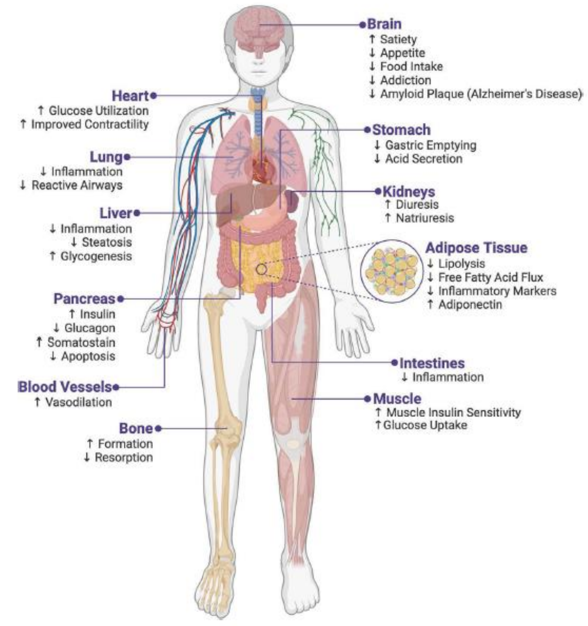

Svetlana Mojsov, Joel Habener, Lotte Bjerre Knudsen and GLP1

Discovery of GLP-1 Based Drugs for the Treatment of Obesity
Drucker D et al, N Engl J Med 392, 6, 2024

Dubin RL, Heymsfield SB, Ravussin E, Greenway FL. Glucagon-like peptide-1 receptor agonist-based agents and weight loss composition: Filling the gaps. Diabetes Obes Metab. 2024 Dec;26(12):5503-5518

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Benefits of bariatric surgery: sustained weight loss over 20 years

Data are mean ±95% confidence interval

SOS study is a nonrandomized, prospective, controlled study
2010 surgical patients, 2037 matched obese controls who received usual care.
Recruitment: September 1987 and January 2001

Sjöström *et al. JAMA* 2012;307:56–65

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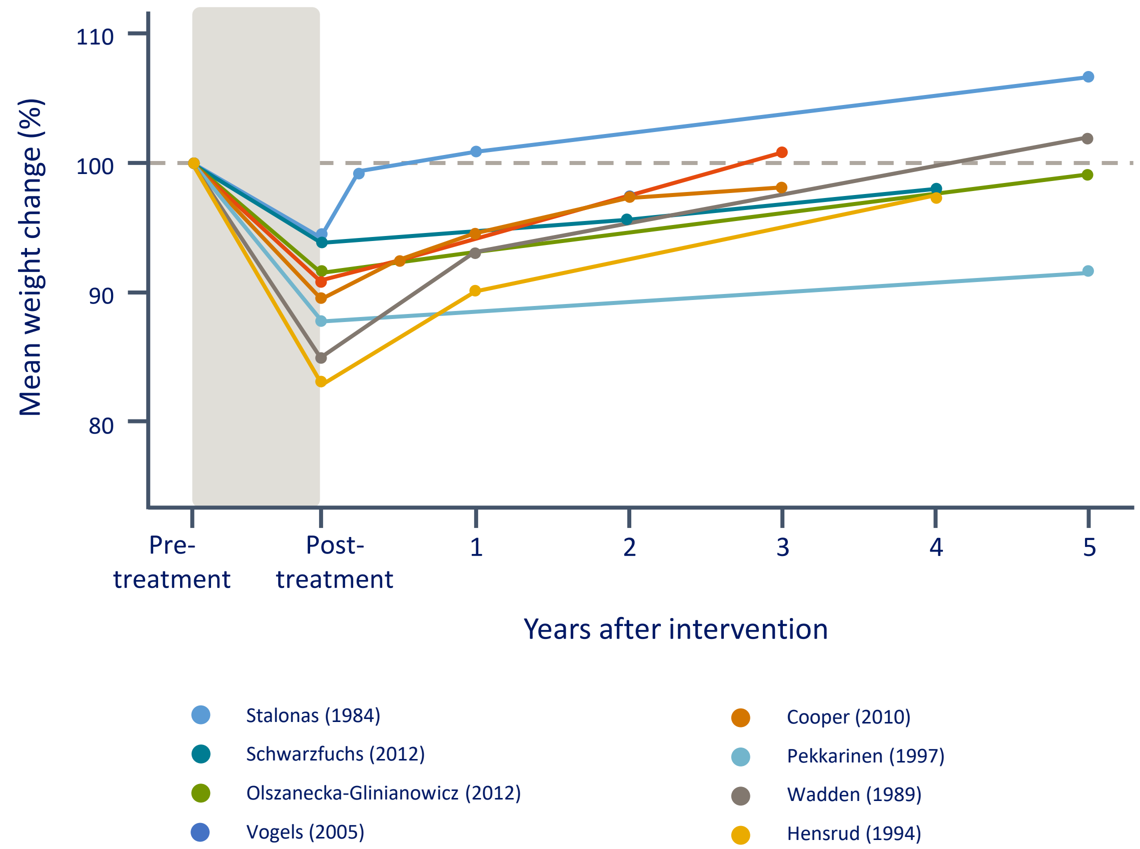
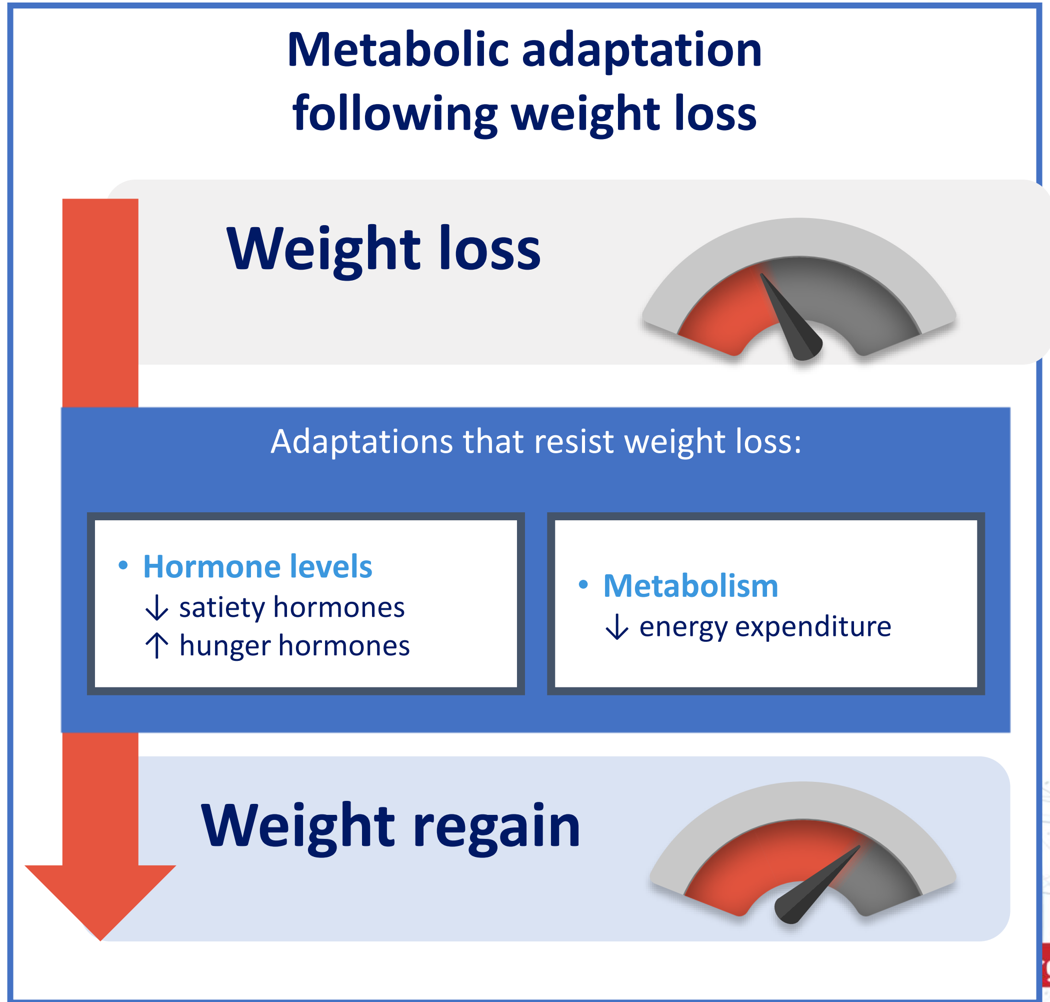
Obesity as a chronic, multifactorial and relapsing disease

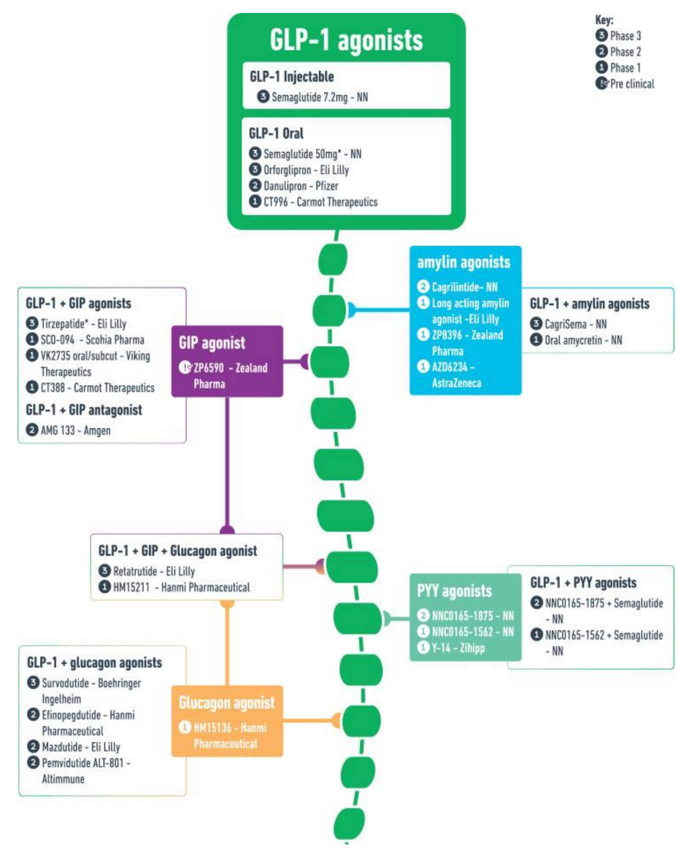
Maintenance of weight loss

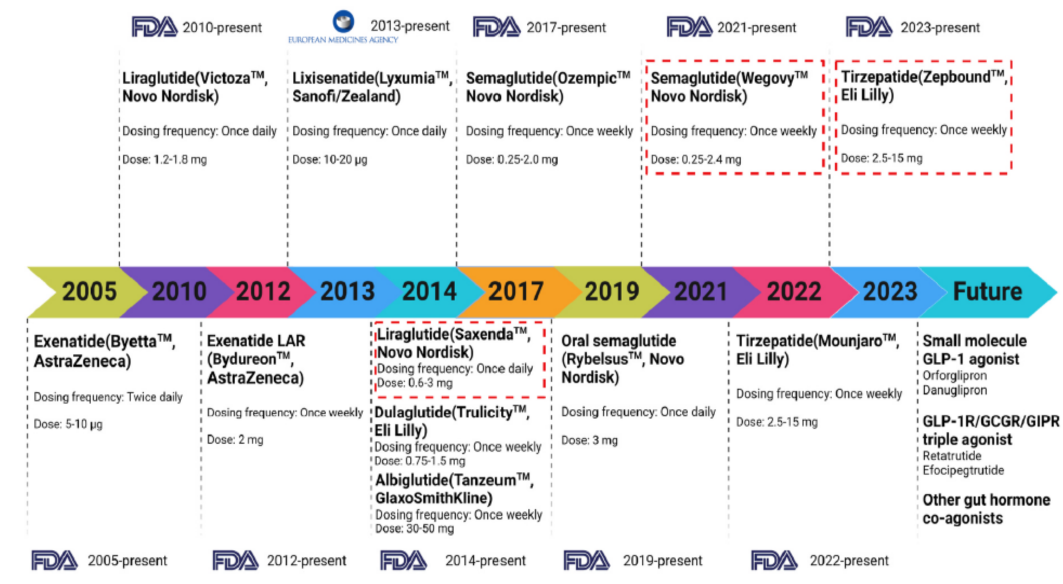


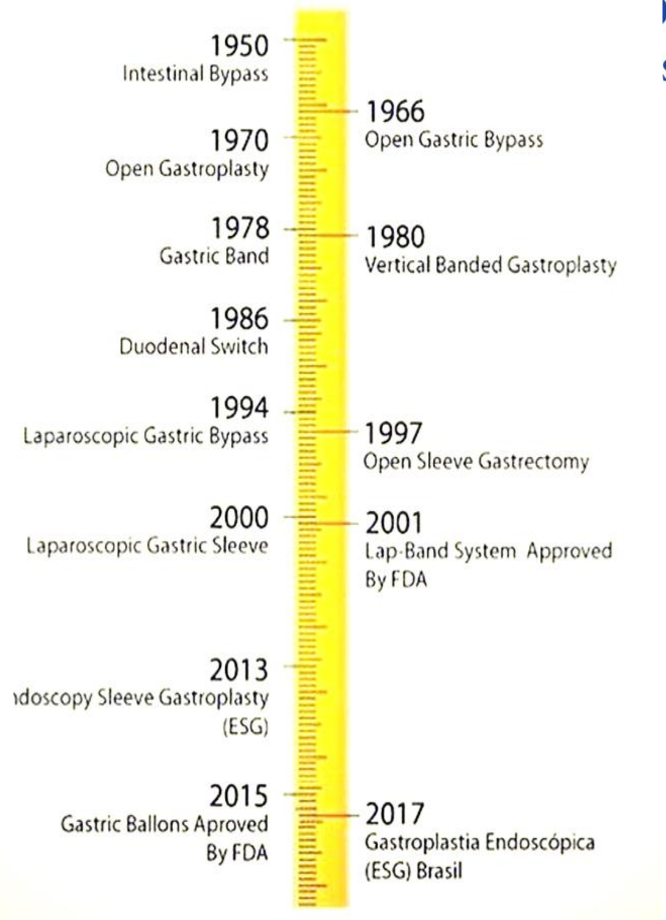
Nordmo et al. Obes Rev 2019. doi: 10.1111/obr.12949. Fothergill E, Guo J, Howard L, et al. Obesity (Silver Spring). 2016;24:1612– 1619; Sumithran P, Prendergast LA, Delbridge E, et al. N Engl J Med. 2011;365:1597–1604



Different timelines of OMM and MBS procedures and FDA







- OAGB 2023
- Transit Bipartition (first described by Santoro in 2001)

Melson E, Ashraf U, Papamargaritis D, Davies MJ. What is the pipeline for future medications for obesity? Int J Obes (Lond). 2025 Mar;49(3):433-451.
Gong B, Yao Z, Zhou C, Wang W, Sun L, Han J. Glucagon-like peptide-1 analogs: Miracle drugs are blooming? Eur J Med Chem. 2024 Apr 5;269:116342.

