

SUPPLEMENTARY MATERIALS

SICOB Italian Clinical Practice GRADE-based Guidelines for the endobariatric treatment of overweight, obesity and obesity-associated diseases.

LIST OF ABBREVIATIONS AND ACRONYMS

BMI: Body Mass Index
BTA: Botulin Tossin A
CNEC: National Center for Clinical Excellence, Quality, and Evidence Safety
HDL Cholesterolemia: High-Density Lipoprotein Cholesterolemia
ERT: Evidence Review Team
ESG: Endoscopic Sleeve Gastrectomy
Etd: Evidence to Decision
FPG: Fasting Plasma Glucose
GCP: Greater Curvature Plication
GLP-1: Glucagon-Like Peptide-1
GRADE: Grading Of Recommendations, Assessment, Development And Evaluation
HA: Hyaluronic Acid
HA: Hyaluronic Acid Injection
Hba1c: Glycated Hemoglobin
IA: Arterial Hypertension
DL: Dyslipidemia
ICER: Incremental Cost-Efficacy Ratio
ICUR: Incremental Cost-Utility Ratio
IGB: IntraGastric Balloonn
IWQOL: Impact Of Weight on Quality of Life
LAGB: Laparoscopic Adjustable Gastric Banding
LG: Guidelines
LSG: Laparoscopic Sleeve Gastrectomy
MACE: Major Adverse Cardiovascular Events
MDC: Medical Doctor
MD: Mean Difference
MH-OR: Mantel-Haenszel Odds Ratio
OAGB: One Anastomosis Gastric Bypass
OR: Odds Ratio
OSAS: Obstructive Sleep Apnoea Syndrome
PAD: Diastolic Blood Pressure
PAS: Systolic Blood Pressure
PICOS: Population, Intervention, Comparison, Outcome, Study Design
QALY: Quality Adjusted Life Years
Qol: Quality of Life
RCT: Randomized Controlled Trial
RR: Relative Risk
RYGB: Roux-En-Y Gastric Bypass
SAE: Severe Adverse Events
SF-12: Short Form-12
SF-36: Short Form-36
SIC: Italian Society of Surgery
SICE: Italian Society of Endoscopic Surgery and New Technologies
SICOB: Italian Society for Obesity Surgery
SID: Italian Society of Diabetology

SIO: Italian Society of Obesity

SIP: Italian Society of Pediatrics

SIUEC: Italian Unified Society of Endocrine Surgery

SoC: Standard of Care

USD: US Dollars

WMD: Weighted Mean Difference

GUIDELINE WORKING GROUP

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DECLARATION OF POTENTIAL CONFLICTS OF INTEREST

All panel members and members of the Evidence Review Team (ERT) completed the conflict of interest disclosure form developed by the CNEC. Below is a summary of the declarations made by individual members

PANEL MEMBERS

Last and First Name	Potential conflicts of interest
Marco Antonio Zappa	no conflicts of interest to declare
Carbonelli Maria Grazia	no conflicts of interest to declare
Cataldo Rita	no conflicts of interest to declare
Cerbone Rosaria	no conflicts of interest to declare
Chianelli Marco	no conflicts of interest to declare
Conigliaro Rita	no conflicts of interest to declare
Cuttica Carla Micaela	no conflicts of interest to declare
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Docimo Ludovico	no conflicts of interest to declare
Gagliardi Giuseppe	no conflicts of interest to declare
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Goracci Arianna	no conflicts of interest to declare
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Lorenzoni Valentina	no conflicts of interest to declare
Manta Raffaele	no conflicts of interest to declare

Marzullo Paolo	no conflicts of interest to declare
Medea Gerardo	no conflicts of interest to declare
Monami Matteo	no conflicts of interest to declare
Navarra Giuseppe	no conflicts of interest to declare
Ortenzi Monica	no conflicts of interest to declare
Paolini Barbara	no conflicts of interest to declare
Piazza Luigi	no conflicts of interest to declare
Porri Debora	no conflicts of interest to declare
Rahimi Farnaz	no conflicts of interest to declare
Rugolotto Simone	no conflicts of interest to declare
Sarnelli Giovanni	no conflicts of interest to declare
Sessa Luca	no conflicts of interest to declare
Scalamogna Caterina	no conflicts of interest to declare
Zani Iris	fees from Boehringer-Ingelheim
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EVIDENCE REVIEW TEAM

Last and First Name	Potential conflicts of interest
Benedetta Ragghianti	no conflicts of interest to declare
Giulia Bandini	no conflicts of interest to declare
Antonio Silverii	no conflicts of interest to declare

OBJECTIVES, SCOPE OF APPLICATION OF THE GUIDELINES AND STAKEHOLDER INVOLVEMENT

Objectives	The purpose of the guideline is to provide a reference on the use of bariatric endoscopy in the treatment of obesity and morbidities in pediatric and adult patients.
Target population	The target population is overweight and obese patients aged ≥ 14 years.
Main concomitant conditions	In the formulation of recommendations, account will be taken of the possible presence of severe comorbidities that may significantly influence the indications for performing a bariatric endoscopy or the type of intervention.
Setting	The recommendations apply to outpatients and inpatients for both primary and specialist care.
Main users and stakeholders	The persons concerned by the guideline are: doctors, nurses, dieticians and educators working in specialized surgical and endocrinological facilities; general practitioners and their nurses; psychologists; territorial nurses and dieticians. The patients' association was represented by a delegate who was responsible for reporting the views and preferences of the target population to the panel, actively participating in the definition of the PICO's (see following chapters) and outcomes and in the subsequent voting.
Main resources to consider	In drafting the guidelines, consideration will be given to existing care resources, whether specific recommendations lead to changes in the organization of care, and cost-effectiveness data will be taken into account where available.
Existing documents	1) Clinical practice guidelines of the European Association for Endoscopic Surgery (EAES) on bariatric surgery: update 2020 endorsed by IFSO-EC, EASO and ESPCOP¹. 2) Development of the Italian clinical practice guidelines on bariatric and metabolic surgery: design and methodological aspects². 3) Linee guida della SICOB - Società Italiana di Chirurgia dell'Obesità e delle Malattie Metaboliche. La terapia chirurgica dell'obesità e delle complicanze associate³. 4) American Society for Gastrointestinal Endoscopy-European Society of Gastrointestinal Endoscopy Guidelines on Primary Endoscopic Bariatric and Metabolic Therapies for Adults with Obesity⁴.

INTERPRETATION OF RECOMMENDATIONS

Grading of Evidence Quality

HIGH QUALITY: High degree of confidence in the results. It is very unlikely that further studies will change confidence in the effect estimate.

MODERATE QUALITY: Moderate degree of confidence in the results. It is likely that further studies may confirm or change confidence in the effect estimate.

LOW QUALITY: The results are of limited credibility. Further studies are needed to obtain reliable estimates of the positive and negative effects of the intervention.

VERY LOW QUALITY: The examined data are completely unreliable. It is not possible to rely on the available effect estimates.

Interpretation of recommendations

Strong Recommendation

- for Clinicians: Most patients should receive the recommended intervention;
- for Patients: Nearly all well-informed patients act according to the recommendation, and only a small portion choose differently;
- for Decision-Makers: the recommendation can be adopted for resource utilization.

Weak Recommendation

- for Clinicians: They should carefully and thoroughly consider the values and preferences of patients that may influence their choice;
- for Patients: A significant portion of well-informed patients acts according to the recommendation, but a good percentage chooses differently;
- for Decision-Makers: It is necessary to develop discussion and involve stakeholders.

GUIDELINES DEVELOPMENT METHODOLOGY

The process of developing and drafting this guideline follows the methodology outlined in the Methodological Manual of the National Guidelines System by the Italian National Institute of Health (Istituto Superiore di Sanità), available at <http://www.snlg-iss.it>. The various development phases are briefly described in the sections below.

Characteristics of the Panel Involved in Guideline Development

Panel members, selected by SICOB in collaboration with other scientific societies, appointed a coordinator and designated members for the evidence review team; this team actively collects and analyzes evidence without participating in defining clinical questions, outcomes, and recommendations. The full list of the 32 panel members, along with their roles, and the 3 evidence review team members, can be found in the section "GUIDELINE WORKING GROUP."

All panel and evidence review team members completed a declaration of potential conflicts of interest, which were collectively discussed to assess their relevance. All reported conflicts were deemed minimal or irrelevant; therefore, all panel and evidence review team members participated in drafting all recommendations.

GRADE Methodology for Guideline Development

The GRADE⁵ methodology was developed to reduce the influence of personal opinions and biases on guideline recommendations, ensuring greater adherence to evidence from methodologically sound studies. The first step in developing guidelines using this method is defining a scoping document that establishes the objectives, target population, and healthcare providers involved.

The next phase is to define a series of clinical questions using the PICO (Patient, Intervention, Comparison, Outcome) framework. Each recommendation is developed in response to a question. For each question, the expert panel defines a series of clinical outcomes that may be relevant for choosing different clinical options. Each outcome is then rated (from 1 to 9) based on its importance; those with a score of 7 or higher are classified as "critical" and form the basis of the recommendation.

For each critical outcome, the evidence review team performs a systematic review of relevant studies, predefining search strategies and inclusion criteria and conducting meta-analyses when possible. Studies and their meta-analyses are evaluated for methodological quality to determine the true strength of the available evidence.

To ensure maximum methodological rigor, the panel decided to include randomized clinical trials, which are at the top of the evidence pyramid, for interventional PICO studies (assessing the efficacy and safety of endoscopic treatments). Observational, non-controlled studies were also included for diagnostic PICO studies.

Additional assessments include economic considerations (based on cost-utility analysis, where possible), organizational impact, equity, acceptability, and feasibility. The final recommendation incorporates all these elements.