What do you mean for weight regain?

Clinical Trial > JAMA. 2024 Jan 2;331(1):38-48. doi: 10.1001/jama.2023.24945.

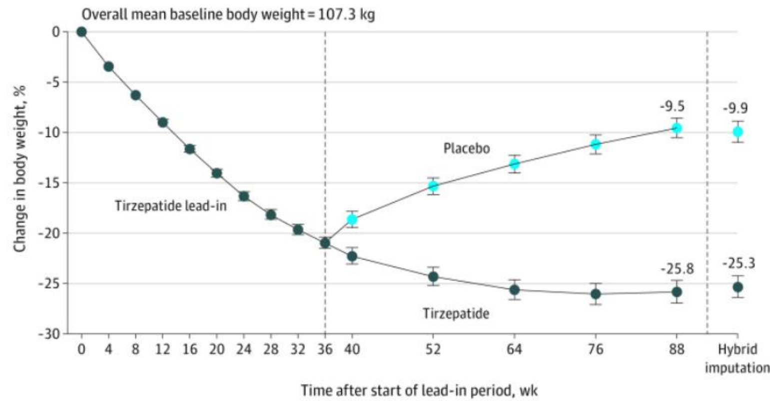
Continued Treatment With Tirzepatide for Maintenance of Weight Reduction in Adults With Obesity: The SURMOUNT-4 Randomized Clinical Trial

Louis J Aronne [1], Naveed Sattar [2], Deborah B Horn [3], Harold E Bays [4], Sean Wharton [5], Wen-Yuan Lin [6], Nadia N Ahmad [7], Shuyu Zhang [7], Ran Liao [7], Mathijs C Bunck [7], Irina Jouravskaya [8], Madhumita A Murphy [7]; SURMOUNT-4 Investigators

Collaborators, Affiliations + expand

PMID: 38078870 PMCID: PMC10714284 DOI: 10.1001/jama.2023.24945

2024



Aronne LJ, Sattar N, Horn B, Bays HE et al.
Continuead Treatment with Tirzepatide for Maintainance of weight Reduction in Adults with Obesity: The SURMOUNT–4 Randomized Clinical Trial
Jama, 2024 Jan 2; 331 (1): 38-48 doi:10100/iama2023.24945

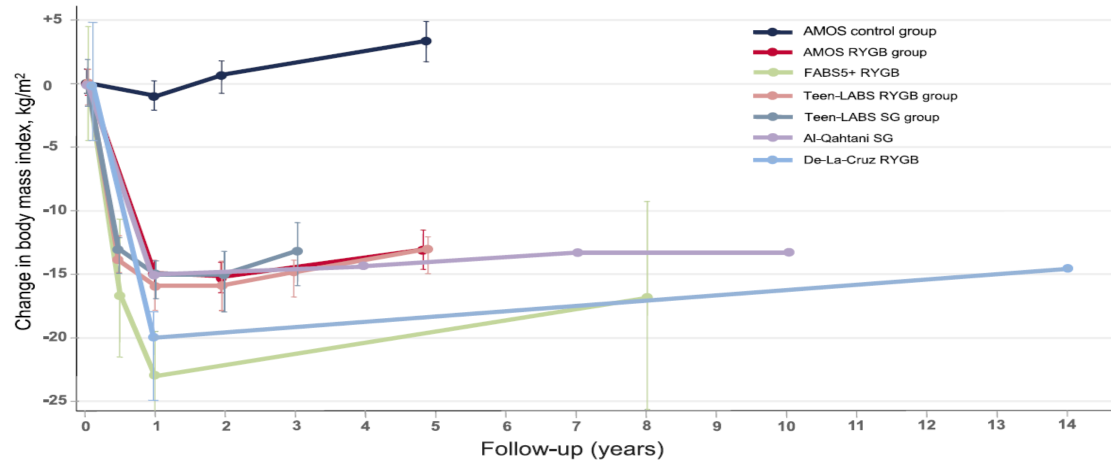
The Journal of Clinical Endocrinology & Metabolism, 2023, 108, 2184–2192
https://doi.org/10.1210/clinem/dgad155
Advance access publication 22 March 2023
Mini-Review

OXFORD

2023

Long-term Outcomes Following Adolescent Metabolic and Bariatric Surgery

Andrew J. Beamish,[1,2] Elizabeth Ryan Harper,[3] Kajsa Järvholm,[4,5] Annika Janson,[6,7] and Torsten Olbers[5,8]



Beamish AJ, Ryan Harper E, Järvholm K, Janson A, Olbers T. Long-term Outcomes Following Adolescent Metabolic and Bariatric Surgery. J Clin Endocrinol Metab. 2023 Aug 18;108(9):2184-2192.

Inge TH, Courcoulas AP, Jenkins TM, *et al.* Five-year outcomes of gastric bypass in adolescents as compared with adults. *N Engl J Med*. 2019;380(22):2136-2145.

Olbers T, Beamish AJ, Gronowitz E, *et al.* Laparoscopic Roux-en-Y gastric bypass in adolescents with severe obesity (AMOS): a prospective five-year Swedish nationwide study. *Lancet Diabetes Endocrinol*. 2017;5(3):174-183.

Inge TH, Courcoulas AP, Jenkins TM, et al. Weight loss and health status 3 years after bariatric surgery in adolescents. N Engl J Med. 2016;374(2):113-123.

Inge TH, Jenkins TM, Xanthakos SA, et al. Long-term outcomes of bariatric surgery in adolescents with severe obesity (FABS-5+): a prospective follow-up analysis. Lancet Diabetes Endocrinol. 2017;5(3):165-173.

Alqahtani AR, Elahmedi MO, Al Qahtani AR, Lee J, Butler MG. Laparoscopic sleeve gastrectomy in children and adolescents with Prader-Willi syndrome: a matched-control study. Surg Obes Relat Dis. 2016;12(1):100-110.

de la Cruz-Muñoz N, Xie L, Quiroz HJ, et al. Long-term outcomes after adolescent bariatric surgery. J Am Coll Surg. 2022;235(4): 592-602.

BJS, 2024, znae284
https://doi.org/10.1093/bjs/znae284
Cutting Edge Review

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Role of obesity-management medications before and after metabolic bariatric surgery: a systematic review

Ricardo V. Cohen[1,*], Ji Yeon Park[2,3], Gerhard Prager[4], Marco Bueter[5], Carel W. le Roux[6], Chetan Parmar[7], Mohammad Kermansaravi[8], Paulina Salminen[9,10] and Alexander D. Miras[11]

Table 1 Summary of the evidence of preoperative use of OMMs

Study	Medication	Patients	Follow-up	Outcomes
Lo and Hsu[23]/retrospective	Orlistat, 360 mg/day	55/baseline BMI not informed	14 weeks	1.7% TWL
Malone *et al.*[24]/prospective matched paired	Orlistat 180 mg/day	19 orlistat × 19 placebo, BMI range 39–60 kg/m^2	6 months	2% TWL orlistat 5.4% placebo
Morton *et al.*[25]/RCT	Phentermine 8 mg × placebo	14 phentermine 10 placebo, BMI 44–52 kg/m^2	3 months	6.3 ± 1.5% *versus* phentermine 1.4 ± 1.5%, placebo. P = 0.0465
Martines *et al.*[16]/ retrospective	IGB/Liraglutide 3 mg	42 liraglutide and 44 IGB, BMI > 50 kg/m^2	12 months	15.5% TWL IGB 6.71% TWL liraglutide
Rubio-Herrera *et al.*[17]/ retrospective	Liraglutide 3 mg or semaglutide 1 mg	BMI ≥ 40 kg/m^2 or BMI ≥ 35 kg/m^2 + related complications, 102 patients on the waiting list for MBS	12 months	16.9 ± 7.2% TWL sema 1 mg* 16.1 ± 5.8% TWL Lira 3 mg*
Wilmington *et al.*[26]/ retrospective	Liraglutide 3 mg	50 patients, BMI.40 kg/m^2	12 months	85.7% TWL > 5% 33.3% TWL > 10%†
Cunningham *et al.*[18]/ retrospective	Phentermine and/or topiramate × no OMMs	98 patients, BMI > 60 kg/m^2	24 months	31.3% TWL OMMs pts 25.3% TWL without OMMs

IGB, intragastric balloon; MBS, metabolic bariatric surgery; OMMs, obesity management medication; TWL, total body weight loss. *68.6% of participants were satisfied with the achieved weight loss and withdrew from the waiting list for MBS. †10% of participants discontinued medication due to tolerability issues.

Cohen RV, Park JY, Prager G, Bueter M, le Roux CW, Parmar C, Kermansaravi M, Salminen P, Miras AD.. Role of obesity-management medications before and after metabolic bariatric surgery: a systematic review. Br J Surg. 2024 Nov 27;111(12)

Maurizio De Luca

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CUTTING EDGE

BJS, 2024, znae284
https://doi.org/10.1093/bjs/znae284
Cutting Edge Review

Role of obesity-management medications before and after metabolic bariatric surgery: a systematic review

Ricardo V. Cohen[1,*], Ji Yeon Park[2,3], Gerhard Prager[4], Marco Bueter[5], Carel W. le Roux[6], Chetan Parmar[7], Mohammad Kermansaravi[8], Paulina Salminen[9,10] and Alexander D. Miras[11]

Table 2 Summary of the current literature on postoperative OMMs for suboptimal initial clinical response and/or recurrent weight gain, including traditional and modern agents

Authors/study type	Medication	Index operation and time since the intervention	Patients	Follow-up	Outcomes
Zoss *et al.*[49] Prospective	Orlistat 240 mg daily	AGB, at least 12–24 months postop	19 orlistat + diet counselling 19 Diet counselling	8 months, with 9 months extension in the orlistat group	8 ± 3 kg orlistat group 3 ± 2 kg counselling group
Hanipah *et al.*[50] Retrospective	Phentermine Phentermine/topiramate extended-release Lorcaserin Naltrexone slow-release/bupropion slow-release*	RYGB, SG, AGB Median of 38 months postop	126 RYGB 52 SG 21 AGB	12 months	% of patients > 10% TWL RYGB 17.2% AGB 23.5% SG 2.4% P < 0.001
Stanford *et al.*[51] Retrospective	Among 15 agents, topiramate, phentermine, metformin, bupropion, and zonisamide were the most prescribed	RYGB, SG At least 12 months postop	258 RYGB 61 SG	Not available	Topiramate was the only medication that demonstrated a 2x more chance of > 10% TWL RYGB pts achieved more TWL than SG
Schwartz *et al.*[52] Retrospective	Phentermine or phentermine–topiramate extended-release	RYGB, AGB Time since MBS not available	51 RYGB 14 AGB	3 months	Phentermine (6.35 kg, 12.8% EWL) and phentermine–topiramate extended-release (3.81 kg, 12.9% EWL P < 0.001
Istfan *et al.*[53] retrospective	Topiramate, phentermine	RYGB, 6 months to 6 years	350	Up to 11 years	Topiramate and phentermine decrease cumulative WR by about 10% relative to nadir weight and reduce the odds of rapid WR after RYGB
Pajecki *et al.*[54] Retrospective	Liraglutide 1.8 mg	RYGB, AGB, BPD-DS, SG, 2–13 years	9 RYGB 4 AGB 1 SG 1 BPD-DS	28 weeks	A mean of 7.3% TWL among all patients
Rye *et al.*[44] Retrospective	Liraglutide 3 mg	RYGB, SG, VBG, AGB. Time since MBS not available	7 RYGB 7 SG 3 VBG 3 AGB	28 weeks	Median of 9.7% TWL
Vinciguerra *et al*[55] Retrospective	Liraglutide 3 mg	RYGB, SG, AGB, OAGB	119 patients	28 weeks	Mean TWL 9.3 ± 3.6%
Suliman *et al.*[56] Prospectively collected chart data	Liraglutide 3 mg	SG, RYGB, others	120 SG, 47 RYGB, 21 other	4 months	Mean 6.1% TWL
Muratori *et al.*[57] Retrospective	Liraglutide 3 mg	RYGB, SG, AGB 70.7 months ± 43.7	17 RYGB 22 AGB 23 SG	28 weeks	Mean of 12.2% TWL
Wharton *et al.*[45] Retrospective	Liraglutide 3 mg	RYGB, AGB, SG 7.8 ± 5.7 years	53 RYGB 50 AGB 14 SG	Up to 12 months	RYGB 6.6% TWL AGB 4.9% TWL SG 4.5% TWL
Jamal *et al.*[58] Retrospective	Liraglutide 3 mg	SG, 1–10 years	57	3 months	8.10% TWL
Horber and Steffen[59] Prospective†	Liraglutide 3 mg	RYGB > 6 years	95	24 months	Liraglutide group lost 4.8 ± 2.9 kg/m² and pouch trimming plus silastic ring, 5.5 ± 2.9 kg/m²
Hany *et al.*[60] RCT	Liraglutide up to 3 mg	Conversions of SG into RYGB	38 Liraglutide 31 placebo	12 months	24.1% TWL for Liraglutide 22.7% TWL placebo (P < 0.001)
Mok *et al.*[43] RCT	Liraglutide up to 3 mg × placebo	SG or RYGB with ≤20% body weight loss, > 12 months after MBS	Lira 35 Placebo 35	6 months	Liraglutide group 8.8% TWL Placebo group 0.5% TWL
Miras *et al.*[42] RCT	Liraglutide 1.8 mg × placebo	SG RYGB > 1 year since MBS	19 SG 51 RYGB	6 months	Mean difference in weight change from baseline to week 26 for liraglutide *versus* placebo of –4.23 kg (P = 0.0017) TWL was a secondary endpoint
Lautenbach *et al.*[61] Retrospective	Semaglutide from weekly 0.25 mg. The maximum dose reached was not disclosed	SG and RYGB 64.7 ± 47.6 months	29 SG 15 RYGB	6 months	10.3 ± 5.5% for both operations

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Combined Therapies, The Dawn of a New Era

Multimodal Treatment

2024

Journal of Clinical Medicine

MDPI

Article

Development of the International Federation for Surgery of Obesity and Metabolic Disorders-European Chapter (IFSO-EC) Grade-Based Guidelines on the Surgical Treatment of Obesity Using Multimodal Strategies: Design and Methodological Aspects

Maurizio De Luca [1,*], Amanda Belluzzi [1], Paulina Salminen [2], Marco Bueter [3], Juan Pujol-Rafols [4], Nasser Sakran [5,6], Christine Stier [7], Halit Eren Taskin [8], Sonja Chiappetta [9], Francesco Maria Carrano [10], Nicola Di Lorenzo [11], Simon Nienhuijs [12], Ramón Vilallonga Puy [13], Erik Stenberg [14], Marloes Emous [15], Gerhard Prager [16], Jacques Himpens [17], Daniel Moritz Felsenreich [16], Antonio Iannelli [18], Chetan Parmar [19], Catalin Copaescu [20], Martin Fried [21], Elena Ruiz-Úcar [22], Ricardo V. Cohen [23], Stefano Olmi [24], Luigi Angrisani [25], Rui Ribeiro [26], Giulia Bandini [27], Daniele Scoccimarro [27], Benedetta Ragghianti [27] and Matteo Monami [27,†]
on behalf of the Panel for the IFSO-EC on the Surgical Treatment of Obesity Using Multimodal Strategies

N	PICO	Disagreement (Score 1–2)	Agreement (Score 3–5)	Outcome (Median)	Approval
	A. Indication for Surgery				
1	In patients with BMI ≥ 30 kg/m² and indication to MBS, is a pre- and/or post-treatment with structured lifestyle interventions preferable MBS alone, for the treatment of obesity?	12.8%	87.2%	-	✓
	Outcomes (efficacy)				
1.1	Body weight reduction (BMI; reduction in total body weight and excess body weight lost)			7.4	✓
1.2	Improvement of glycometabolic control (glycosilated hemoglobin (HbA1c); fasting plasma glucose (FPG); and lipid and blood pressure profile)			7.5	✓
1.3	Comorbid conditions remission (diabetes, hypertension, dyslipidemia, OSAS, and arthropathy)			8.1	✓
1.4	Reduction of all-cause mortality			7.6	✓
1.5	Improvement of quality of life			7.8	✓
	Outcomes (safety)				
1.6	Perioperative surgical complications			8.2	✓
1.7	Serious adverse events (surgical and non-surgical)			8.3	✓

N	PICO	Disagreement	Agreement	Outcome	Approval
2	In patients with BMI ≥ 30 kg/m² and indication to MBS, is a pre- and/or post-treatment with approved obesity management medications preferable to MBS alone, for the treatment of obesity?	16.7%	83.3%	-	✓
	Outcomes (efficacy)				
2.1	Body weight reduction (BMI; reduction in total body weight and excess body weight lost)			7.8	✓
2.2	Improvement of glycometabolic control (glycosilated hemoglobin (HbA1c); fasting plasma glucose (FPG); and lipid and blood pressure profile)			8.1	✓
2.3	Comorbid conditions remission (diabetes, hypertension, dyslipidemia, OSAS, and arthropathy)			8.4	✓
2.4	Reduction of all-cause mortality			8.2	✓
2.5	Improvement of quality of life			7.5	✓
	Outcomes (safety)				

N	PICO	Disagreement	Agreement	Outcome	Approval
3	In patients with BMI ≥ 30 kg/m² and indication to MBS, is a pre-treatment with endoscopic bariatric interventions preferable to MBS alone, for the treatment of obesity?	33.3%	66.7%	-	✓
	Outcomes (efficacy)				
3.1	Body weight reduction (BMI; reduction in total body weight and excess body weight lost)			7.7	✓
3.2	Improvement of glycometabolic control (glycosilated hemoglobin (HbA1c); fasting plasma glucose (FPG); and lipid and blood pressure profile)			7.5	✓
3.3	Comorbid conditions remission (diabetes, hypertension, dyslipidemia, OSAS, and arthropathy)			8.0	✓
3.4	Reduction of all-cause mortality			7.9	✓
3.5	Improvement of quality of life			7.4	✓
	Outcomes (safety)				
3.6	Perioperative surgical complications			8.0	✓
3.7	Serious adverse events (surgical and non-surgical)			8.3	✓

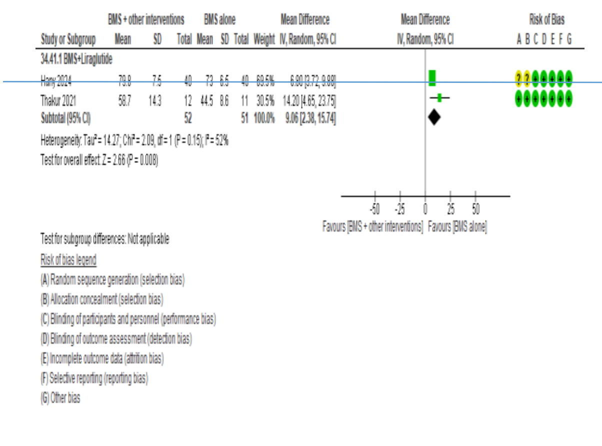


Figure 3S – Effects of metabolic surgery add-on to other anti-obesity strategies in comparison with BMS alone on excess body weight lost (EBWL%).

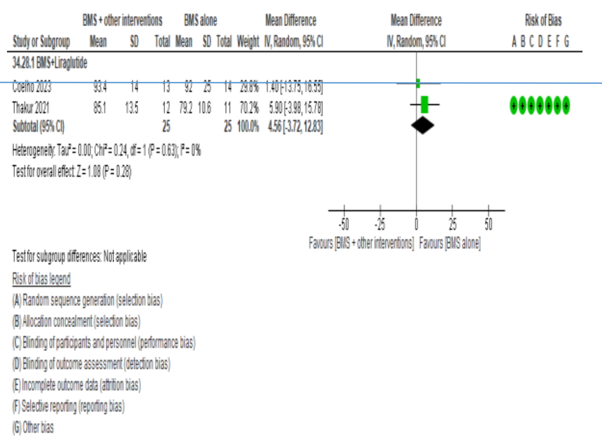


Figure 4S – Effects of metabolic surgery add-on to other anti-obesity strategies in comparison with BMS alone on total body weight lost (TBWL).

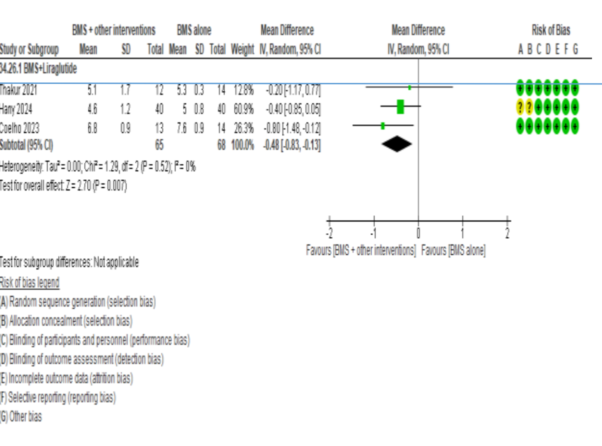
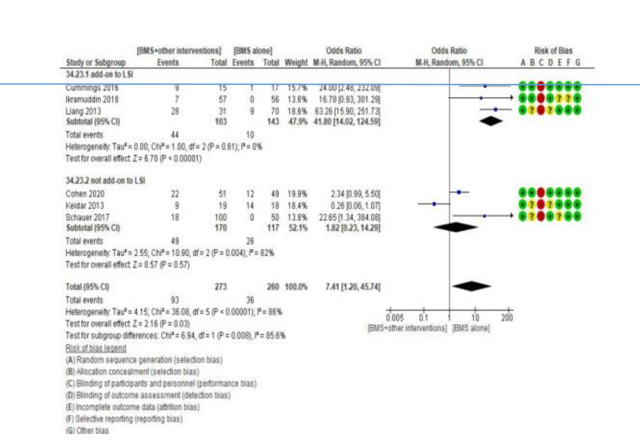


Figure 6S – Effects of metabolic surgery add-on to other anti-obesity strategies in comparison with BMS alone on endpoint HbA1c.



Effects of the addition of LSI to BMS on complete diabetes remission in comparison with matched trials performed with BMS alone.

COMPREHENSIVE GRADE-BASED META-ANALYSIS OF RANDOMIZED CONTROLLED TRIALS FOR THE DEVELOPMENT OF THE INTERNATIONAL FEDERATION FOR SURGERY OF OBESITY AND METABOLIC DISORDERS-EUROPEAN CHAPTER (IFSO-EC) ON MULTIMODAL STRATEGIES FOR THE SURGICAL TREATMENT OF OBESITY.

Maurizio De Luca [1,*], Amanda Belluzzi [1], Paulina Salminen [2], Marco Bueter [3], Juan Pujol-Rafols [4], Nasser Sakran [5,6], Christine Stier [7], Halit Eren Taskin [8], Sonja Chiappetta [9], Francesco Maria Carrano [10], Nicola Di Lorenzo [11], Simon Nienhuijs [12], Ramón Vilallonga Puy [13], Erik Stenberg [14], Marloes Emous [15], Gerhard Prager [16], Jacques Himpens [17], Daniel Moritz Felsenreich [16], Antonio Iannelli [18], Chetan Parmar [19], Catalin Copaescu [20], Martin Fried [21], Elena Ruiz-Úcar [22], Ricardo V. Cohen [23], Stefano Olmi [24], Luigi Angrisani [25], Giuseppe Navarra [26], Rui Ribeiro [27], Giulia Bandini [28], Daniele Scoccimarro [28], Benedetta Ragghianti [28], Barbara Becattini [29] and Matteo Monami [28] on behalf of the Panel for the IFSO-EC on the Surgical Treatment of Obesity Using Multimodal Strategies

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ORIGINAL ARTICLE

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XXVIII IFSO World Congress

9-12 September 2025
Santiago, Chile

Meta-analysis of randomized controlled trials for the development of the International Federation for Surgery of Obesity and Metabolic Disorders-European Chapter (IFSO-EC) guidelines on multimodal strategies for the surgical treatment of obesity

Maurizio De Luca MD[1] | Amanda Belluzzi MD[1] | Luigi Angrisani MD[2] |

Subtotal (95% CI)			**2771**			**1839**	**15.2%**	**4.64 [4.00, 5.28]**

Heterogeneity: Tau² = 0.26; Chi² = 11.37, df = 7 (P = 0.12); I² = 38%
Test for overall effect: Z = 14.25 (P < 0.00001)

5.1.3 Naltrexone/Bupropione

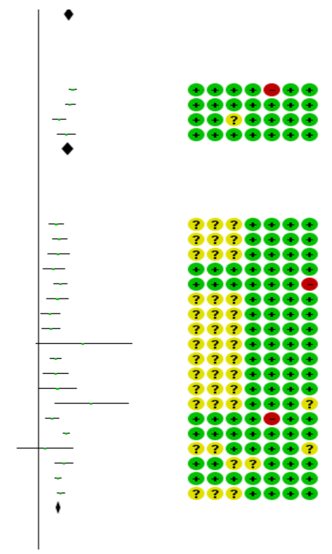
Apovian 2013	6.4	6.3	992	1.2	3.2	492	2.0%	5.20 [4.72, 5.68]
Greenway 2010	6.1	6.5	583	1.3	6.9	581	2.0%	4.80 [4.03, 5.57]
Hollander 2013	5	5.5	335	1.8	5.2	170	2.0%	3.20 [2.22, 4.18]
Wadden 2011	9.3	9.7	591	5.1	8.5	202	2.0%	4.20 [2.79, 5.61]
Subtotal (95% CI)			**2501**			**1445**	**7.9%**	**4.43 [3.54, 5.32]**

Heterogeneity: Tau² = 0.61; Chi² = 13.56, df = 3 (P = 0.004); I² = 78%
Test for overall effect: Z = 9.76 (P < 0.00001)