Delphi Process

The clinical questions developed by the panel using the PICO format are listed in Table 1.

From June 2023 to February 2024, the panel was invited to propose topics using the PICO framework and to express their level of agreement or disagreement with each proposed topic

using a 5-point Likert scale (1, strongly disagree; 2, disagree; 3, agree; 4, mostly agree; and 5, strongly agree)⁶. Results were expressed as a percentage, classifying each topic with a value of 1 or 2 in cases of disagreement, or with a value of 3, 4, or 5 in cases of agreement. Positive consensus was achieved if agreement exceeded 66%, negative consensus if disagreement exceeded 66%, and no consensus if the sum of agreement and disagreement was less than 66%. For topics where consensus was not reached, the panel was asked to express their agreement or disagreement again in a second round after further discussion⁷.

Outcomes selection

The panel identified and subsequently ranked the outcomes by importance through an individual voting process using a 9-point scale:

0-3 points: low relevance

4-6 points: important but not critical

7-9 points: critical.

Only outcomes categorized as critical were considered in the literature review and subsequently in the recommendation formulation. Full voting results are shown in Table 1.

Literature Review and Quality Assessment of Evidence

A systematic literature search was conducted (criteria provided in Table 2) in the following bibliographic databases and websites:

- Cochrane Database of Systematic Reviews (CDSR) (Wiley)
- Cochrane Central Register of Controlled Trials (CENTRAL) (Wiley)
- MEDLINE (OVID)
- Embase (OVID)
- Clinicaltrials.gov

For all clinical questions developed by the expert panel, priority was always given to randomized controlled trials (RCTs) or subgroup analyses of clinical trials. Only when these sources were unavailable and for PICO questions not related to surgical, endoscopic, or pharmacological treatments, were observational studies considered.

Each database utilized specific search strategies (see respective chapters), including search terms and temporal limits. No language restrictions were applied. Bibliographic references of studies acquired in full text were also reviewed to identify additional studies.

The following activities were then conducted:

- Selection of records obtained from the bibliographic search based on title and abstract. Studies deemed potentially eligible were retrieved in full text.
- Identification of relevant studies based on predetermined inclusion and exclusion criteria.
- Critical appraisal of the risk of bias in studies using validated tools and cochecklists, such as AMSTAR 2 for systematic reviews and the Cochrane Collaboration's criteria for RCTs.
- Data extraction regarding study characteristics, population under review, outcomes considered, and results. Summary tables (available for each chapter) were prepared.
- Quantitative synthesis of results for each outcome. The Mantel-Haenszel Odds Ratio (MH-OR) was used for dichotomous outcomes, and the weighted mean difference (WMDC) was used for continuous outcomes, with 95% confidence intervals. Random-effects models were primarily used; fixed-effects models were employed for sensitivity analyses.
- Assessment of heterogeneity (I^2 test) and publication bias (Funnel plot).

- Evaluation of the confidence in overall evidence quality regarding selected outcome measures, performed using GRADE criteria, with the creation of GRADE evidence tables.
- Summary of results in Evidence to Decision (EtD) frameworks using the GRADEPro Guideline Development tool (<https://grade.pro.org>). The EtD frameworks summarize systematic literature review results across eight dimensions: priority of the problem, desirable and undesirable effects, certainty of evidence, patient values and preferences, required resources, equity, acceptability, and feasibility.

The following software was used for statistical analyses: [Software details would typically be listed here based on specifics provided].

RevMan 5.0: meta-analisi (<https://training.cochrane.org/online-learning/core-software-cochrane-reviews/revman/revman-5-download>);

MetaXL: network metanalisi (http://epigear.com/index_files/metaxl.html)

Guideline Recommendation Development

During the guideline (LG) development, the panel was presented with:

- Evidence tables for each chapter
- Results (forest plot)
- EtD framework for each clinical question

The panel formulated the recommendations by considering the quality of evidence for each outcome and the synthesized literature results across the dimensions outlined in the EtD. Panel discussions were followed by individual voting on each dimension and a final vote to establish the recommendations. In cases of disagreement, panel members engaged in further discussion until consensus was reached.

Guideline Update

Systematic literature reviews supporting the current version of the guidelines will be updated (following the same search protocol) at least once every two years from the guideline's approval date. The ERT (Evidence Review Team) and Panel will assess if new evidence impacts the risk/benefit balance or the overall evidence quality in a way that warrants changing the recommendation formulation, strength, or evidence grade.

Additionally, every two years, the SICOB-nominated Panel will review the need to modify, update, add, or remove questions, adjust outcomes of interest, or their respective weighting. If there are changes to the questions and/or critical outcomes, a comprehensive re-evaluation will be conducted to arrive at new recommendations.

DEFINITION OF PICOs

Table 1S – Voting on Individual Clinical Questions According to the Delphi Method and Outcomes of Efficacy and Safety (Critical and Non-Critical)

N	PICO	Disagreement (score 1–2)	Agreement (score 3–5)	Outcome (median)	Approval
A. INDICATIONS					
1	<i>In patients with overweight (BMI 27-29.9) and at least one uncontrolled obesity-related medical condition (type 2 diabetes, hypertension, dyslipidemia, liver metabolic disease, obstructive sleep apnea syndrome, load-bearing arthropathies, etc.), are bariatric endoscopic procedures (suturing systems and endoluminal procedures) preferable to psychological/nutritional and medical approaches for weight loss?</i>	0%	100%	-	
<i>Outcome (effectiveness)</i>					
1.1	Remission of obesity-related medical conditions (type 2 diabetes, hypertension, dyslipidemia, liver metabolic disease, obstructive sleep apnea syndrome, load-bearing arthropathies, etc.)			8	
1.2	Improvement in glycemic metabolism (HbA1c, FPG, lipid profile, blood pressure)			8	
1.3	Reduction in body weight (BMI, percentage weight loss, and excess weight)			9	
1.4	Reduction in major cardiovascular events			7.5	
1.5	Reduction in all-cause mortality			7	
1.6	Improvement in quality of life			8	
1.7	Decreased incidence of weight regain			7	
1.8	Decreased incidence of insufficient weight loss			7	
<i>Outcome (safety)</i>					
1.9	Perioperative mortality			7.5	
1.10	Serious periprocedural adverse events			7.5	
1.11	Nutritional deficits			7	

N	PICO	Disagreement (score 1–2)	Agreement (score 3–5)	Outcome (median)	Approval
1.12	Total serious adverse events			8.5	
N	PICO	Disagreement (score 1–2)	Agreement (score 3–5)	Outcome (median)	Approval
2	<i>In patients with class I obesity (BMI 30-34.9) and at least one obesity-related medical condition (type 2 diabetes, hypertension, dyslipidemia, liver metabolic disease, obstructive sleep apnea syndrome, load-bearing arthropathies, polycystic ovary syndrome), are bariatric endoscopic procedures (suturing systems and endoluminal procedures) preferable to psychological/nutritional and medical approaches for weight loss?</i>	0%	100%	-	
	<i>Outcome (effectiveness)</i>				
2.1	Remission of obesity-related medical conditions (type 2 diabetes, hypertension, dyslipidemia, liver metabolic disease, obstructive sleep apnea syndrome, load-bearing arthropathies, etc.)			8.5	
2.2	Improvement in glycometabolic control (HbA1c, FPG, lipid profile, blood pressure)			8.5	
2.3	Reduction in body weight (BMI, percentage weight loss, and excess weight)			9	
2.4	Reduction in major cardiovascular events			8	
2.5	Reduction in all-cause mortality			7	
2.6	Improvement in quality of life			8	
2.7	Reduced incidence of weight-regain			8	
2.8	Reduced incidence of insufficient weight loss			8	
	<i>Outcome (safety)</i>				
2.9	Perioperative mortality			8	
2.10	Serious periprocedural adverse events			8	
2.11	Nutritional deficits			7	
2.12	Total serious adverse events			8.5	

N	PICO	Disagreement (score 1–2)	Agreement (score 3–5)	Outcome (median)	Approval
3	<i>In patients with class ≥ II obesity (BMI ≥ 35), regardless of the presence of obesity-related medical conditions (type 2 diabetes, hypertension, dyslipidemia, liver metabolic disease, obstructive sleep apnea syndrome, load-bearing arthropathies, polycystic ovary syndrome), are bariatric endoscopic procedures (suturing systems and endoluminal procedures) preferable to the psychological/nutritional and medical approach for weight loss?</i>	0%	100%	-	
	<i>Outcome (effectiveness)</i>				
3.1	Remission of obesity-related medical conditions (type 2 diabetes, hypertension, dyslipidemia, liver metabolic disease, obstructive sleep apnea syndrome, load-bearing arthropathies, etc.)			8	
3.2	Improvement of glycemic and metabolic control (HbA1c, FPG, lipid profile, blood pressure)			8	
3.3	Reduction of body weight (BMI, percentage weight loss, and excess weight)			9	
3.4	Reduction of major cardiovascular events			8	
3.5	Reduction of all-cause mortality			7	
3.6	Improvement in quality of life			8	
3.7	Lower incidence of weight regain			8	
3.8	Lower incidence of insufficient weight loss			8	
	<i>Outcome (safety)</i>				
3.9	Perioperative mortality			8	
3.10	Serious periprocedural adverse events			8	
3.11	Nutritional deficiencies			7	
3.12	Total serious adverse events			8.5	
N	PICO	Disagreement (score 1–2)	Agreement (score 3–5)	Outcome (median)	Approval