5.1.4 Orlistat

Bakris 2022	5.4	6.4	267	2.7	6.4	265	2.0%	2.70 [1.61, 3.79]
Berne 2005	5	4.2	111	1.8	4.2	109	2.0%	3.20 [2.09, 4.31]
Davidson 1999	8.8	10.3	657	5.8	10.5	223	1.9%	3.00 [1.41, 4.59]
Derosa 2003	10.5	4	53	8.2	4	47	1.9%	2.30 [0.73, 3.87]
Finer 2000	8.8	4	110	5.5	4	108	2.0%	3.30 [2.24, 4.36]
Hauptman 2000	4.5	8.2	210	1.6	8.2	212	1.9%	2.90 [1.34, 4.46]
Hill 1999	8.2	5.3	179	6.4	7.7	184	2.0%	1.80 [0.44, 3.16]
Hollander 1998	6.2	5.7	162	4.3	6	159	2.0%	1.90 [0.62, 3.18]
James 1997	8.8	12.5	23	2	12.5	23	1.2%	6.80 [-0.42, 14.02]
Kelley 2002	3.8	5	266	1.2	5	269	2.0%	2.60 [1.75, 3.45]
Krempf 2003	7.4	13	346	4.8	11.2	350	1.9%	2.60 [0.80, 4.40]
Miles 2002	4.6	15.9	250	1.7	17	254	1.8%	2.90 [0.03, 5.77]
Poston 2003	8	12	37	0	12	35	1.5%	8.00 [2.45, 13.55]
Rossner 2000	9.7	6.3	244	7.6	4.8	243	2.0%	2.10 [1.11, 3.09]
Sjostrom 1998	10.3	4	343	6.1	1.7	340	2.0%	4.20 [3.74, 4.66]
Svendsen 2009	-2	7	23	-3	7	21	1.7%	1.00 [-3.14, 5.14]
Swinburn 2005	4.4	7.7	170	0.5	4.2	169	2.0%	3.90 [2.58, 5.22]
Togerson 2004	7	6	1640	4	6	1637	2.0%	3.00 [2.59, 3.41]
Zavoral 1998	9.2	6	1561	5.8	6	1119	2.0%	3.40 [2.94, 3.86]
Subtotal (95% CI)			**6652**			**5767**	**35.7%**	**2.99 [2.59, 3.38]**

Heterogeneity: Tau² = 0.33; Chi² = 43.19, df = 18 (P = 0.0008); I² = 58%
Test for overall effect: Z = 14.92 (P < 0.00001)



5.1.5 Phentermine/Topiramate

Allison 2012	10.9	8.5	512	1.6	8.5	514	2.0%	9.30 [8.26, 10.34]
Gadde 2011	9.8	8.9	995	1.2	8.9	994	2.0%	8.60 [7.82, 9.38]
Subtotal (95% CI)			**1507**			**1508**	**4.0%**	**8.86 [8.20, 9.53]**

Heterogeneity: Tau² = 0.02; Chi² = 1.11, df = 1 (P = 0.29); I² = 10%
Test for overall effect: Z = 26.15 (P < 0.00001)

5.1.6 POSE

Sullivan 2017	4.9	7	221	1.4	5.6	111	2.0%	3.50 [2.11, 4.89]
Subtotal (95% CI)			**221**			**111**	**2.0%**	**3.50 [2.11, 4.89]**

Heterogeneity: Not applicable
Test for overall effect: Z = 4.93 (P < 0.00001)

5.1.7 Semaglutide

Bliddal 2024	13.7	3.3	271	3.2	3.3	136	2.0%	10.50 [9.82, 11.18]
Davies 2021	9.6	8	404	3.4	8	403	2.0%	6.20 [5.10, 7.30]
Garvey 2022	15.2	11.1	152	2.6	13.9	152	1.8%	12.60 [9.77, 15.43]
Kadowaki 2022	13.4	8.6	199	2.1	8	101	1.9%	11.30 [9.33, 13.27]
Kosiborod 2023	13.3	8.8	263	2.6	8.8	266	1.9%	10.70 [9.20, 12.20]
Kosiborod 2024	9.8	2	310	3.4	2	306	2.0%	6.40 [6.08, 6.72]
Lincoff 2023	10	9.6	8803	0.9	9.6	8801	2.0%	9.10 [8.82, 9.38]
McGowan, 2024	13.9	7.9	138	2.7	4.3	69	1.9%	11.20 [9.54, 12.86]
Rubino 2021	7.9	8.3	535	-6.9	8.8	268	2.0%	14.80 [13.53, 16.07]
Wadden 2021	17.6	2	407	5	3	204	2.0%	12.60 [12.14, 13.06]
Wilding 2021	14.9	3.6	1306	2.4	2.6	655	2.0%	12.50 [12.22, 12.78]
Subtotal (95% CI)			**12788**			**11361**	**21.5%**	**10.67 [8.95, 12.39]**

Heterogeneity: Tau² = 7.99; Chi² = 1082.18, df = 10 (P < 0.00001); I² = 99%
Test for overall effect: Z = 12.18 (P < 0.00001)

5.1.8 Tirzepatide

Aronne, 2024	5.5	12.1	335	-14	11.2	335	1.9%	19.50 [17.73, 21.27]
Garvey 2023	13.8	8.8	623	3.3	8.8	315	2.0%	10.50 [9.31, 11.69]
Jastreboff 2022	20	4	1266	3.1	3	643	2.0%	16.90 [16.58, 17.22]
Loomba, 2024	14	4	95	-0.8	4	48	2.0%	14.80 [13.41, 16.19]
Malhotra, 2024	18.7	10.9	234	2	10.9	235	1.9%	16.70 [14.73, 18.67]
Subtotal (95% CI)			**2553**			**1576**	**9.8%**	**15.64 [12.89, 18.40]**

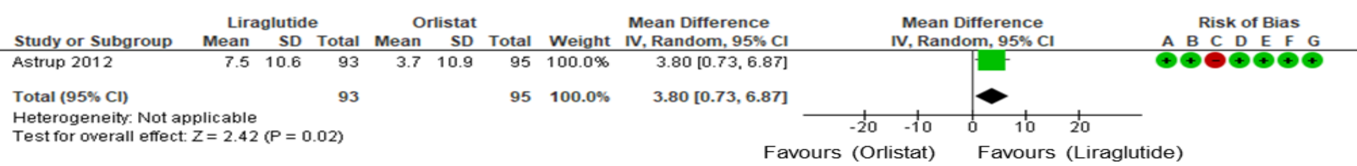
Heterogeneity: Tau² = 9.33; Chi² = 120.15, df = 4 (P < 0.00001); I² = 97%
Test for overall effect: Z = 11.14 (P < 0.00001)

Total (95% CI)			**29378**			**23935**	**100.0%**	**6.61 [5.29, 7.92]**

Heterogeneity: Tau² = 22.56; Chi² = 8039.37, df = 51 (P < 0.00001); I² = 99%
Test for overall effect: Z = 9.84 (P < 0.00001)
Test for subgroup differences: Chi² = 342.93, df = 7 (P < 0.00001), I² = 98.0%

-20 -10 0 10 20
Favours [control] Favours [experimental]

Risk of bias legend
(A) Random sequence generation (selection bias)
(B) Allocation concealment (selection bias)
(C) Blinding of participants and personnel (performance bias)
(D) Blinding of outcome assessment (detection bias)
(E) Incomplete outcome data (attrition bias)
(F) Selective reporting (reporting bias)
(G) Other bias



	Liraglutide			Orlistat				Mean Difference
Study or Subgroup	Mean	SD	Total	Mean	SD	Total	Weight	IV, Random, 95% CI
Astrup 2012	7.5	10.6	93	3.7	10.9	95	100.0%	3.80 [0.73, 6.87]
Total (95% CI)			**93**			**95**	**100.0%**	**3.80 [0.73, 6.87]**

Heterogeneity: Not applicable
Test for overall effect: Z = 2.42 (P = 0.02)

Risk of bias legend
(A) Random sequence generation (selection bias)
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(G) Other bias

Effects of individual anti-obesity strategy on TBWL% at endpoint in placebo and active controlled trials

De Luca M, Belluzzi et al. Meta-analysis of randomized controlled trials for the development of the International Federation for Surgery of Obesity and Metabolic Disorders-European Chapter (IFSO-EC) guidelines on multimodal strategies for the surgical treatment of obesity.
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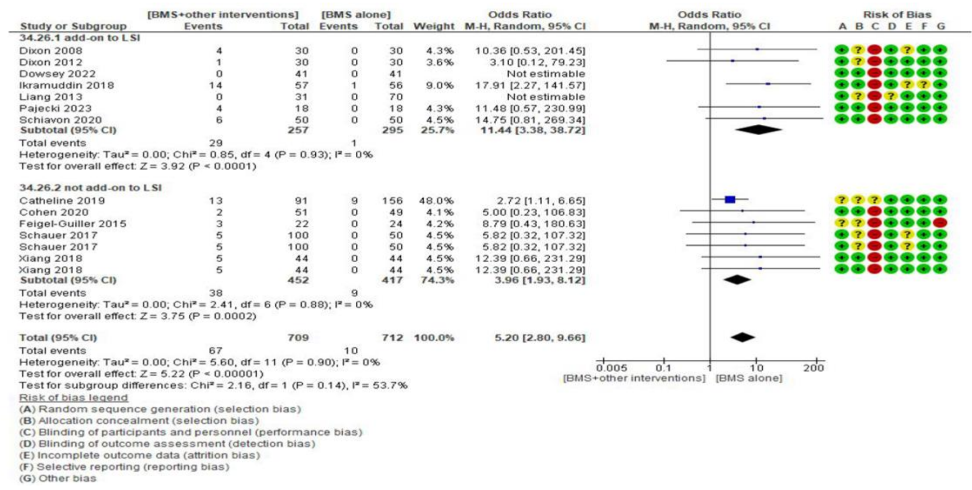
Meta-analysis of randomized controlled trials for the development of the International Federation for Surgery of Obesity and Metabolic Disorders-European Chapter (IFSO-EC) guidelines on multimodal strategies for the surgical treatment of obesity

Maurizio De Luca MD[1] | Amanda Belluzzi MD[1] | Luigi Angrisani MD[2] |



Study or Subgroup	[BMS+other interventions] Events	Total	[BMS alone] Events	Total	Weight	Odds Ratio M-H, Random, 95% CI
34.26.1 add-on to LSI						
Dixon 2008	4	30	0	30	4.3%	10.36 [0.53, 201.45]
Dixon 2012	1	30	0	30	3.6%	3.10 [0.12, 79.23]
Dowsey 2022	0	41	0	41		Not estimable
Ikramuddin 2018	14	57	1	56	9.0%	17.91 [2.27, 141.57]
Liang 2013	0	31	0	70		Not estimable
Pajecki 2023	4	18	0	18	4.3%	11.48 [0.57, 230.99]
Schiavon 2020	6	50	0	50	4.5%	14.75 [0.81, 269.34]
Subtotal (95% CI)		**257**		**295**	**25.7%**	**11.44 [3.38, 38.72]**
Total events	29		1			
Heterogeneity: Tau² = 0.00; Chi² = 0.85, df = 4 (P = 0.93); I² = 0%						
Test for overall effect: Z = 3.92 (P < 0.0001)						
34.26.2 not add-on to LSI						
Catheline 2019	13	91	9	156	48.0%	2.72 [1.11, 6.65]
Cohen 2020	2	51	0	49	4.1%	5.00 [0.23, 106.83]
Feigel-Guiller 2015	3	22	0	24	4.2%	8.79 [0.43, 180.63]
Schauer 2017	5	100	0	50	4.5%	5.82 [0.32, 107.32]
Schauer 2017	5	100	0	50	4.5%	5.82 [0.32, 107.32]
Xiang 2018	5	44	0	44	4.5%	12.39 [0.66, 231.29]
Xiang 2018	5	44	0	44	4.5%	12.39 [0.66, 231.29]
Subtotal (95% CI)		**452**		**417**	**74.3%**	**3.96 [1.93, 8.12]**
Total events	38		9			
Heterogeneity: Tau² = 0.00; Chi² = 2.41, df = 6 (P = 0.88); I² = 0%						
Test for overall effect: Z = 3.75 (P = 0.0002)						
Total (95% CI)		**709**		**712**	**100.0%**	**5.20 [2.80, 9.66]**
Total events	67		10			
Heterogeneity: Tau² = 0.00; Chi² = 5.60, df = 11 (P = 0.90); I² = 0%						
Test for overall effect: Z = 5.22 (P < 0.00001)						
Test for subgroup differences: Chi² = 2.16, df = 1 (P = 0.14), I² = 53.7%						

Risk of bias legend
(A) Random sequence generation (selection bias)
(B) Allocation concealment (selection bias)
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(D) Blinding of outcome assessment (detection bias)
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(F) Selective reporting (reporting bias)
(G) Other bias

Effects of the addition of LSI to BMS on periprocedural SAEs (Serious Adverse Events) in comparison with matched trials performed with MBS alone.

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Multimodal Treatment

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https://doi.org/10.1007/s11695-025-07733-8

RESEARCH

Glucagon-Like Peptide-1 Receptor Agonists for the Treatment of Suboptimal Initial Clinical Response and Weight Gain Recurrence After Bariatric Surgery: a Systematic Review and Meta-analysis

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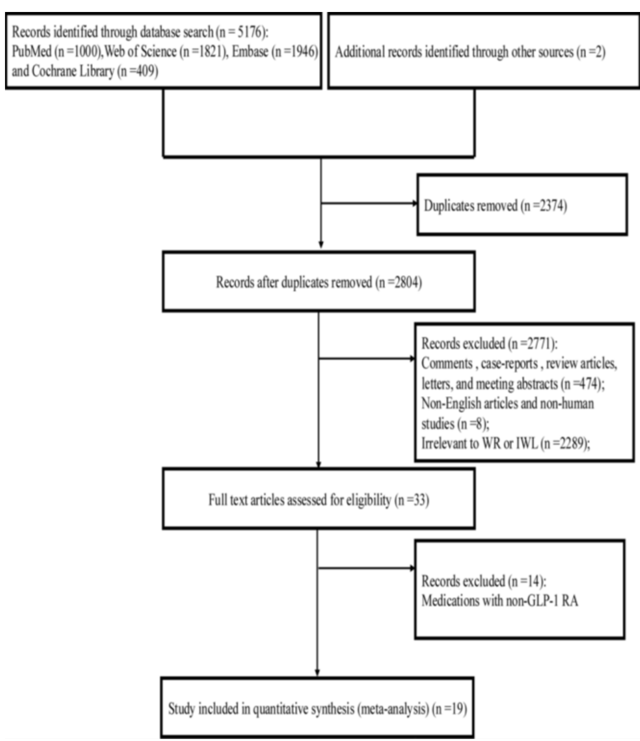

Table 2 Patient characteristics

Study (year)	Age (years)	Male	BMI (kg/m²)/ BW (kg) pre-operative	BMI (kg/m²)/ BW (kg) at nadir post-operative	BMI (kg/m²)/ BW (kg) before treatment	Time from surgery to treatment (years)*	Medication (dose)	Treatment duration (month)*
Pajecki (2012)	47	26.7%	47.2/120.8	NR/86.7	NR/100.9	5.3	Liraglutide (1.8 mg/d)	3.0
Rye (2018)	50	5.0%	NR/117.9	NR/101.2	NR/117.9	6.4	Liraglutide (3.0 mg/d)	7.0
Wharton (2019)	51	12.8%	49.7/NR	NR/NR	42.5/NR	7.8	Liraglutide (3.0 mg/d)	7.6
Horber (2020)	52	8.8%	45.0/120.0	25.5/NR	31.2/NR	9.0	Liraglutide (3.0 mg/d)	24.0
Gazda (2021)	48	20.2%	49.6/138.4	NR/93.7	42.3/117.9	7.3	Liraglutide, semaglutide, exenatide, dulaglutide, albiglutide, or lixisenatide (NR)	12.0
Rubio (2021)	55	30.4%	46.6/129.5	29.6/NR	36.6/NR	NR	Liraglutide (3.0 mg/d)	12.0
Elhag (2022)	43	16.0%	45.9/118.2	32.1/82.1	37.6/96.8	NR	Liraglutide (3.0 mg/d)	12.0
Lautenbach (2022)	46	27.2%	49.4/145.7	34.7/102.9	38.3/113.5	5.4	Semaglutide (0.5 mg/wk)	6.0
Muratori (2022)	44	3.2%	45.4/NR	29.5/NR	34.2/NR	5.9	Liraglutide (3.0 mg/d)	10.5
Bonnet (2023)	54	38.5%	45.7/125.2	NR/96.1	NR/NR	8.4	Semaglutide (2.4 mg/wk)	6.0
Colbourne (2023)	41	16.2%	44.8/117.4	34.6/89.1	35.2/95.8	NR	Liraglutide (3.0 mg/d)	3.0
Jensen (2023)	43	18.0%	41.8/112.4	29.2/78.3	34/90.5	6.0	Liraglutide (3.0 mg/d) or Semaglutide (1.0 mg/wk)	6.0
Lautenbach (2023)	48	17.2%	50.4/145.7	34.6/100.6	38.3/110.8	5.4	Semaglutide (1.0 mg/wk)	12.0
Mok (2023)	47	25.7%	NR/NR	NR/NR	41.6/116.1	4.6	Liraglutide (3.0 mg/d)	24.0
Murvelashvili (2023) (cohort 1)	55	8.7%	50.3/136.8	NR/95.1	NR/114.4	8.2	Liraglutide (3.0 mg/d)	12.0
Murvelashvili (2023) (cohort 2)	55	11.3%	48.5/134.1	NR/94.2	NR/110.7	7.8	Semaglutide (1.0 mg/wk)	12.0
Vinciguerra (2023)	39	28.8%	47.7/NR	33.4/NR	38.2/101.8	NR	Liraglutide (2.4 mg/d)	6.0
Jamal (2024) (1)	37	19.1%	NR/121.5	NR/77.8	NR/96.1	NR	Liraglutide (3.0 mg/d)	3.0
Jamal (2024) (2, cohort 1)	38	20.0%	42.0/112.8	28.4/75.3	33.9/90.1	6.0	Semaglutide (2.5 mg/wk)	6.0
Jamal (2024) (2, cohort 2)	40	17.8%	44.9/122.5	30.1/81.7	36.9/100.2	6.0	Tirzepetide (2.5 mg/wk)	6.0
Vinciguerra (2024)	41	28.6%	37.6/100.9	NR/NR	37.6/100.9	NR	Liraglutide (3.0 mg/d)	6.0

Data are reported as mean values

BW body weight, *BMI* body mass index, *NR* not reported

*Data were presented as mean

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Nie Y, Zhang Y, Liu B, Meng H. Glucagon-Like Peptide-1 Receptor Agonists for the Treatment of Suboptimal Initial Clinical Response and Weight Gain Recurrence After Bariatric Surgery: a Systematic Review and Meta-analysis. Obes Surg. 2025 Mar;35(3):808-822.

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Obesity Surgery (2025) 35:808–822
https://doi.org/10.1007/s11695-025-07733-8

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RESEARCH

2025

Glucagon-Like Peptide-1 Receptor Agonists for the Treatment of Suboptimal Initial Clinical Response and Weight Gain Recurrence After Bariatric Surgery: a Systematic Review and Meta-analysis

Yuntao Nie[1] · Yiran Zhang[2] · Baoyin Liu[1] · Hua Meng[1]

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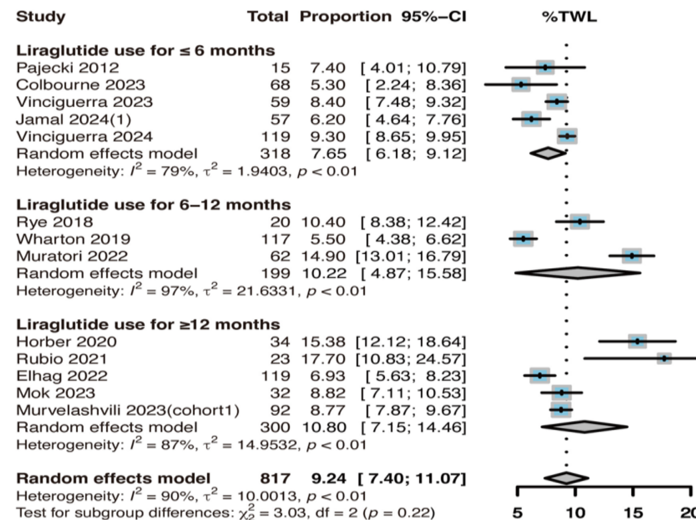

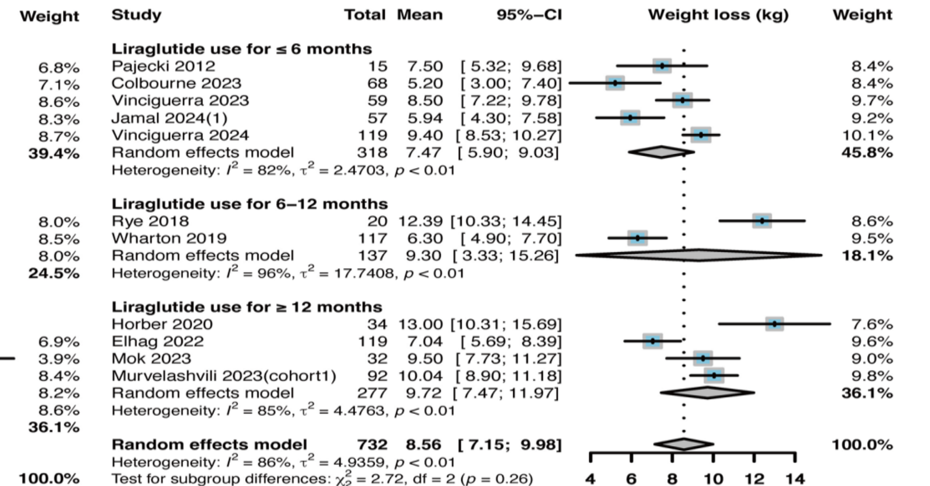

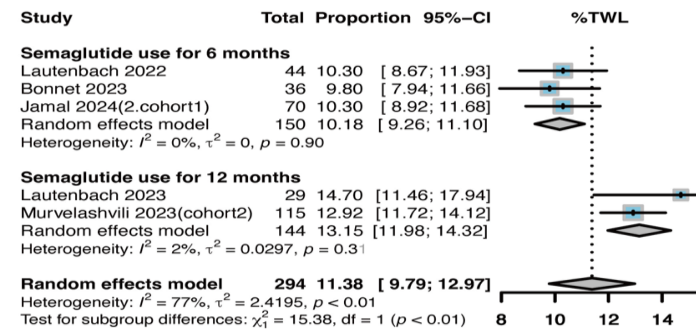

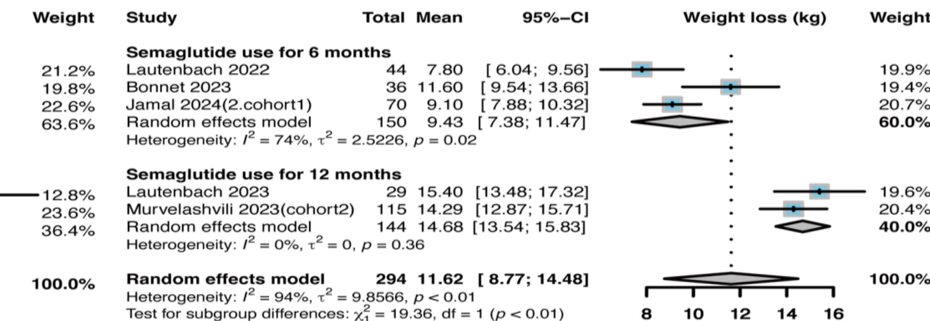

Nie Y, Zhang Y, Liu B, Meng H. Glucagon-Like Peptide-1 Receptor Agonists for the Treatment of Suboptimal Initial Clinical Response and Weight Gain Recurrence After Bariatric Surgery: a Systematic Review and Meta-analysis. Obes Surg. 2025 Mar;35(3):808-822.

Obesity Surgery
https://doi.org/10.1007/s11695-025-07848-y

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RESEARCH

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2025

Impact of Semaglutide Administration on Weight Loss After Bariatric Surgery: A Meta-Analysis

Tannaz Jamialahamdi[1] · Elaheh Mirhadi[2] · Wael Almahmeed[3] · Salim Virani[4] · Ali H. Eid[5] · Khalid Al-Rasadi[6,7] · Sepideh Salehabadi[8] · Amirhossein Sahebkar[8,9,10]

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Table 1 Characteristics of the studies included in this meta-analysis

Study	Year	Study design	Target population	Duration of study	Intervention (N)	Age (years)	Female, N. (%)	BMI (kg/m^2)	Semaglutide administration	Ref
Murvelashvili et al.	2022	Retrospective study	Post-bariatric patients	12 months	115	53.87 ± 11.01	102 (88.7%)	48.54 ± 10.24	Semaglutide 1.0 mg weekly post BS	[12]
Jensen et al.	2023	Retrospective Observational Study	Patients with weight regain after bariatric surgery	6 months	50 (Semaglutide: 21, Liraglutide: 29)	51.4 ± 10.32	41 (82%)	35.08 ± 5.32	Semaglutide (1.0 mg, weekly subcutaneous injection [n = 20] or 14 mg, daily oral intake [n = 1])	[5]
Lautenbach et al.	2023	Retrospective study	Patients without type 2 diabetes with post-bariatric treatment	12 months	29	48.5 ± 8.4	24 (82.8%)	38.3 ± 6.1	Semaglutide 2.4 mg once-weekly	[1]
Bonnet et al.	2023	Retrospective cohort study	Patients with a history of bariatric surgery	6 months	36	53.6 ± 10.8	24 (61.5%)	45.7 ± 7.8	The treatment started at a dose of 0.25 mg/wk and was escalated in 4-week increments to achieve a target dose of 2.4 mg/wk, administered	[18]
Jamal et al.	2024	Retrospective cohort study	Patients who underwent SG	6 months	70	38.1 ± 10.3	56 (80.0%)	33.9 ± 6	The treatment started at a dose of 0.25 mg/wk	[19]
Kanai et al.	2024	Retrospective study	Patients with type 2 diabetes (T2D) underwent LSG	12 months	29	47.2 ± 8.7	12 (30.77%)	37.7 ± 11.02	Semaglutide 0.25–1 mg once-weekly	[20]
Jensen et al.	2023	Retrospective Observational Study	Patients with weight regain after bariatric surgery	6 months	50 (Semaglutide: 21, Liraglutide: 29)	51.4 ± 10.32	41 (82%)	35.08 ± 5.32	Semaglutide (1.0 mg, weekly subcutaneous injection [n = 20] or 14 mg, daily oral intake [n = 1])	[5]
Lautenbach et al.	2023	Retrospective study	Patients without type 2 diabetes with post-bariatric treatment	12 months	29	48.5 ± 8.4	24 (82.8%)	38.3 ± 6.1	Semaglutide 2.4 mg once-weekly	[1]
Bonnet et al.	2023	Retrospective cohort study	Patients with a history of bariatric surgery	6 months	36	53.6 ± 10.8	24 (61.5%)	45.7 ± 7.8	The treatment started at a dose of 0.25 mg/wk and was escalated in 4-week increments to achieve a target dose of 2.4 mg/wk, administered	[18]

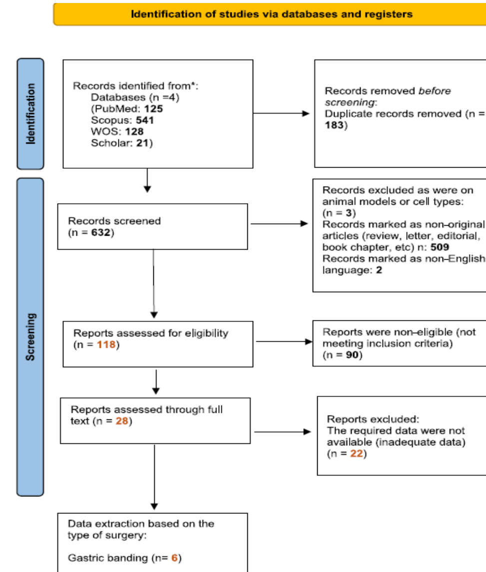

Table 2 Quality of bias assessment of the included publication in accordance with the Newcastle–Ottawa scale (cohort studies)

Study	Selection				Comparability†	Outcome		
	Representativeness of the exposed cohort	Selection of the nonexposed cohort	Ascertainment of exposure	Demonstration that outcome of interest was not present at start of study	Comparability of cohorts on the basis of the design or analysis	Assessment of outcome	Follow-up was not long enough for outcomes to occur	Adequacy of follow up of cohorts
Murvelashvili et al. [12]	*	-	*	*	-	*	*	*
Jensen et al. [5]	*	-	*	*	-	*	*	*
Lautenbach et al. [1]	*	-	*	*	-	*	*	*
Bonnet et al. [18]	*	-	*	*	-	*	*	*
Jamal et al. [19]	*	-	*	*	-	*	*	*
Kanai et al. [20]	*	-	*	*	-	*	*	*

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Jamialahamdi T, Mirhadi E, Almahmeed W, Virani S, Eid AH, Al-Rasadi K, Salehabadi S, Sahebkar A. Impact of Semaglutide Administration on Weight Loss After Bariatric Surgery: A Meta-Analysis. Obes Surg. 2025 May 26.