B. TEMPORARY INTRAGASTRIC PROCEDURES

N	PICO	Disagreement (score 1–2)	Agreement (score 3–5)	Outcome (median)	Approval
4	<i>In patients aged 14-17 years with overweight (BMI 27-29.9) and at least one uncontrolled obesity-related medical condition (type 2 diabetes, hypertension, dyslipidemia, liver metabolic disease, obstructive sleep apnea syndrome, load-bearing arthropathies, etc.), are temporary intragastric procedures (intragastric balloon) preferable to psychological/nutritional and medical approaches for the treatment of overweight?</i>	13.4%	86.6%	-	
	<i>Outcome (effectiveness)</i>				
4.1	Remission of obesity-related medical conditions (type 2 diabetes, hypertension, dyslipidemia, liver metabolic disease, obstructive sleep apnea syndrome, load-bearing arthropathies, etc.)			8	
4.2	Improvement in glycometabolic control (HbA1c, FPG, lipid profile, blood pressure)			8	
4.3	Reduction in body weight (BMI, percentage weight reduction, and excess weight loss)			8	
4.4	Reduction in major cardiovascular events			8	
4.5	Reduction in all-cause mortality			7	
4.6	Improvement in quality of life			8	
4.7	Reduced incidence of weight regain			7	
4.8	Reduced incidence of insufficient weight loss			7	
	<i>Outcome (safety)</i>				
4.9	Perioperative mortality			7.5	
4.10	Serious periprocedural adverse events			7.5	
4.11	Nutritional deficiencies			7	
4.12	Total serious adverse events			8.5	

N	PICO	Disagreement (score 1–2)	Agreement (score 3–5)	Outcome (median)	Approval
5	<i>In patients aged 14-17 years with obesity (BMI ≥30 kg/m²), are temporary intragastric procedures (intragastric balloon) preferable to psychological/nutritional and medical approaches for the treatment of obesity?</i>	13.4%	86.6%	-	
Outcome (effectiveness)					
5.1	Remission of obesity-related medical conditions (type 2 diabetes, hypertension, dyslipidemia, liver metabolic disease, obstructive sleep apnea syndrome, load-bearing arthropathies, etc.)			8	
5.2	Improvement in glycometabolic control (HbA1c, FPG, lipid profile, blood pressure)			8	
5.3	Reduction in body weight (BMI, percentage weight reduction, and excess weight loss)			8	
5.4	Reduction in major cardiovascular events			8	
5.5	Reduction in all-cause mortality			7	
5.6	Improvement in quality of life			8	
5.7	Reduced incidence of weight regain			7	
5.8	Reduced incidence of insufficient weight loss			7	
Outcome (safety)					
5.9	Perioperative mortality			7.5	
5.10	Serious periprocedural adverse events			7.5	
5.11	Nutritional deficiencies			7	
5.12	Total serious adverse events			8.5	
N	PICO	Disagreement (score 1–2)	Agreement (score 3–5)	Outcome (median)	Approval
C. REVISIONAL SURGERY					
6	<i>In patients with insufficient weight loss or weight regain after MBS, is bariatric endoscopy (suturing and endoluminal systems)</i>	6.7%	93.3%	-	

N	PICO	Disagreement (score 1–2)	Agreement (score 3–5)	Outcome (median)	Approval
	<i>preferable to the psychological/nutritional and medical approach for weight loss?</i>				
	<i>Outcome (effectiveness)</i>				
6.1	Remission of obesity-related medical conditions (type 2 diabetes, hypertension, dyslipidemia, liver metabolic disease, obstructive sleep apnea syndrome, load-bearing arthropathies, etc.)			8	
6.2	Improvement in glycometabolic control (HbA1c, FPG, lipid profile, blood pressure)			7.5	
6.3	Reduction in body weight (BMI, percentage weight reduction, and excess weight loss)			8.5	
6.4	Reduction in major cardiovascular events			8	
6.5	Reduction in all-cause mortality			7	
6.6	Improvement in quality of life			7.5	
6.7	Reduced incidence of weight regain			7.5	
6.8	Reduced incidence of insufficient weight loss			8	
	<i>Outcome (safety)</i>				
6.9	Perioperative mortality			8	
6.10	Serious periprocedural adverse events			8	
6.11	Nutritional deficiencies			7	
6.12	Total serious adverse events			8.5	

N	PICO	Disagreement (score 1–2)	Agreement (score 3–5)	Outcome (median)	Approval
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D. ENDOSCOPIC APPROACH TO SURGICAL COMPLICATIONS

7	<i>In patients undergoing metabolic and bariatric surgery, is a prompt endoscopic examination preferable over other tests for diagnosing post-surgical complications when a complication is suspected?</i>	0%	100%	-	
	<i>Outcome (effectiveness)</i>				
7.1	Reduction in re-operations			8	

N	PICO	Disagreement (score 1–2)	Agreement (score 3–5)	Outcome (median)	Approval
7.2	Reduction in length of hospital stay			8	✓
7.3	Reduction in hospitalizations			8	✓
7.4	Reduction in all-cause mortality			8	✓
7.5	Improvement in quality of life			8	✓
	<i>Outcome (safety)</i>				
7.6	Perioperative mortality			8	✓
7.7	Serious periprocedural adverse events			8	✓
7.8	Total serious adverse events			7	✓
8	<i>In patients with post-operative complications (i.e., leak, dehiscence, bleeding, stenosis, anastomotic ulcers, dumping syndrome) following MBS, is an endoscopic approach preferable to other non-endoscopic interventions for the treatment of postoperative complications?</i>	0%	100%	-	✓
	<i>Outcome (effectiveness)</i>				
8.1	Reduction in re-operations			8	✓
8.2	Reduction in length of hospital stay			8	✓
8.3	Reduction in hospitalizations			8	✓
8.4	Reduction in all-cause mortality			8	✓
8.5	Improvement in quality of life			8	✓
	<i>Outcome (safety)</i>				
8.6	Perioperative mortality			8	✓
8.7	Serious periprocedural adverse events			8	✓
8.8	Total serious adverse events			7	✓

ANALYTICAL REPORT OF RECOMMENDATIONS

1. INDICATIONS FOR SURGERY

Questions

PICO 1: *In patients with overweight (BMI 27-29.9) and at least one uncontrolled obesity-related medical condition (type 2 diabetes, hypertension, dyslipidemia, metabolic liver disease, obstructive sleep apnea syndrome, weight-bearing arthropathies, etc.) bariatric endoscopic procedures (suturing systems and endoluminal procedures) are preferable to psychological/nutritional and medical approaches for weight loss.?*

Critical Outcomes:

1. Remission of obesity-related medical conditions (e.g., type 2 diabetes, hypertension, dyslipidemia, metabolic liver disease, obstructive sleep apnea syndrome, weight-bearing joint arthropathies, etc.)
2. Improvement in glycometabolic control (HbA1c, FPG, lipid profile, blood pressure)
3. Reduction in body weight (BMI, percentage weight reduction, and excess weight loss)
4. Reduction in major cardiovascular events
5. Reduction in all-cause mortality
6. Improvement in quality of life
7. Reduced incidence of weight regain
8. Reduced incidence of inadequate weight loss
9. Perioperative mortality
10. Serious periprocedural adverse events)
11. Nutritional deficiencies
12. Total serious adverse events

PICO

<i>Population</i>	Individuals with a BMI between 27 and 29.9 Kg/m ²
<i>Intervention</i>	Endoscopic bariatric surgery
<i>Endoscopic bariatric surgery</i>	Conservative pharmacological/non-pharmacological treatment, either conventional or intensive
<i>Critical Outcomes</i>	See table "Critical and Non-Critical Outcomes"

EVALUATION

Relevance of the problem <i>Is the problem a priority?</i>		
Judgment	Evidence	Adjunctive Considerations
Yes	Overweight, obesity, and weight-related complications are a growing public health issue in many countries due to increasing prevalence, significant health impacts on affected individuals, and the rising economic burden associated with them ⁸⁻¹⁰ . Metabolic and bariatric surgery, developed to achieve substantial weight loss in obese patients, has also shown curative potential for obesity-related medical conditions; however, it is associated with an increased risk of potentially serious adverse events ^{1,11-13} . Bariatric endoscopy may be beneficial in treating obesity by effectively reducing body weight without a high rate of serious adverse events ^{1,14} . However, solid evidence is lacking regarding the therapeutic effects and safety of bariatric endoscopy across different classes of overweight/obesity.	
Favorable Effects <i>Of what extent are the favorable effects of the intervention?</i>		
Judgment	Evidence (see “Supporting Evidence”)	Adjunctive Considerations (see “Supporting Evidence”)
Not Known	No clinical trials with at least 26 weeks of follow-up have been found in patients with a BMI between 27 and 29.9 kg/m ² . Only 4 out of 25 trials ¹⁵⁻¹⁸ meet the inclusion criteria specified in a previous publication ⁶ , but none of these report subgroup analyses for overweight patients or indicate their percentage.	
Adverse Effects <i>Of what extent are the adverse effects of the intervention?</i>		
Judgment	Evidence	Adjunctive Considerations

Not Known	No clinical trials have been conducted on patients with a BMI between 27 and 29.9 kg/m ² . Only 4 ¹⁵⁻¹⁸ out of 26 trials meet the inclusion criteria specified in a previous publication ⁶ , but none of these report subgroup analyses for overweight patients or indicate their percentage.	
Level of evidence <i>What is the degree of evidence for the effects of the intervention?</i>		
Judgment	Evidence (see “GRADE evaluation”)	Adjunctive Considerations
No studies	A judgment cannot be made due to the lack of studies.	
Value <i>Is there significant uncertainty about the value attributable to key outcomes?</i>		
Judgment	Evidence	Adjunctive Considerations
No studies	No evidence of uncertainty. Improvement in obesity-related complications, body weight, quality of life, micro- and macrovascular complications, mortality, and adverse events associated with bariatric endoscopy are already listed among the primary treatment goals for obesity and associated conditions in major national and international guidelines. ¹⁹⁻²² .	
Balance of Effects <i>Does the balance of favorable and unfavorable effects favor the intervention or the comparator?</i>		
Judgment	Evidence	Adjunctive Considerations
No studies	It is not possible to assess the balance of effects of bariatric endoscopy in overweight patients with comorbidities compared to other lifestyle modification interventions due to a lack of studies.	
Resources needed <i>What is the amount of expected costs?</i>		
Judgment	Evidence	Adjunctive Considerations