2025

Obesity Surgery
https://doi.org/10.1007/s11695-025-07848-y

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RESEARCH

Impact of Semaglutide Administration on Weight Loss After Bariatric Surgery: A Meta-Analysis

Tannaz Jamialahamdi[1] · Elaheh Mirhadi[2] · Wael Almahmeed[3] · Salim Virani[4] · Ali H. Eid[5] · Khalid Al-Rasadi[6,7] · Sepideh Salehabadi[8] · Amirhossein Sahebkar[8,9,10]

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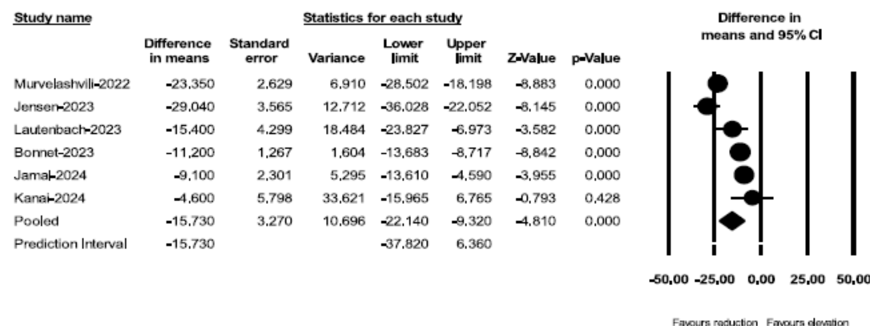
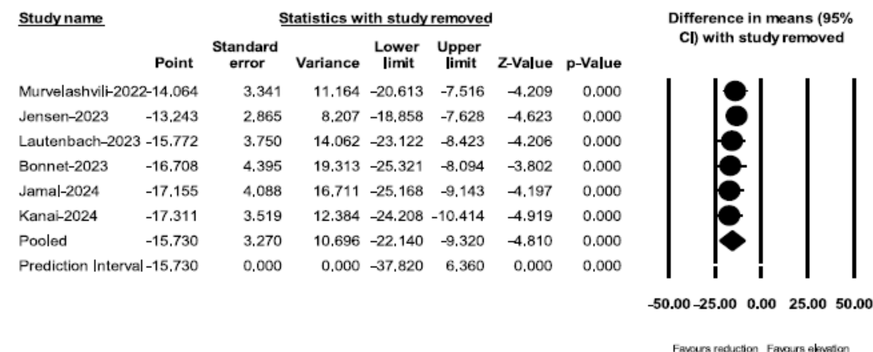


Study name	Difference in means	Standard error	Variance	Lower limit	Upper limit	Z-Value	p-Value
	Statistics for each study						
Murvelashvili-2022	-23.350	2.629	6.910	-28.502	-18.198	-8.883	0.000
Jensen-2023	-29.040	3.565	12.712	-36.028	-22.052	-8.145	0.000
Lautenbach-2023	-15.400	4.299	18.484	-23.827	-6.973	-3.582	0.000
Bonnet-2023	-11.200	1.267	1.604	-13.683	-8.717	-8.842	0.000
Jamal-2024	-9.100	2.301	5.295	-13.610	-4.590	-3.955	0.000
Kanai-2024	-4.600	5.798	33.621	-15.965	6.765	-0.793	0.428
Pooled	-15.730	3.270	10.696	-22.140	-9.320	-4.810	0.000
Prediction Interval	-15.730			-37.820	6.360		

Forest plot representing weighted mean difference and 95% confidence intervals (CIs) for the effect of semaglutide administration after bariatric surgery on weight loss



Study name	Point	Standard error	Variance	Lower limit	Upper limit	Z-Value	p-Value
	Statistics with study removed						
Murvelashvili-2022	-14.064	3.341	11.164	-20.613	-7.516	-4.209	0.000
Jensen-2023	-13.243	2.865	8.207	-18.858	-7.628	-4.623	0.000
Lautenbach-2023	-15.772	3.750	14.062	-23.122	-8.423	-4.206	0.000
Bonnet-2023	-16.708	4.395	19.313	-25.321	-8.094	-3.802	0.000
Jamal-2024	-17.155	4.088	16.711	-25.168	-9.143	-4.197	0.000
Kanai-2024	-17.311	3.519	12.384	-24.208	-10.414	-4.919	0.000
Pooled	-15.730	3.270	10.696	-22.140	-9.320	-4.810	0.000
Prediction Interval	-15.730	0.000	0.000	-37.820	6.360	0.000	0.000

Leave-one-out sensitivity analysis for the effect of semaglutide administration after bariatric surgery on weight reduction

Jamialahamdi T, Mirhadi E, Almahmeed W, Virani S, Eid AH, Al-Rasadi K, Salehabadi S, Sahebkar A. Impact of Semaglutide Administration on Weight Loss After Bariatric Surgery: A Meta-Analysis. Obes Surg. 2025 May 26.

Obesity Surgery (2024) 34:1846–1854
https://doi.org/10.1007/s11695-024-07127-2

2024

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REVIEW

Adjuvant Glucose-Like Peptide 1 Receptor Agonist Therapy for Suboptimal Weight Loss After Bariatric Surgery: a Systematic Review

Alexandre Dréant[1,3] · Claire Blanchard[1,2] · David Jacobi[1]

Table 1 Summary of population characteristics and design of the individual studies included in the review

Article	Country Type of study	Indications for GLP1-RA	Type of surgeries (total, sleeve gastrectomy, gastric bypass, gastric banding, biliopancreatic diversion, revision surgery)	Male (*n*, %)	Age (year: mean ± standard deviation)
Pajecki et al., 2013 [28]	Brazil Observational	- Excess weight loss < 50% at 18 months - Weight regain > 15	15, 1, 9, 4, 1, 0	5 (33.3)	47.2 ± 12.5
Rye et al., 2018 [29]	Canada Observational	- Weight loss < 20 - Total weight regain > 10 - Patient request - Weight loss plateau	20, 7, 7, 3, 3, 0	1 (5.0)	49.6 ± 8.3
Wharton et al., 2019 [30]	Canada Observational	- None	117, 50, 14, 53, 0, 0	15 (12.8)	51.2 ± 9.4
Horber et al., 2021 [31]	Switzerland Non-randomized non-blinded comparative trial.	- total weight recovery > 10%.	34, 0, 34, 0, 0, 0	3 (8.8)	55 ± 12
Gazda et al., 2021 [32]	United States Observational	- BMI > 27 kg/m^2	84, 44, 14, 26, 0, 0	17 (20.2)	54.9 ± 10.6
Rubio et al., 2021 [33]	Spain Non-randomized non-blinded comparative trial	- Weight regain > 15%	23, 23, 0, 0, 0, 0	7 (30.4)	40.2 ± 11.8
Elhag et al., 2022 [34]	Qatar Observational	- Excess weight loss < 50% at 18 months - Weight regain > 10 kg	145, 110, 6, 3, 0, 26	25 (17.2)	43.32 ± 10.49
Muratori et al., 2022 [35]	Italy Observational	- Weight regain >10% - Patient request	62, 23, 17, 22, 0, 0	2 (3.2)	43.6 ± 9.9
Lautenbach et al., 2022 [36]	Germany Observational	- Excess loss < 50% at 18 months - Weight regain > 50% of the total weight lost	44, 28, 15, 0, 0, 1	12 (27.2)	46.4 ± 8
Jensen et al., 2023 [37]	Switzerland Observational	The indication to initiate GLP1-RA therapy and the agent prescribed was at the discretion of the treating physician	50, 5, 45, 0, 0, 0	9 (18)	43 ± 4

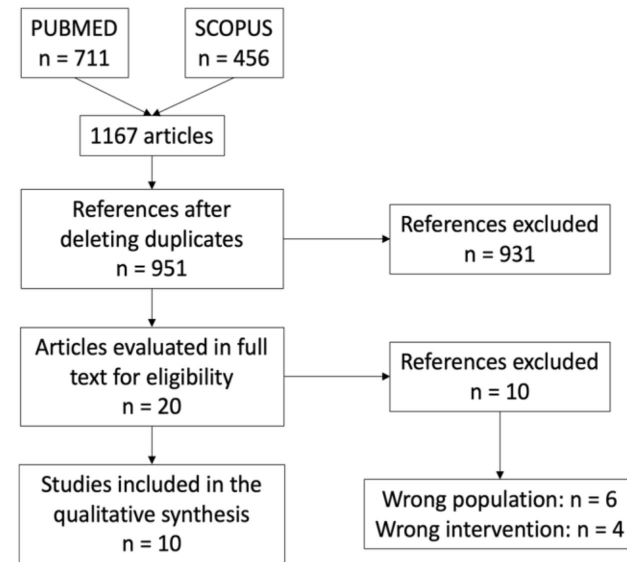

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Table 2 Population description

Article	Preoperative body weight (kg) (kg/m^2)	Postoperative body weight (kg) (kg/m^2)	Time between surgery and GLP1-RA treatment (years)	Body weight before GLP1-RA (kg) (kg/m^2)	Patient with diabetes (*n*, %)
Pajecki et al., 2013 [28]	120.8 ± 22.1 NK	86.7 ± 14.4 NK	7.3	100.9 ± 18.3 NK	NK (NK)
Rye et al., 2018 [29]	134.4 NK	98.1 NK	6.4	117.8 NK	5 (25)
Wharton et al., 2019 [30]	NK 51.2 ± 9.4	NK NK	7.8	NK 42.50	NK (NK)
Horber et al., 2021 [31]	120 ± 19 45 ± 8	NK 25.5 ± 4.4	9	NK 31.2 ± 4	2 (5 .8)
Gazda et al., 2021 [32]	138.4 49.6 ± 9.0	98.6 NK	7.3	117.9 ± 24.5 42.3 ± 7.9	42 (50)
Rubio et al., 2021 [33]	NK NK	NK NK	6	NK 36.6 ± 4.6	0 (0)
Elhag et al., 2022 [34]	120.4 ± 32.9 46.4 ± 9.8	83.2 ± 20.0 32.3 ± 6.9	4.5	NK NK	60 (41.4)
Muratori et al., 2022 [35]	NK 45.4 ± 5.5	NK 29.5 ± 4.9	5.9	NK 34.2 ± 4.8	0 (0)
Lautenbach et al., 2022 [36]	145.7 ± 33.5 49.4 ± 8.9	102.9 ± 25 34.7 ± 6.5	5.4	113.5 ± 25.2 38.3 ± 6.4	0 (0)
Jensen et al., 2023 [37]	112.4 41.8	78.3 29.2	1,2	90.5 34.0	11 (22)

Dréant A, Blanchard C, Jacobi D. Adjuvant Glucose-Like Peptide 1 Receptor Agonist Therapy for Suboptimal Weight Loss After Bariatric Surgery: a Systematic Review. Obes Surg. 2024 May;34(5):1846-1854.

Obesity Surgery (2024) 34:1846–1854
https://doi.org/10.1007/s11695-024-07127-2

REVIEW

2024

Adjuvant Glucose-Like Peptide 1 Receptor Agonist Therapy for Suboptimal Weight Loss After Bariatric Surgery: a Systematic Review

Alexandre Dréant[1,3] · Claire Blanchard[1,2] · David Jacobi[1]

XXVIII IFSO World Congress
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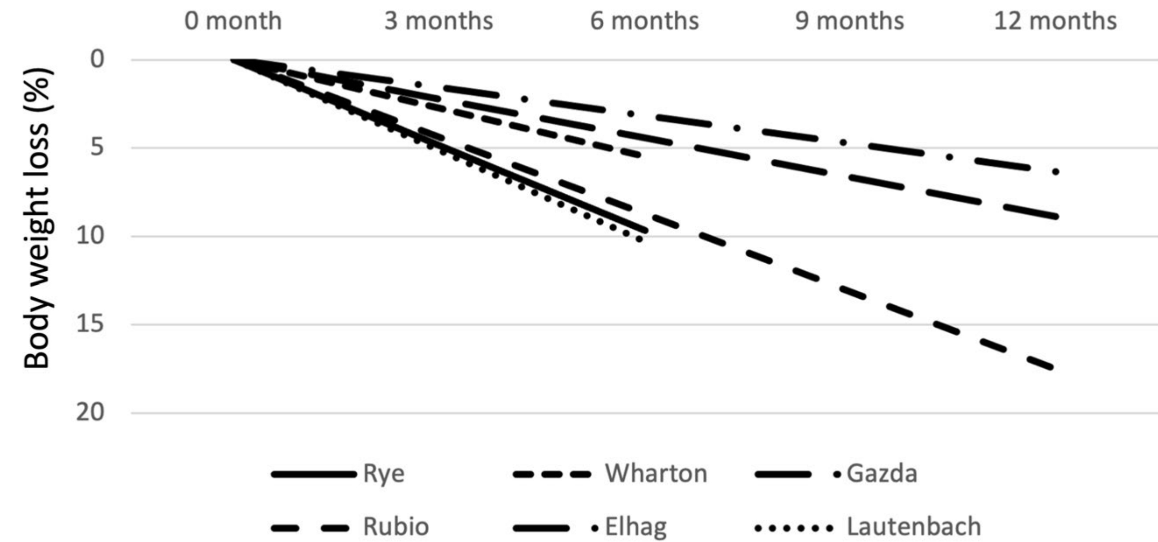
Table 3 Summary of the exposure and outcome assessments and main results of individual studies included in the review

Article	GLP1-RA	Dose (mg)	Lost to view (n, %)	Serious and non-serious adverse events (*n*, %)	Follow-up after introduction of GLP1-RA (months)	Body weight loss (control) (kg) (%)	Body weight loss in kg (%)
Pajecki et al., 2013 [28]	Liraglutide	1.2 1.8	0 (0)	0 (0) 6 (40)	4.2 (3–7)	None None	7.5 (NK)
Rye et al., 2018 [29]	Liraglutide	3.0	13 (39.4)	0 (0) 2 (10)	6	None	NK (9.7)
Wharton et al., 2019 [30]	Liraglutide	3.0	43 (36.8)	1 (0.9) 59 (50.4)	7.6 ± 7.1	None None	6.3 (5.5)
Horber et al., 2021 [31]	Liraglutide	3.0	0 (0)	0 (0) NK	24	0.4 (NK)	12 (NK)
Gazda et al., 2021 [32]	Liraglutide, semaglutide, exenatide, dulaglutide, albiglutide, lixisenatide	None	77 (70)	0 (0) NK	12	None None	11.2 (8.9)
Rubio et al., 2021 [33]	Liraglutide	3.0	0 (0)	0 (0) NK	12	None None	NK (17.5)
Elhag et al., 2022 [34]	Liraglutide	3.0	3 (2.0)	0 (0) 14 (17.5)	12	None None	6.50 (6.35)
Muratori et al., 2022 [35]	Liraglutide	3.0	0 (0)	0 (0) 7 (11.3)	10.5 ± 4.4	None None	NK (NK)
Lautenbach et al., 2022 [36]	Semaglutide	0.5	22 (50)	1 (2.3) NK	6	None None	NK (10.3)
Jensen et al., 2023 [37]	Liraglutide (29) Semaglutide (21)	3.0 1.0	36 (42)	0 (0) 18 (36)	6	None None	7.4 (NK)

NK, not known



Body weight evolution with GLP1-RA treatment. The figure illustrates the evolution of body weight with GLP-1 RA.