Elevated	High costs, mainly related to the direct costs of bariatric endoscopy and hospital admission.	
Degree of evidence on resources needed <i>What is the degree of evidence on the resources needed?</i>		
Judgment	Evidence	Adjunctive Considerations
High	There are numerous high-quality studies on the subject (see paragraph “Pharmacoeconomics”; Table 3).	
Cost-effectiveness <i>Does cost-effectiveness favor the treatment under consideration or the comparison treatment?</i>		
Judgment	Evidence (see “Pharmacoeconomic Evidence”)	Adjunctive Considerations
Probably unfavorable	The costs associated with bariatric endoscopy for the treatment of overweight complicated by associated conditions, in the absence of reliable clinical efficacy data from trials, make the cost-effectiveness ratio likely unfavorable.	
Equity <i>What would be the impact of the intervention on equity?</i>		
Judgment	Evidence	Adjunctive Considerations
Probably no impact	There are no specific data.	The number of public facilities capable of providing adequate bariatric endoscopy is limited and not evenly distributed across the territory, meaning that some patients may be forced to turn to private, non-conventionally affiliated facilities.

Acceptability <i>Is the intervention acceptable to all stakeholders?</i>		
Judgment	Evidence	Adjunctive Considerations
Probably yes	No evidence is available.	Individual patients may have different attitudes toward medical, endoscopic, and surgical therapy, depending on their personal assessments and priorities.
Feasibility <i>Is the intervention feasible?</i>		
Judgment	Evidence	Adjunctive Considerations
Probably yes	Numerous centers in Italy are capable of performing bariatric endoscopy procedures, assessing the indications for bariatric endoscopy, and following patients over time to prevent weight regain, as well as monitoring for any late side effects (such as malnutrition, vitamin deficiencies, etc.). However, it is possible that some areas may lack all the necessary expertise, thereby reducing feasibility.	All centers should be monitored to determine whether they are able to follow the recommendations included in these guidelines.

SUMMARY OF THE EVALUATIONS

	JUDGMENT						
Relevance of the problem	Not ☐	Probably Not ☐	Probably Yes ☐	Yes ☒		Variable ☐	Not Known ☐
Favorable effects	Insignificant ☐	Little ☐	Moderate ☐	Big ☐		Variable ☐	Not Known ☒
Unfavorable effects	Big ☐	Moderate ☐	Little ☐	Insignificant ☐		Variable ☐	Not Known ☒
Level of evidence	Very low ☐	Low ☐	Moderate ☐	High ☐			No studies ☒
Value	Very relevant ☐	Probably relevant ☐	Probably not relevant ☐	Not relevant ☒			Not Known ☐
Balance of effects	Unfavorable ☐	Probably unfavorable ☐	Neutral ☐	Probably in favor ☐	In favor ☐	Variable ☐	Not Known ☒
Necessary resources	Elevated ☒	Moderate ☐	Insignificant ☐	Moderate savings ☐	Lare savings ☐	Variable ☐	Not Known ☒
Evidence resources on	Very low ☐	Low ☐	Moderate ☐	High ☐			No studies ☒
Cost-effectiveness	Unfavorable ☐	Probably unfavorable	Neutral ☐	Probably in favor ☐	In favor ☐	Variable ☐	Not Known ☐

		☒					
Equity	Reduced ☐	Probably reduced ☐	Probably no impact ☒	Probably increased ☐	Increased ☐	Variable ☐	Not Known ☐
Acceptability	Not ☐	Probably not ☐	Probably yes ☒	Yes ☐		Variable ☐	Not Known ☐
Feasibility	Not ☐	Probably not ☐	Probably yes ☒	Yes ☐		Variable ☐	Not Known ☐

LEVEL OF RECOMMENDATION

PICO 1

No preference is expressed, either in favor or against, the use of bariatric endoscopy in overweight patients (BMI between 27 and 29.9 kg/m²) with at least one comorbidity not controlled by medical therapy for the treatment of overweight.

Weak recommendation, neither in favor nor against, with very low quality of evidence.

Reason for the recommendation

Bariatric endoscopy in overweight patients with at least one obesity-related complication, compared to other non-surgical interventions, is a potential therapeutic option for achieving weight loss and improving metabolic and non-metabolic complications, with minimal risks of serious adverse events¹⁻³. The evidence review team (ERT) did not find any clinical trials conducted on patients with a BMI between 27 and 29.9 kg/m². Furthermore, in the absence of reliable efficacy and safety data from controlled clinical trials in overweight patients with uncontrolled comorbidities, and considering the costs associated with the procedures proposed in this PICO, the panel expresses an unfavorable opinion regarding the use of bariatric endoscopy in this patient category.

The pharmacoeconomic studies available in the literature show that surgical treatment is associated with higher costs compared to other treatments, although it is cost-effective in obese patients. However, no study has evaluated the cost-benefit ratio in the overweight population. Therefore, the panel does not recommend the use of bariatric endoscopy as a primary intervention in this patient category.

Considerations on subgroups of patients

The utility of bariatric endoscopy cannot be excluded for overweight patients with multiple associated comorbidities. In these patients, at high risk of developing renal and cardiovascular events, weight loss and improvement of comorbidities could justify such interventions even in the absence of clear evidence in this patient category. Indirect evidence from patients with higher BMI values shows clear beneficial effects of weight loss achieved through this type of surgery.

Implementation Considerations

Healthcare providers should be made aware of the content of this recommendation through specific continuing medical education programs.

Evaluation and monitoring

Monitoring and evaluating adherence to these guidelines is very challenging and could be done by assessing the proportion of overweight patients receiving bariatric endoscopy. This monitoring can be conducted through the consultation of medical records.

Research Priorities

Trials are needed in patients with overweight and uncontrolled comorbidities to strengthen the basis for this recommendation.

PICO 2: *In patients with class I obesity (BMI 30-34.9 kg/m²) and at least one obesity-related medical condition (such as type 2 diabetes mellitus, hypertension, dyslipidemia, fatty liver disease, obstructive sleep apnea syndrome, weight-bearing arthropathy, etc.), are endoscopic bariatric procedures (suturing systems and endoluminal procedures) preferable to psychological/nutritional and medical approaches for weight loss?*

Critical outcomes:

1. Remission of obesity-related medical conditions (type 2 diabetes mellitus, hypertension, dyslipidemia, fatty liver disease, obstructive sleep apnea syndrome, weight-bearing arthropathy, etc.)
2. Improvement in glycemic and metabolic control (HbA1c, FPG, lipid profile, blood pressure)
3. Reduction in body weight (BMI, percentage weight reduction, and reduction of excess weight)
4. Reduction in major cardiovascular events
5. Reduction in all-cause mortality
6. Improvement in quality of life
7. Reduced incidence of weight regain
8. Reduced incidence of insufficient weight loss
9. Perioperative mortality
10. Serious peri-procedural adverse events
11. Nutritional deficiencies
12. Total serious adverse events

PICO

<i>Population</i>	People with type 2 diabetes and a BMI between 30 and 34.9 kg/m ² .
<i>Intervention</i>	Endoscopic bariatric surgery
<i>Comparison</i>	Conservative pharmacological/non-pharmacological treatment, either conventional or intensive
<i>Critical outcomes</i>	See "Critical and non-critical outcomes"

EVALUATION

Relevance of the problem <i>Is the problem a priority?</i>		
Judgment	Evidence	Adjunctive Considerations
Yes	Overweight, obesity, and obesity-related medical conditions are a growing public health concern in many countries due to increasing prevalence, significant health impacts on affected individuals, and the rising associated economic burden ⁸⁻¹⁰ . Metabolic and bariatric surgery, developed to achieve significant weight loss in patients with obesity, has also shown curative potential for obesity-related medical conditions; however, it is associated with an increase in potentially severe adverse events ^{1,11-13} . Bariatric endoscopy, in this regard, could be beneficial for obesity treatment, as it effectively reduces body weight without a notable increase in severe adverse events ^{1,14} . Nevertheless, robust evidence exploring the therapeutic effects and safety of bariatric endoscopy across different obesity classes is still lacking.	
Favorable Effects <i>Of what extent are the favorable effects of the intervention?</i>		
Judgment	Evidence (see “Supporting Evidence”)	Adjunctive Considerations (see “Supporting Evidence”)
Little	Five clinical trials with at least 24 weeks of follow-up, conducted on patients with a BMI between 30 and 34.9 Kg/m² ^{16-18,23} were identified among 25 studies meeting inclusion criteria reported in a previous publication⁶. Five studies examined the effectiveness of space-occupying devices (intragastric balloon) compared with sibutramine.^{15,18}, HA¹⁰ and placebo¹⁷ while one study evaluated BTA versus sham intervention ²⁴. Some critical outcomes, as identified by the expert panel, were not reported in the six included trials for bariatric endoscopy:	

	1. Obesity-related complications and comorbidities 2 Major cardiovascular events 3. Incidence of weight regain 4. Inadequate weight loss 5. Nutritional deficiencies 6. Total serious adverse events; However, the following outcomes were reported in at least one of the included trials: Body Weight All five studies reported end-of-study BMI data (all with follow-up of 24-26 weeks). Overall, bariatric endoscopy interventions, compared to other therapies/placebo/standard of care (SoC), significantly reduced BMI by 1.1 Kg/m² (Figure 1). This effect is mainly due to interventions with intragastric balloons, while BTA yielded no significant effects. Analyzing only studies against sibutramine^{15,18} did not reveal a significant effect favoring surgery. In trials using intragastric balloons against placebo/ SoC^{17,25,26}, the reduction was -1.74 Kg/m², p<0.001. A formal meta-analysis for percentage weight loss reduction was not possible as it was only reported in one BTA²⁴ trial and one IGB trial²⁵, while in two IGB trials^{25,26} against SoC, a reduction of 14.8% was observed at the end of the study (Figure 3). Glycometabolic Control Only one trial, comparing IGB and HA, reported data on one predefined outcome for glycometabolic control (fasting glucose)¹⁶, showing no difference between groups. (WMDC: -1.00 [-8.15, 6.15] mg/dl, p=0.78). Improvement in Quality of Life. Three studies reported QoL data at the end of the study, using SF-36²⁵, IWQoL²⁶ and SF-12¹⁶. Only the study using IWQoL showed significant differences between groups, favoring bariatric endoscopy.	
Unfavorable effects <i>Of what extent are the adverse effects of the intervention?</i>		
Judgment	Evidence	Adjunctive

		Considerations
Negligible	<i>Periprocedural SAE</i> Only two studies did not report data on this outcome^{15,18}. In studies comparing against placebo/SoC, the risk of severe periprocedural SAEs was approximately four times higher but not statistically significant (Figure 4). <i>Serious Adverse Events</i> Information on total SAEs was reported in four studies, all with IGB^{16,17,25,26}, with no increased risk (MH-OR: 2.8; Figure 5). <i>Perioperative Mortality</i> All included studies reported information on survival status at the end of the study. No deaths were reported.	
Level of evidence What is the degree of evidence for the effects of the intervention?		
Judgment	Evidence (see “GRADE evaluation”)	Adjunctive Considerations
Very low	This judgment is based on the critical outcomes assessed by taking the outcome with the worst rating (see Table 1).	
Value Is there significant uncertainty about the value attributable to key outcomes?		
Judgment	Evidence	Adjunctive Considerations
Not relevant	No evidence of uncertainty. Improvement in obesity-related complications, body weight, quality of life, micro- and macrovascular complications, mortality, and adverse events related to surgery are already included among the primary treatment goals for obesity and associated conditions in major national and international guidelines ^{1,2,27,28} .	
Balance of effects Does the balance of favorable and unfavorable effects favor the treatment under consideration or the comparison treatment?		
Judgment	Evidence	Adjunctive Considerations
Probably in favor	The balance of effects of bariatric endoscopy in	

	patients with class I obesity complicated by other conditions compared to other lifestyle interventions appears favorable, given the small but significant effects on body weight and quality of life without an increase in severe adverse events.	
Resources needed <i>What is the amount of expected costs?</i>		
Judgment	Evidence	Adjunctive Considerations
High	High costs are primarily due to the direct costs of bariatric endoscopy and hospital admission.	
Degree of evidence on resources needed <i>What is the degree of evidence on the resources needed?</i>		
Judgment	Evidence	Adjunctive Considerations
High	Numerous high-quality studies on the subject are available (see “Pharmacoeconomics” paragraph; Table 3).	
Cost-effectiveness <i>Does cost-effectiveness favor the treatment under consideration or the comparison treatment?</i>		
Judgment	Evidence (see “Pharmacoeconomic Evidence”)	Adjunctive Considerations
Probably in favor	The costs per QALY gained are advantageous (Table 3), at least for IGB and ESG.	
Equity <i>What would be the impact of the intervention on equity?</i>		
Judgment	Evidence	Adjunctive Considerations
Probably no impact	No specific data.	The number of public facilities capable of providing adequate bariatric endoscopy is limited and not uniformly distributed across the country, meaning some patients may need to rely on private facilities.
Acceptability		

<i>Is the intervention acceptable to all stakeholders?</i>		
Judgment	Evidence	Adjunctive Considerations
Probably yes	No available evidence.	Individual patients may have varying attitudes toward medical, endoscopic, and surgical therapies, depending on personal values and priorities.
Feasibility <i>Is the intervention feasible?</i>		
Judgment	Evidence	Adjunctive Considerations
Probably yes	Numerous centers in Italy can perform bariatric endoscopy, assess indications, and provide long-term follow-up to prevent weight regain and manage late side effects (malnutrition, vitamin deficiencies, etc.). However, some areas may lack all necessary competencies, thus reducing feasibility.	All centers should be monitored to ensure they can follow the guidelines included in this LG.

SUMMARY OF THE EVALUATIONS

	JUDGMENT						
Relevance of the problem	Not ☐	Probably Not ☐	Probably Yes ☐	Yes ☒		Variable ☐	Not Known ☐
Favorable Effects	Insignificant ☐	Little ☒	Moderate ☐	Big ☐		Variable ☐	Not Known ☐
Unfavorable effects	Big ☐	Moderate ☐	Little ☐	Insignificant ☒		Variable ☐	Not Known ☐
Level of evidence	Very Low ☒	Low ☐	Moderate ☐	High ☐			No studies ☐
Value	Very relevant ☐	Probably relevant ☐	Probably not relevant ☐	Not relevant ☒			Not Known ☐
Balance of Effects	Unfavorable ☐	Probably unfavorable ☐	Neutral ☐	Probably in favour ☒	In favor ☐	Variable ☐	Not Known ☐
Necessary resources	Elevated ☒	Moderate ☐	Insignificant ☐	Moderate savings ☐	Large savings ☐	Variable ☐	Not Known ☐
Evidence on resources	Very Low ☐	Low ☐	Moderate ☐	High ☒			No studies ☐
Cost-Effectiveness	Unfavorable ☐	Probably unfavorable ☐	Neutral ☐	Probably in favor ☒	In favor ☐	Variable ☐	Not Known ☐

		☐					
Equity	Reduced ☐	Probably reduced ☐	Probably no impact ☒	Probably increased ☐	Increased ☐	Variable ☐	Not Known ☐
Acceptability	Not ☐	Probably not ☐	Probably yes ☒	Yes ☐		Variable ☐	Not Known ☐
Feasibility	Not ☐	Probably not ☐	Probably yes ☒	Yes ☐		Variable ☐	Not Known ☐

LEVEL OF RECOMMENDATION

PICO 2

The use of bariatric endoscopy is suggested for patients with class I obesity (BMI between 30 and 34.9 kg/m²) and at least one comorbidity for the treatment of obesity.

Weak recommendation in favor, with very low quality of evidence.

Reason for the recommendation

Bariatric endoscopy in patients with class I obesity and at least one obesity-related complication, compared to other non-surgical interventions, is a potential therapeutic option for achieving weight loss and improving metabolic and non-metabolic complications, with minimal risks of serious adverse events¹⁻³. The evidence review team (ERT) found 7 clinical trials with at least 24 weeks of follow-up conducted on patients with a BMI between 30 and 34.9 kg/m² ^{15-18,24-26} out of 26 that met the inclusion criteria reported in a previous publication⁶. Of these, 6 were conducted with intragastric balloons (IGB) (two compared space-occupying devices with sibutramine^{15,18}, one with HA¹⁶, and three with SoC/placebo) ^{17,25,26} and one with botulinum toxin A (BTA) compared to a sham intervention²⁴. Overall, bariatric endoscopy interventions significantly reduced the BMI by an average of 1.1 kg/m² over 6 months (Figure 1-3) compared to other therapies/placebo/SoC and improved quality of life without significant serious adverse events (Figura 4, 5). However, it should be noted that the only trial conducted with BTA²⁴ yielded neutral results, meaning that the favorable data supporting the intervention are all driven by IGB. Pharmacoeconomic data show a good cost-effectiveness profile for the surgical approach (Table 3).

Based on these considerations, it is possible to formulate a weak recommendation in favor of bariatric endoscopy in patients with class I obesity with at least one comorbidity.

Considerations on subgroups of patients

We do not have certain information on the maintenance or regain of body weight over time. However, observational studies show that 30% of patients regain 100% of their weight, 40% regain less than 50%, 20% maintain the weight achieved, and 10% lose additional weight (www.sicob.org/04_chirurgia_bariatrica/pallone.html). Some subgroups of patients may experience lesser benefits, such as those with obstructive sleep apnea syndrome, severe hepatic steatosis, etc²⁹.

Implementation Considerations

Healthcare providers should be made aware of the content of this recommendation through specific continuing medical education programs.

Evaluation and monitoring

Monitoring and evaluating adherence to these guidelines is very challenging and could be done by assessing the proportion of class I obesity patients receiving a bariatric endoscopy procedure. This monitoring can be conducted through the consultation of medical records.

Research Priorities

More trials are needed in patients with class I obesity and associated comorbidities to strengthen this recommendation.