Dréant A, Blanchard C, Jacobi D. Adjuvant Glucose-Like Peptide 1 Receptor Agonist Therapy for Suboptimal Weight Loss After Bariatric Surgery: a Systematic Review. Obes Surg. 2024 May;34(5):1846-1854.

Obesity Surgery (2025) 35:1947–1960
https://doi.org/10.1007/s11695-025-07856-y

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REVIEW

2025

Efficacy and Safety of GLP- 1 Receptor Agonists in the Management of Weight Recurrence or Suboptimal Clinical Response after Undergoing Metabolic Bariatric Surgeries: A Meta-Analysis

Arief Arrowaili[1]

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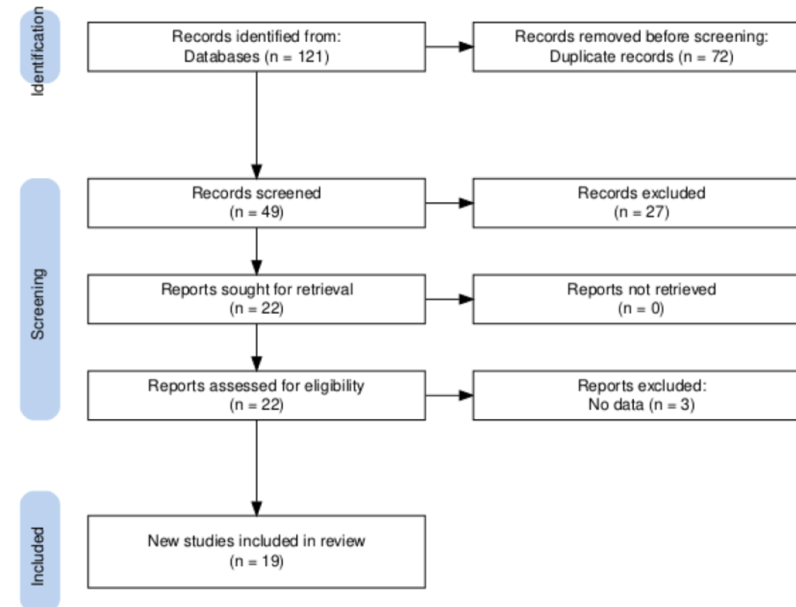
Table 2 Baseline characteristics of the included studies

Study ID	Design	Drug	Dose	Follow-up	Time from surgery to drug, months	Sample size		Surgery	Age, mean (SD)		Male, n (%)	
						Drug	Control		Drug	Control	Drug	Control
Bonnet et al., 2023	Cohort	Semaglutide	2.4 mg	6 months	100.8 (52.8)	39	NR	Bariatric surgery	53.6 (10.8)	NR	15 (38.5)	NR
Coelho et al., 2023	RCT	Liraglutide	1.8 mg	6 months	NR	13	14	Laparoscopic adjustable gastric banding	53.48 (8.31)	51.20 (8.59)	3 (13.1)	3 (11.4)
Elhag and El ansari, 2022	Cohort	Liraglutide	3 mg	6 months	54.1 (31.75)	119	NR	Primary MBS	42.86 (10.94)	NR	19 (16)	NR
Elhag and El ansari, 2022	Cohort	Liraglutide	3 mg	6 months	54.1 (31.75)	26	NR	Revisional MBS	45.42 (7.93)	NR	6 (23.1)	NR
Farías, 2024	Cohort	Liraglutide	1.2 mg	6 months	NR	41	NR	MBS	41.3 (11.5)	NR	6 (14.6)	NR
Hany et al., 2024	RCT	Liraglutide	3 mg	6 months	18	38	31	Roux-en-Y bypass	38.21 (9.06)	37.16 (12.81)	13 (34.2)	7 (22.6)
Horber et al., 2020	Cohort	Liraglutide	3 mg	6 months and 24 months for BMI change	72	34	NR	Roux-en-Y bypass	56 (10)	NR	3 (8.8)	NR
Jamal et al., 2023	Cohort	Liraglutide	3 mg	6 months	NR	57	NR	Sleeve gastrectomy	36.71 (7.3)	NR	15 (26.32)	NR
Jamal et al., 2024	Cohort	Semaglutide	0.25 mg	6 months	71.8 (51.1)	70	NR	Sleeve gastrectomy	38.1 (10.3)	NR	14 (20)	NR
Jamal et al., 2024	Cohort	Tirzepatide	2.5 mg	6 months	71.8 (51.1)	45	NR	Sleeve gastrectomy	40.2 (10.5)	NR	8 (17.8)	NR
Jensen et al., 2023	Cohort	Liraglutide and sema-glutide	1.8 – 3 mg	6 months	72	50	NR	MBS	50.18 (3)	NR	9 (18)	NR
Kanai et al., 2024	Cohort	Semaglutide	NR	12 months	52 (14)	29	NR	Sleeve gastrectomy	47.2 (8.7)	NR	17 (58.6)	NR
Lautenbach et al., 2022	Cohort	Semaglutide	0.5 mg	6 months	64.7 (47.6)	44	NR	MBS	46.8 (7.3)	46.3 (9.6)	3 (20)	12 (27)
Lautenbach et al., 2023	Cohort	Semaglutide	1 mg	6 months	64.5 (51.9)	29	NR	MBS	48.7 (5.3)	48.4 (9.9)	2 (18.9)	3 (16.7)
Lofton et al., 2024	RCT	Liraglutide	3 mg	12 months	18 to 24	89	43	Roux-en-Y bypass	46.74 (9.74)	48.21 (10.67	14 (15.73)	5 (11.63)
Mok et al., 2023	RCT	Liraglutide	3 mg	6 months	55.1 (33.3)	35	35	MBS	46.7 (10.8)	48.4 (10.6)	9 (26)	9 (26)
Muratori et al., 2022	Cohort	Liraglutide	3 mg	NR	70.7 (43.7)	62	NR	MBS	43.6 (9.9)	NR	2 (3.2)	NR
Pajecki et al., 2012	Cohort	liraglutide	1.2 to 1.8 mg	NR	63.6 (39.6)	15	NR	MBS	47.2 (12.5)	NR	5 (33.3)	NR
Rye et al., 2018	Cohort	Liraglutide	3 mg	7 months	76.3 (72.9)	20	NR	MBS	49.6 (8.3)	NR	1 (5)	NR
Thuker et al., 2021	RCT	Liraglutide	3 mg	6 months	NR	12	11	Sleeve gastrectomy	40.2 (11.8)	44.7 (11.7)	6 (50)	5 (45.5)
Vinciguerra et al., 2023	Cohort	Liraglutide	2.4 mg	6 months	20 (6)	59	NR	MBS	38.6 (11.8)	NR	17 (29)	NR

RCT randomized controlled trial, *NR* not reported, *SD* standard deviation, *BMI* body mass index, *MBS* metabolic bariatric surgery



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Obesity Surgery (2025) 35:1947–1960
https://doi.org/10.1007/s11695-025-07856-y

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REVIEW

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2025

Efficacy and Safety of GLP- 1 Receptor Agonists in the Management of Weight Recurrence or Suboptimal Clinical Response after Undergoing Metabolic Bariatric Surgeries: A Meta-Analysis

Arief Arrowaili[1]

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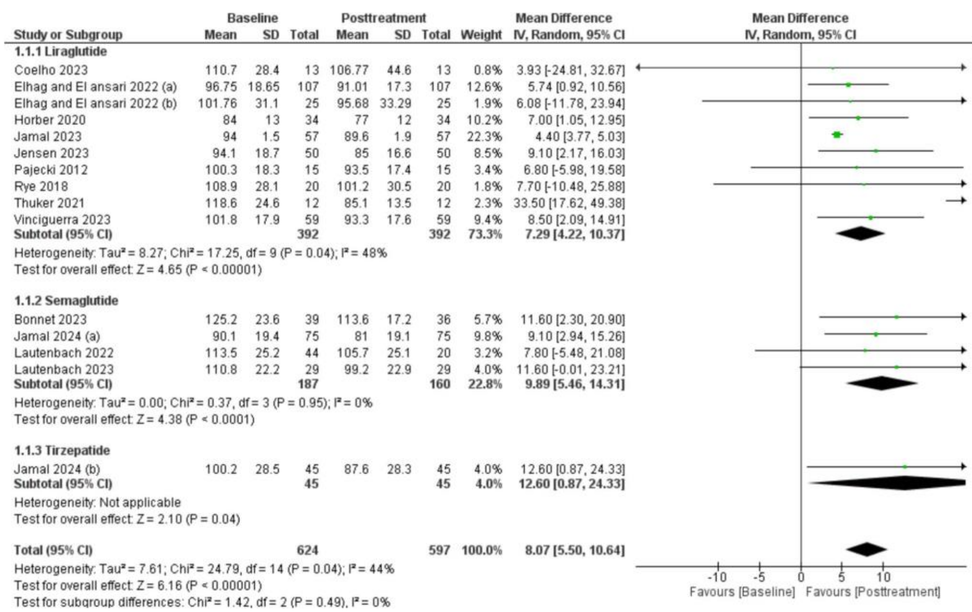
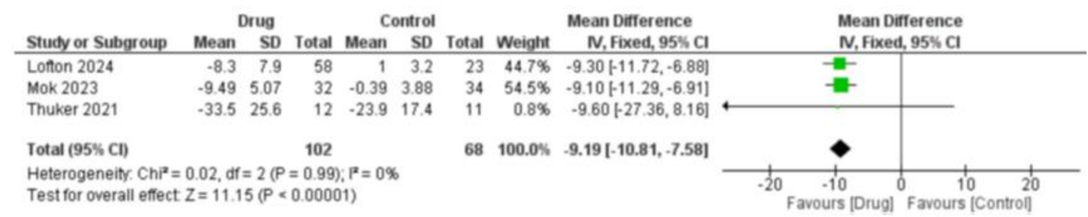


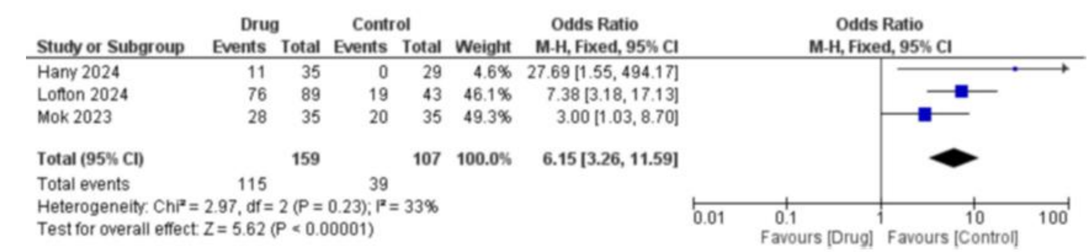
Study or Subgroup	Baseline Mean	Baseline SD	Baseline Total	Posttreatment Mean	Posttreatment SD	Posttreatment Total	Weight	Mean Difference IV, Random, 95% CI
1.1.1 Liraglutide								
Coelho 2023	110.7	28.4	13	106.77	44.6	13	0.8%	3.93 [-24.81, 32.67]
Elhag and El ansari 2022 (a)	96.75	18.65	107	91.01	17.3	107	12.6%	5.74 [0.92, 10.56]
Elhag and El ansari 2022 (b)	101.76	31.1	25	95.68	33.29	25	1.9%	6.08 [-11.78, 23.94]
Horber 2020	84	13	34	77	12	34	10.2%	7.00 [1.05, 12.95]
Jamal 2023	94	1.5	57	89.6	1.9	57	22.3%	4.40 [3.77, 5.03]
Jensen 2023	94.1	18.7	50	85	16.6	50	8.5%	9.10 [2.17, 16.03]
Pajecki 2012	100.3	18.3	15	93.5	17.4	15	3.4%	6.80 [-5.98, 19.58]
Rye 2018	108.9	28.1	20	101.2	30.5	20	1.8%	7.70 [-10.48, 25.88]
Thuker 2021	118.6	24.6	12	85.1	13.5	12	2.3%	33.50 [17.62, 49.38]
Vinciguerra 2023	101.8	17.9	59	93.3	17.6	59	9.4%	8.50 [2.09, 14.91]
Subtotal (95% CI)			**392**			**392**	**73.3%**	**7.29 [4.22, 10.37]**
Heterogeneity: Tau² = 8.27; Chi² = 17.25, df = 9 (P = 0.04); I² = 48%								
Test for overall effect: Z = 4.65 (P < 0.00001)								
1.1.2 Semaglutide								
Bonnet 2023	125.2	23.6	39	113.6	17.2	36	5.7%	11.60 [2.30, 20.90]
Jamal 2024 (a)	90.1	19.4	75	81	19.1	75	9.8%	9.10 [2.94, 15.26]
Lautenbach 2022	113.5	25.2	44	105.7	25.1	20	3.2%	7.80 [-5.48, 21.08]
Lautenbach 2023	110.8	22.2	29	99.2	22.9	29	4.0%	11.60 [-0.01, 23.21]
Subtotal (95% CI)			**187**			**160**	**22.8%**	**9.89 [5.46, 14.31]**
Heterogeneity: Tau² = 0.00; Chi² = 0.37, df = 3 (P = 0.95); I² = 0%								
Test for overall effect: Z = 4.38 (P < 0.0001)								
1.1.3 Tirzepatide								
Jamal 2024 (b)	100.2	28.5	45	87.6	28.3	45	4.0%	12.60 [0.87, 24.33]
Subtotal (95% CI)			**45**			**45**	**4.0%**	**12.60 [0.87, 24.33]**
Heterogeneity: Not applicable								
Test for overall effect: Z = 2.10 (P = 0.04)								
Total (95% CI)			**624**			**597**	**100.0%**	**8.07 [5.50, 10.64]**
Heterogeneity: Tau² = 7.61; Chi² = 24.79, df = 14 (P = 0.04); I² = 44%								
Test for overall effect: Z = 6.16 (P < 0.00001)								
Test for subgroup differences: Chi² = 1.42, df = 2 (P = 0.49), I² = 0%								