PICO 3: *In patients with class II obesity (BMI ≥ 35 kg/m²) regardless of the presence of obesity-related medical conditions (type 2 diabetes, hypertension, dyslipidemia, metabolic liver disease, obstructive sleep apnea syndrome, weight-bearing arthropathies, etc.), are bariatric endoscopic procedures (suturing systems and endoluminal procedures) preferable to psychological/nutritional and medical approaches for weight loss?*

Critical Outcomes:

1. Remission of obesity-related medical conditions (type 2 diabetes, hypertension, dyslipidemia, metabolic liver disease, obstructive sleep apnea syndrome, weight-bearing arthropathies, etc.)
2. Improvement of glycometabolic compensation (HbA1c, FPG, lipid profile, blood pressure)
3. Reduction of body weight (BMI, percentage reduction in weight and excess weight)
4. Reduction of major cardiovascular events
5. Reduction of all-cause mortality
6. Improvement in quality of life
7. Reduced incidence of weight regain
8. Reduced incidence of insufficient weight loss
9. Perioperative mortality
10. Serious periprocedural adverse events
11. Nutritional deficiencies
12. Total serious adverse events)

PICO

<i>Population</i>	People with type 2 diabetes and a BMI between 35 and 34.9 kg/m ² .
<i>Intervention</i>	Endoscopic bariatric surgery
<i>Comparison</i>	Pharmacological/non-pharmacological conservative, conventional, or intensive treatment
<i>Critical Outcomes</i>	See Table "Critical and Non-Critical Outcomes"

EVALUATION

Relevance of the problem Is the problem a priority?		
Judgement	Evidence	Adjunctive considerations
Yes	Overweight, obesity, and the obesity-related medical conditions are a growing public health problem in many countries due to increasing prevalence, significant health impacts on affected individuals, and the rising economic burden associated with these conditions ⁸⁻¹⁰ . MBS, developed to achieve significant weight loss in patients with obesity, has also shown potential in treating obesity-related conditions. However, it is associated with an increased risk of potentially serious adverse events ^{1,11,12} . Bariatric endoscopy may thus have utility in treating obesity, as it effectively reduces body weight without an excess of serious adverse events ^{1,14} . Nonetheless, robust evidence on the therapeutic effects and safety of bariatric endoscopy across different obesity classes is still lacking.	
Favourable effects <i>Of what extent are the favorable effects of the intervention?</i>		
Judgement	Evidence (see “Support Evidence”)	Adjunctive considerations (see “Support Evidence”)
Little	Thirteen clinical trials with at least 24 weeks of follow-up (average 36 weeks) were conducted on patients with a BMI between 35 and 39.9 kg/m ² , or with an average BMI at baseline between 35 and 39.9 kg/m ² , out of 25 studies that met inclusion criteria from a previous publication ⁶ . Six of these trials were excluded due to the use of a device not yet approved in Italy (EndoBarrier) ³⁰⁻³⁴ . The seven included trials investigate the effectiveness of space-occupying devices (n=4, intragastric balloon) ^{26,35-37} compared to placebo or standard of care (SoC), and suturing interventions (POSE, n=2 ^{38,39}); ESG, n=1 ¹⁹) compared to placebo or SoC. For several outcomes deemed critical by the expert	

	panel, the six included trials did not provide information on the effects of bariatric endoscopy regarding: 1. Complications and comorbidities associated with obesity; 2. Major cardiovascular events; 3. Incidence of weight regain; 4. Insufficient weight loss; 5. Nutritional deficiencies; 6. Total serious adverse events. However, the following outcomes were reported in at least one of the included trials: <i>Body Weight</i> All seven studies provided data on BMI at the end of the study. Overall, bariatric endoscopy interventions compared to other therapies/placebo/SoC significantly reduced BMI by 2.5 kg/m² (Figure 6). This effect did not vary based on the type of intervention performed, as all trials were compared to SoC/placebo. Six studies that reported percentage weight reduction^{19,26,35-37} and four studies that reported excess weight^{19,26,36,38} loss showed greater improvements in favor of bariatric surgery (8.1% and 24.8%, respectively; Figures 7 and 8). <i>Glycometabolic Control</i> Only two trials conducted on intragastric balloon (compared to SoC/placebo) reported information on these outcomes^{35,37}. These studies demonstrated superiority over SoC/placebo in reducing FPG, triglycerides, and systolic blood pressure by the end of the study, but not in HbA1c, total cholesterol, HDL, or diastolic blood pressure (Figures 9–15). One trial provided data on diabetes remission, showing a higher remission rate in the treatment group³⁹. <i>Quality of Life Improvement</i> Three studies provided quality of life (QoL) data at the end of the study^{26,36,39}, all using the IWQoL scale. Two studies involved IGB^{26,36} and one used POSE³⁹. All three showed significant QoL improvements over the control group.	
Unfavorable effects Of what extent are the adverse effects of the intervention?		

Judgement	Evidence	Adjunctive considerations
Insignificant	<i>Periprocedural Serious Adverse Events (SAEs)</i> Only one study did not report data on this outcome³⁶. In the other six studies (all compared to placebo/SoC), the risk of severe periprocedural serious adverse events (SAEs) was approximately 22 times higher, reaching statistical significance (Figure 16). <i>Serious Adverse Events</i> Only one study did not report data on this outcome³⁶. In the other six studies (all compared to placebo/SoC), the risk of serious periprocedural adverse events (SAEs) was approximately 3.6 times higher, achieving statistical significance (Figure 17). <i>Perioperative Mortality:</i> All studies included, except two^{36,37}, provide information on patients' survival status at the end of the study period. No deaths were reported.	
Level of evidence <i>What is the degree of evidence for the effects of the intervention?</i>		
Judgement	Evidence (see "GRADE evaluation")	Adjunctive considerations
Low	The assessment is based on the evaluable critical outcomes, taking the outcome with the worst evaluation as the reference (see Table 1).	
Value <i>Is there significant uncertainty about the value attributable to key outcomes?</i>		
Judgement	Evidence	Adjunctive considerations
Not relevant	No evidence of uncertainty. Improvements in obesity-related complications, body weight, quality of life, micro- and macrovascular complications, mortality, and adverse events related to surgery are already highlighted among the primary goals in the treatment of obesity and associated conditions, according to major national and international guidelines ^{1,2,27,28} .	
Balance of effects <i>Does the balance of favorable and unfavorable effects favor the treatment under consideration or</i>		

<i>the comparison treatment?</i>		
Judgement	Evidence	Adjunctive considerations
Probably in favor	The balance of effects for bariatric endoscopy in patients with class II obesity complicated by comorbid conditions, compared to other lifestyle modification interventions, appears favorable. This is due to significant effects on body weight, triglycerides, systolic blood pressure, fasting blood glucose, and quality of life, although there is also a significant increase in total and periprocedural serious adverse events.	
Resources needed <i>What is the amount of expected costs?</i>		
Judgement	Evidence	Adjunctive considerations
Elevated	High costs mainly related to direct costs of bariatric endoscopy and hospitalization.	
Degree of evidence on resources needed <i>What is the degree of evidence on the resources needed?</i>		
Judgement	Evidence	Adjunctive considerations
High	There are numerous good quality studies on the subject (see section "Pharmacoeconomics"; Table 3).	
Cost-effectiveness <i>Does cost-effectiveness favor the treatment under consideration or the comparison treatment?</i>		
Judgement	Evidence (see "Pharmacoeconomic evidence")	Adjunctive considerations
Probably in favor	The costs incurred for each QALY gained are favorable, at least for IGB and ESG. (see Table 3)	
Equity <i>What would be the impact of the intervention on equity?</i>		
Judgement	Evidence	Adjunctive considerations
Probably no impact	Probably no impact	The number of public facilities capable of

		providing adequate bariatric endoscopy is limited and unevenly distributed throughout the territory, so a proportion of patients may be forced to turn to private, non-contracted facilities.
Acceptability <i>Is the intervention acceptable to all stakeholders?</i>		
Judgement	Evidence	Adjunctive considerations
Probably yes	There is no available evidence.	Individual patients may have different attitudes toward medical, endoscopic and surgical therapy, depending on their personal assessments and priority scales.
Feasibility <i>Is the intervention feasible?</i>		
Judgement	Evidence	Adjunctive considerations
Probably yes	Many centers in Italy are able to perform the bariatric endoscopy and assess indications for bariatric endoscopy and follow patients over time in order to prevent weight regain and worsening of glycometabolic compensation, as well as any late side effects (malnutrition, dysvitaminosis, etc.). However, it is possible that some areas may not have all the necessary expertise thus reducing feasibility.	All centers should be monitored in order to see if they can follow the recommendations included in this LG.

SUMMARY OF EVALUATIONS

	JUDGEMENT						
Relevance of the problem	Not ☐	Probably Not ☐	Probably Yes ☐	Yes ☒		Variable ☐	Not known ☐
Favorable effects	Insignificant ☐	Little ☒	Moderate ☐	Big ☐		Variable ☐	Not known ☐
Unfavorable effects	Big ☐	Moderate ☐	Little ☐	Insignificant ☒		Variable ☐	Not known ☐
Level of evidence	Very low ☐	Low ☒	Moderate ☐	High ☐			No studies ☐
Value	Very relevant ☐	Probably relevant ☐	Probably not relevant ☐	Not relevant ☒			Not known ☐
Balance of effects	Unfavorable ☐	Probably unfavorable ☐	Neutral ☐	Probably in favor ☒	In favor ☐	Variable ☐	Not known ☐
Necessary resources	Elevated ☒	Moderate ☐	Insignificant ☐	Moderate savings ☐	Large savings ☐	Variable ☐	Not known ☐
Evidence on resources	Very low ☐	Low ☐	Moderate ☐	High ☒			No studies ☐
Cost-effectiveness	Unfavorable ☐	Probably unfavorable ☐	Neutral ☐	Probably in favor ☒	In favor ☐	Variable ☐	Not known ☐

		☐					
Equity	Reduced ☐	Probably reduced ☐	Probably no impact ☒	Probably increased ☐	Increased ☐	Variable ☐	Not known ☐
Acceptability	Not ☐	Probably not ☐	Probably yes ☒	Yes ☐		Variable ☐	Not known ☐
Feasibility	Not ☐	Probably not ☐	Probably yes ☒	Yes ☐		Variable ☐	Not known ☐

LEVEL OF RECOMMENDATION

PICO 3

The use of bariatric endoscopy is suggested in patients with class $\geq$ II obesity (BMI $\geq$ 35 kg/m²), regardless of comorbidities, as a treatment for obesity.

Weak recommendation in favor, with very low quality of evidence

Reason for the recommendation

In patients with class $\geq$ II obesity (BMI $\geq$ 35 kg/m²), bariatric endoscopy, compared to other non-surgical interventions, is a viable therapeutic option for weight reduction and improvement of metabolic and other complications, with minimal risks of serious adverse events¹⁻³. The ERT identified 7 clinical trials with at least 24 weeks of follow-up conducted on patients with a BMI between 35 and 39.9 kg/m² out of 26 that met inclusion criteria from a previous publication⁶. These 7 trials investigated the efficacy of space-occupying devices (n=4, intragastric balloon)^{26,35-37} against placebo or standard of care (SoC), as well as suturing interventions (POSE, n=3^{38,39}, and ESG, n=1¹⁹) compared to placebo or SoC. Overall, bariatric endoscopic interventions compared to other therapies/placebo/SoC showed significant benefits on BMI (-2.5 kg/m²), percentage of weight loss and excess weight loss (Figures 6-8), triglycerides, fasting glucose, systolic blood pressure, and quality of life improvement (Figures 9-15). These benefits were achieved with a significant increase in both periprocedural and overall serious adverse events (Figures 16, 17). Pharmacoeconomic data demonstrate a favorable cost-effectiveness profile for the endoscopic surgical approach (Table 3).

Based on these considerations, a weak recommendation can be made in favor of bariatric endoscopy for patients with class II obesity, with at least one comorbidity.

Considerations on subgroups of patients

No definitive information exists on long-term weight maintenance or regain. However, observational studies indicate that 30% of patients regain 100% of the lost weight, 40% regain less than 50%, 20% maintain the achieved weight, and 10% continue to lose weight (www.sicob.org/04_chirurgia_bariatrica/pallone.html). Certain subgroups, such as patients with obstructive sleep apnea syndrome, severe hepatic steatosis, etc., may experience fewer benefits²⁹.

Implementation considerations

Healthcare providers should be informed of this recommendation through specific continuing medical education programs.

Evaluation and monitoring

Monitoring and evaluation of adherence to this guideline are challenging and could be achieved by assessing the proportion of class I obesity patients receiving a bariatric endoscopy procedure. This monitoring could be done through records consultation.

Research priorities

More trials are needed in patients with class I obesity and associated comorbidities to strengthen this recommendation.

PICO 4: *In patients aged 14-17 years with overweight (BMI 27-29.9 kg/m²) and at least one uncontrolled obesity-related medical condition (type 2 diabetes, hypertension, dyslipidemia, liver metabolic disease, obstructive sleep apnea syndrome, weight-bearing joint diseases, etc.), are temporary intragastric procedures (intragastric balloon) preferable to a psychological/nutritional and medical approach for treating overweight?*

Critical outcomes:

1. Remission of obesity-related medical conditions (type 2 diabetes, hypertension, dyslipidemia, liver metabolic disease, obstructive sleep apnea syndrome, weight-bearing joint diseases, etc.)
2. Improvement of glycometabolic control (HbA1c, fasting plasma glucose, lipid profile, blood pressure)
3. Reduction in body weight (BMI, percentage weight loss, and excess weight loss)
4. Reduction in major cardiovascular events
5. Reduction in all-cause mortality
6. Improved quality of life
7. Lower incidence of weight regain
8. Lower incidence of insufficient weight loss
9. Perioperative mortality
10. Serious periprocedural adverse events
11. Nutritional deficiencies
12. Total serious adverse events

PICO

<i>Population</i>	Individuals aged 14-17 years with a BMI between 27 and 29.9 kg/m ²
<i>Intervention</i>	Endoscopic bariatric surgery
<i>Comparison</i>	Conservative pharmacological/non-pharmacological treatment, conventional or intensive
<i>Critical Outcomes</i>	See Table "Critical and Non-critical Outcomes"

EVALUATION

Relevance of the problem <i>Is the problem a priority?</i>		
Judgement	Evidence	Adjunctive considerations
Yes	Overweight, obesity, and obesity-related medical conditions are a growing public health problem in many countries due to increasing prevalence, significant health impact on affected individuals, and growing related economic burden ⁸⁻¹⁰ . Metabolic and bariatric surgery, which was developed to achieve substantial weight loss in patients with obesity, has also shown to have curative potential for obesity-related conditions, even in pediatric populations. However, it is associated with a higher incidence of potentially severe adverse events ^{1,11-13} . Bariatric endoscopy could be useful for obesity treatment, including in pediatric cases, as it effectively reduces body weight without an excess of severe adverse events ^{1,14} . However, there is a lack of solid evidence exploring the therapeutic effects and safety of bariatric endoscopy across different overweight/obesity categories, especially in pediatric patients.	
Favourable effects <i>Of what extent are the favorable effects of the intervention?</i>		
Judgement	Evidence (see “Support Evidence”)	Adjunctive considerations (see “Support Evidence”)
Not Known	No clinical trials with at least 26 weeks of follow-up have been found in patients with a BMI between 27 and 29.9 kg/m ² .	
Unfavorable effects <i>Of what extent are the adverse effects of the intervention?</i>		
Judgement	Evidence	Adjunctive considerations

Not Known	No clinical trials with a follow-up of at least 26 weeks have been conducted in patients with a BMI between 27 and 29.9 kg/m ² .	
Level of evidence <i>What is the degree of evidence for the effects of the intervention?</i>		
Judgement	Evidence (see "GRADE evaluation")	Adjunctive considerations
No studies	A judgment cannot be made due to a lack of studies.	
Value <i>Is there significant uncertainty about the value attributable to key outcomes?</i>		
Judgement	Evidence	Adjunctive considerations
Not relevant	No evidence of uncertainty. Improvement of obesity-related complications, body weight, quality of life, micro- and macrovascular complications, mortality, and adverse events related to endoscopic bariatric surgery are already listed among the primary objectives for the treatment of obesity and associated conditions in major national and international guidelines. ¹⁹⁻²² .	
Balance of effects <i>Does the balance of favorable and unfavorable effects favor the treatment under consideration or the comparison treatment?</i>		
Judgement	Evidence	Adjunctive considerations
No studies	It is not possible to assess the balance of effects of bariatric endoscopy in pediatric patients with overweight complicated by other conditions compared to other lifestyle modification interventions due to a lack of studies.	
Resources needed <i>What is the amount of expected costs?</i>		
Judgement	Evidence	Adjunctive considerations
Elevated	High costs are primarily related to the direct expenses of bariatric endoscopy and hospital admission.	

Degree of evidence on resources needed <i>What is the degree of evidence on the resources needed?</i>		
Judgement	Evidence	Adjunctive considerations
High	There are numerous good quality studies on the subject (see section "Pharmacoeconomics"; Table 3), although they are not specific to the pediatric population.	
Cost-effectiveness <i>Does cost-effectiveness favor the treatment under consideration or the comparison treatment?</i>		
Judgement	Evidence (see "Pharmacoeconomic evidence")	Adjunctive considerations
Probably unfavorable	The costs arising from a bariatric endoscopy procedure for the treatment of overweight complicated by obesity-related conditions, in the absence of definitive clinical efficacy data from trials, likely make the cost-effectiveness ratio unfavorable.	
Equity <i>What would be the impact of the intervention on equity</i>		
Judgement	Evidence	Adjunctive considerations
Probably no impact	No specific data exist.	The number of public facilities capable of providing adequate bariatric endoscopy is limited and unevenly distributed throughout the territory, so a proportion of patients may be forced to turn to private, non-contracted facilities.
Acceptability <i>Is the intervention acceptable to all stakeholders?</i>		
Judgement	Evidence	Adjunctive considerations
Probably Yes	There is no available evidence.	Individual patients may have different attitudes

		toward medical, endoscopic and surgical therapy, depending on their personal assessments and priority scales.
Feasibility <i>Is the intervention feasible?</i>		
Judgement	Evidence	Adjunctive considerations
Probably Yes	Many centers in Italy are able to perform the bariatric endoscopy and assess indications for bariatric endoscopy and follow patients over time in order to prevent weight regain as well as any late side effects (malnutrition, dysvitaminosis, etc.). However, it is possible that some areas may not have all the necessary expertise thus reducing feasibility.	All centers should be monitored in order to see if they can follow the recommendations included in this LG.

SUMMARY OF EVALUATIONS

	JUDGEMENT						
Relevance of the problem	Not ☐	Probably not ☐	Probably Yes ☐	Yes ☒		Variable ☐	Not Known ☐
Favorable effects	Insignificant ☐	Little ☐	Moderate ☐	Big ☐		Variable ☐	Not Known ☒
Unfavorable effects	Big ☐	Moderate ☐	Little ☐	Insignificant ☐		Variable ☐	Not Known ☒
Level of evidence	Very Low ☐	Low ☐	Moderate ☐	High ☐			No studies ☒
Value	Very relevant ☐	Probably relevant ☐	Probably not relevant ☐	Not relevant ☒			Not Known ☐
Balance of effects	Unfavorable ☐	Probably unfavorable ☐	Neutral ☐	Probably in favor ☐	In favor ☐	Variable ☐	Not Known ☒
Resources needed	Elevated ☒	Moderate ☐	Insignificant ☐	Moderate savings ☐	Large savings ☐	Variable ☐	Not Known ☐
Evidence on resources	Very Low ☐	Low ☐	Moderate ☐	High ☐			No studies ☒
Cost-effectiveness	Unfavorable ☐	Probably unfavorable	Neutral ☐	Probably in favor ☐	In favor ☐	Variable ☐	Not Known ☐

		☒					
Equity	Reduced ☐	Probably reduced ☐	Probably no impact ☒	Probably increased ☐	Increased ☐	Variable ☐	Not Known ☐
Acceptability	Not ☐	Probably not ☐	Probably Yes ☒	Yes ☐		Variable ☐	Not Known ☐
Feasibility	Not ☐	Probably not ☐	Probably Yes ☒	Yes ☐		Variable ☐	Not Known ☐

LEVEL OF RECOMMENDATION

PICO 4

The use of temporary intragastric procedures in patients (aged 14-17 years) with overweight (BMI between 27-29.9 kg/m²) and at least one comorbidity not controlled by medical therapy for the treatment of overweight is not recommended. This is a weak recommendation against it, with very low quality of evidence

Weak recommendation against it, with very low quality of evidence.