Effect of use of GLP- 1 agonist drugs on weight change according to the drug used



Study or Subgroup	Drug Mean	Drug SD	Drug Total	Control Mean	Control SD	Control Total	Weight	Mean Difference IV, Fixed, 95% CI
Lofton 2024	-8.3	7.9	58	1	3.2	23	44.7%	-9.30 [-11.72, -6.88]
Mok 2023	-9.49	5.07	32	-0.39	3.88	34	54.5%	-9.10 [-11.29, -6.91]
Thuker 2021	-33.5	25.6	12	-23.9	17.4	11	0.8%	-9.60 [-27.36, 8.16]
Total (95% CI)			**102**			**68**	**100.0%**	**-9.19 [-10.81, -7.58]**
Heterogeneity: Chi² = 0.02, df = 2 (P = 0.99); I² = 0%								
Test for overall effect: Z = 11.15 (P < 0.00001)								

Comparison between GLP- 1 and control in the weight reduction



Study or Subgroup	Drug Events	Drug Total	Control Events	Control Total	Weight	Odds Ratio M-H, Fixed, 95% CI
Hany 2024	11	35	0	29	4.6%	27.69 [1.55, 494.17]
Lofton 2024	76	89	19	43	46.1%	7.38 [3.18, 17.13]
Mok 2023	28	35	20	35	49.3%	3.00 [1.03, 8.70]
Total (95% CI)		**159**		**107**	**100.0%**	**6.15 [3.26, 11.59]**
Total events	115		39			
Heterogeneity: Chi² = 2.97, df = 2 (P = 0.23); I² = 33%						
Test for overall effect: Z = 5.62 (P < 0.00001)						

Comparison between GLP- 1 and control in the risk of adverse events

Arrowaili A. Efficacy and Safety of GLP- 1 Receptor Agonists in the Management of Weight Recurrence or Suboptimal Clinical Response after Undergoing Metabolic Bariatric Surgeries: A Meta-Analysis. Obes Surg. 2025 May;35(5):1947-1960.

Comment

International Federation for the Surgery of Obesity statement on metabolic bariatric surgery after pharmacotherapy-induced weight loss in clinical obesity

Cohen RV, Prager G, le Roux CW, Lingvay I, Salminen P.
Lancet Diabetes Endocrinol. 2025 Jul 22:S2213-8587(25)00198-6..

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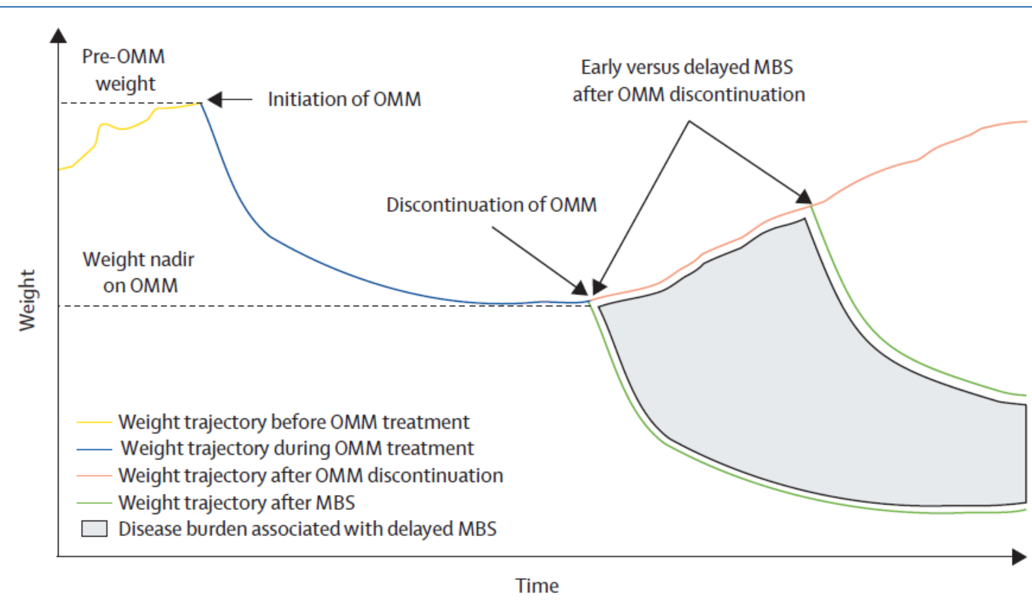

There is considerable variation in treatment response after both MBS and OMMs, mainly due to the heterogeneity of the disease.

Persistence of obesity and related burden of excess adiposity could persist after active treatment due to:

1. initial suboptimal clinical response
2. high baseline BMI despite a good clinical outcome with either approach, or
3. recurrent weight gain during follow-up after initial good response.

Obesity treatment should follow the **principles of chronic disease management**, which entails **combining multiple potentially synergistic or additive treatment approaches when treatment goals are not met or when the disease progresses**, involving clinical or surgical options, **without implying failure or hierarchy**.

Cohen RV, Prager G, le Roux CW, Lingvay I, Salminen P. International Federation for the Surgery of Obesity statement on metabolic bariatric surgery after pharmacotherapy-induced weight loss in clinical obesity. Lancet Diabetes Endocrinol. 2025 Jul 22:S2213-8587(25)00198-6..

Time to Rethink the Approach to Treating Obesity

2024

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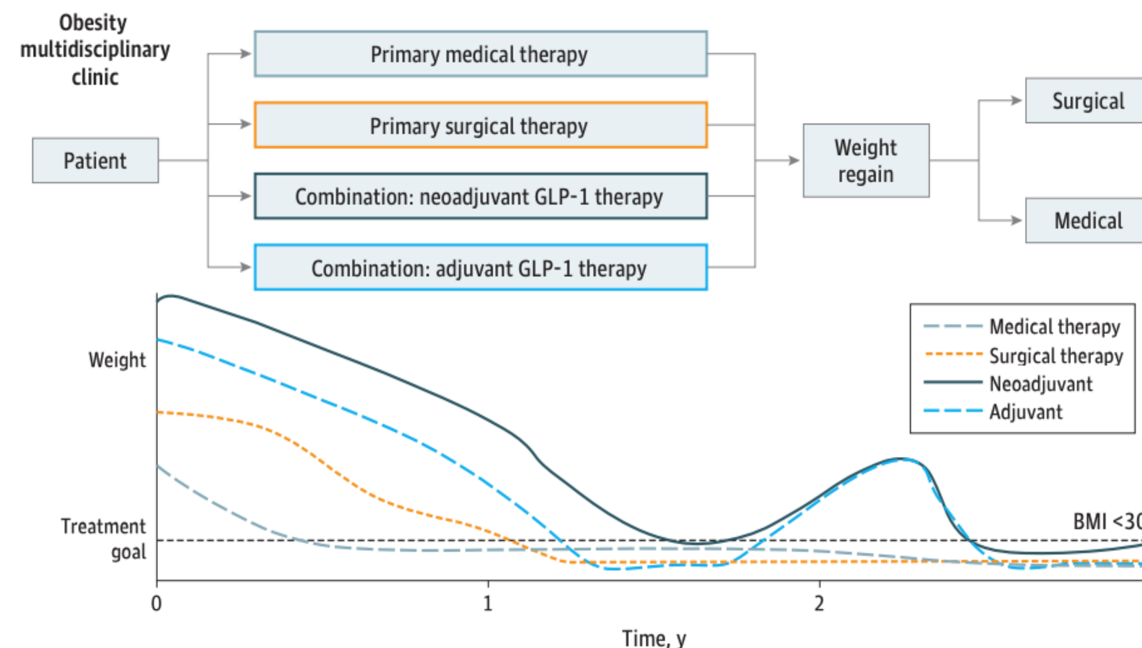
Figure. Proposed Multidisciplinary Obesity Treatment Paradigm



A multidisciplinary approach to obesity therapy would implement evidence-based treatment goals achieved through either monotherapy or combination therapy with encouragement of long-term monitoring and follow-up.
BMI indicates body mass index (calculated as weight in kilograms divided by height in meters squared); GLP-1, glucagon-like peptide 1.

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Maurizio De Luca

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IFSO 2025 Venice Declaration

Obesity Surgery
https://doi.org/10.1007/s11695-025-07869-7

IFSO GLOBAL STATEMENT

The Venice Declaration: Obesity as a Disease—A Call to Action for Diagnosis, Multimodal Treatment, and Policy Change

Maurizio De Luca[1] · Amanda Belluzzi[1] · Giuseppe Navarra[2] · Tarissa B. Z. Petry[3] · Scott Shikora[4] · Nicola Di Lorenzo[5] · Ricardo V. Cohen[3]

1. Obesity: A Global Epidemic and Public Health Priority
2. Obesity as a Complex, Multifactorial Disease
3. The spectrum of obesity
4. The Challenge of Diagnostic Inertia and Therapeutic Inertia
5. Multimodal and Combined Treatment Strategies
6. Addressing Therapeutic Inertia through Education and Policy
7. The IFSO Global Call to Action

The IFSO Global Call to Action

IFSO urges governments, healthcare systems, and global health organizations to recognize obesity as a public health priority and to adopt multimodal, patient-centered care strategies that address the entire continuum of obesity.

Take home messages

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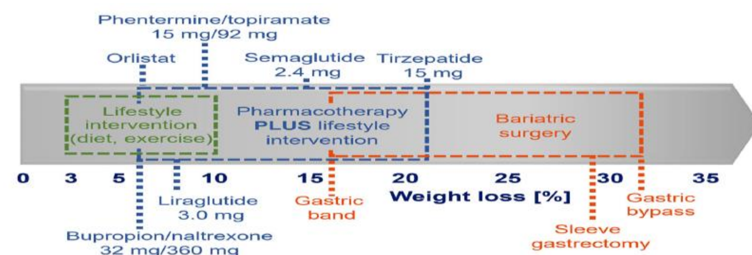

News & Analysis

Medical News & Perspectives

What Does the Rise of GLP-1 Drugs Mean for Bariatric Surgery?

Kate Schweitzer

2025

"Choices are being framed as 'either or' or one-size-fits-all, but **combination therapies are common in medicine, so why not consider them here**?"

"How can we systematically approach this so we can individualize treatment?"

"If this is an opportunity to bring more people in so they can learn about the benefits of bariatric surgery and not be afraid of it, that can increase those numbers".

"There's enough room for all of us."

Schweitzer K. What Does the Rise of GLP-1 Drugs Mean for Bariatric Surgery? JAMA. 2025 Mar 4;333(9):743-745.
Blüher M, Aras M, Aronne LJ, Batterham RL, Giorgino F, Ji L, Pietiläinen KH, Schnell O, Tonchevska E, Wilding JPH. New insights into the treatment of obesity. Diabetes Obes Metab. 2023 Aug;25(8):2058-2072.

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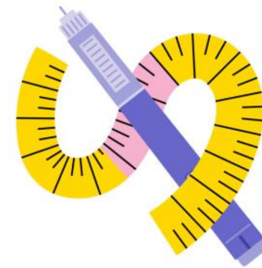
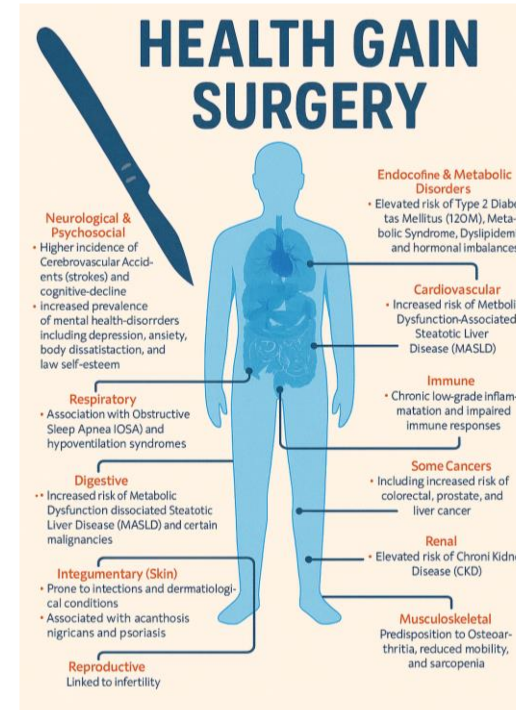
There is
no progress
without
change.





Thank you for your attention