Reason for the recommendation

Bariatric endoscopy in patients with overweight and at least one obesity-related medical condition, compared to other non-surgical interventions, is a potential therapeutic option for achieving weight loss and improving metabolic and non-metabolic complications, with minimal risks of severe adverse events¹⁻³. The ERT found no clinical trials conducted on patients (in the pediatric age group) with a BMI between 27 and 29.9 kg/m². Furthermore, in the absence of definitive efficacy and safety data for patients with overweight and uncontrolled comorbidities, and considering the costs associated with the procedures proposed in this PICO, the panel expresses an unfavorable opinion regarding the use of bariatric endoscopy in this patient category.

Considerations on subgroups of patients

The utility of bariatric endoscopy in patients with overweight and multiple associated comorbidities cannot be excluded. In these patients, who are at high risk of developing renal and cardiovascular events, weight loss and improvement of comorbidities could justify such interventions even in the absence of clear evidence in this patient category. Indeed, there is indirect evidence obtained from adults with higher BMI values that demonstrates clear beneficial effects of weight loss achieved through this type of surgery.

Implementation considerations

Healthcare providers should be informed of this recommendation through specific continuing medical education programs.

Evaluation and monitoring

Monitoring and evaluation of adherence to this guideline are challenging and could be achieved by assessing the proportion of patients with overweight receiving a bariatric endoscopy procedure. This monitoring could be done through records consultation.

Research priorities

More trials are needed in patients with class I obesity and associated comorbidities to strengthen this recommendation.

PICO 5: *In patients aged 14-17 years with obesity (BMI ≥ 30 kg/m²) and at least one obesity-related medical condition (such as type 2 diabetes, hypertension, dyslipidemia, metabolic liver disease, obstructive sleep apnea syndrome, weight-bearing arthropathies, etc.), are temporary intragastric procedures (e.g., intragastric balloon) preferable to psychological/nutritional and medical approaches for the treatment of overweight??*

Critical outcomes:

1. Remission of obesity-related medical conditions (Type 2 diabetes, hypertension, dyslipidemia, metabolic liver disease, obstructive sleep apnea syndrome, weight-bearing arthropathies, etc.)
2. Improvement of glycometabolic compensation (HbA1c, FPG, lipid profile, blood pressure)
3. Reduction of body weight (BMI, percentage weight reduction, excess weight)
4. Reduction of major cardiovascular events
5. Reduction of all-cause mortality
6. Improvement in quality of life
7. Reduced incidence of weight regain
8. Reduced incidence of insufficient weight loss
9. Perioperative mortality
10. Serious periprocedural adverse events
11. Nutritional deficiencies
12. Total serious adverse events

PICO

<i>Population</i>	Individuals aged 14-17 years with BMI ≥ 30 kg/m ²
<i>Intervention</i>	Endoscopic bariatric surgery
<i>Comparison</i>	Conservative pharmacological/non-pharmacological treatment, either conventional or intensive
<i>Critical outcomes:</i>	See Table "Critical and Non-Critical Outcomes."

EVALUATION

Relevance of the problem <i>Is the problem a priority?</i>		
Judgement	Evidence	Adjunctive considerations
Yes	Overweight, obesity, and obesity-related medical conditions are a growing public health problem in many countries due to increasing prevalence, significant health impact on affected individuals, and growing related economic burden ⁸⁻¹⁰ . Metabolic and bariatric surgery, which was developed to achieve substantial weight loss in patients with obesity, has also shown to have curative potential for obesity-related conditions, even in pediatric populations, however, it is associated with a higher incidence of potentially severe adverse events ^{1,11-13} . Bariatric endoscopy could be useful for obesity treatment, including in pediatric cases, as it effectively reduces body weight without an excess of severe adverse events ^{1,14} . However, there is a lack of solid evidence exploring the therapeutic effects and safety of bariatric endoscopy across different overweight/obesity categories, especially in pediatric patients.	
Favorable effects <i>Of what extent are the favorable effects of the intervention?</i>		
Judgement	Evidence (see “Support Evidence”)	Adjunctive considerations (see “Support Evidence”)
Not Known	No clinical trials with at least 26 weeks of follow-up have been found in patients with a BMI > 29.9 Kg/m ² in pediatric age.	
Unfavorable effects <i>Of what extent are the adverse effects of the intervention?</i>		
Judgement	Evidence	Adjunctive considerations
Not Known	No clinical trials with at least 26 weeks of follow-up have been found in patients with a BMI > 29.9 Kg/m ²	

	in pediatric age.	
Level of evidence <i>What is the degree of evidence for the effects of the intervention?</i>		
Judgement	Evidence (see “GRADE evaluation”)	Adjunctive considerations
No studies	A judgment cannot be made due to a lack of studies.	
Value <i>Is there significant uncertainty about the value attributable to key outcomes?</i>		
Judgement	Evidence	Adjunctive considerations
Not relevant	No evidence of uncertainty. Improvement of obesity-related medical conditions, body weight, quality of life, micro- and macrovascular complications, mortality, and adverse events related to surgery are already listed among the primary objectives for the treatment of obesity and associated conditions in major national and international guidelines. ¹⁹⁻²² .	
Balance of effects <i>Does the balance of favorable and unfavorable effects favor the treatment under consideration or the comparison treatment?</i>		
Judgement	Evidence	Adjunctive considerations
No studies	It is not possible to assess the balance of effects of bariatric endoscopy in pediatric patients with overweight complicated by other medical conditions compared to other lifestyle modification interventions due to a lack of studies.	
Resources needed <i>What is the amount of expected costs?</i>		
Judgement	Evidence	Adjunctive considerations
Elevated	High costs are primarily related to the direct expenses of bariatric endoscopy and hospital admission.	
Level of evidence sulle risorse necessarie <i>What is the degree of evidence for the effects of the intervention?</i>		

Judgement	Evidence	Adjunctive considerations
High	There are numerous good quality studies on the subject (see section "Pharmacoeconomics"; Table 3), although they are not specific to the pediatric population.	
Cost-effectiveness <i>Does cost-effectiveness favor the treatment under consideration or the comparison treatment?</i>		
Judgement	Evidence (see "Pharmacoeconomic evidence")	Adjunctive considerations
Probably unfavorable	The costs arising from a bariatric endoscopy procedure for the treatment of overweight complicated by obesity-related conditions, in the absence of definitive clinical efficacy data from trials, likely make the cost-effectiveness ratio unfavorable.	
Equity <i>What would be the impact of the intervention on equity</i>		
Judgement	Evidence	Adjunctive considerations
Probably no impact	No specific data exist.	The number of public facilities capable of providing adequate bariatric endoscopy is limited and unevenly distributed throughout the territory, so a proportion of patients may be forced to turn to private, non-contracted facilities.
Acceptability <i>Is the intervention acceptable to all stakeholders?</i>		
Judgement	Evidence	Adjunctive considerations
Probably Yes	There is no available evidence.	Individual patients may have different attitudes toward medical, endoscopic and surgical

		therapy, depending on their personal assessments and priority scales
Feasibility <i>Is the intervention feasible?</i>		
Judgement	Evidence	Adjunctive considerations
Probably Yes	Many centers in Italy are able to perform the bariatric endoscopy and assess indications for bariatric endoscopy and follow patients over time in order to prevent weight regain as well as any late side effects (malnutrition, dysvitaminosis, etc.). However, it is possible that some areas may not have all the necessary expertise thus reducing feasibility.	All centers should be monitored in order to see if they can follow the recommendations included in this LG.

SUMMARY OF EVALUATIONS

	JUDGEMENT						
Relevance of the problem	Not ☐	Probably not ☐	Probably Yes ☐	Si ☒		Variable ☐	Not Known ☐
Favorable effects	Insignificant ☐	Little ☐	Moderate ☐	Big ☐		Variable ☐	Not Known ☒
Unfavorable effects	Big ☐	Moderate ☐	Little ☐	Insignificant ☐		Variable ☐	Not Known ☒
Level of evidence	Very Low ☐	Low ☐	Moderate ☐	High ☐			No studies ☒
Value	Very relevant ☐	Probably relevant ☐	Probably not relevant ☐	Not relevant ☒			Not Known ☐
Balance of effects	Unfavorable ☐	Probably unfavorable ☐	Neutral ☐	Probably in favor ☐	In favor ☐	Variable ☐	Not Known ☒
Resources needed	Elevated ☒	Moderate ☐	Insignificant ☐	Moderate savings ☐	Large savings ☐	Variable ☐	Not Known ☐
Evidence on resources	Very Low ☐	Low ☐	Moderate ☐	High ☐			No studies ☒
Cost-effectiveness	Unfavorable ☐	Probably unfavorable	Neutral ☐	Probably in favor ☐	In favor ☐	Variable ☐	Not Known ☐

		☒					
Equity	Reduced ☐	Probably reduced ☐	Probably no impact ☒	Probably increased ☐	Increased ☐	Variable ☐	Not Known ☐
Acceptability	Not ☐	Probably not ☐	Probably Yes ☒	Yes ☐		Variable ☐	Not Known ☐
Feasibility	Not ☐	Probably not ☐	Probably Yes ☒	Yes ☐		Variable ☐	Not Known ☐

LEVEL OF RECOMMENDATION

PICO 5

No preference is expressed, either in favor or against, the use of temporary intragastric procedures in pediatric patients with class I obesity (BMI ≥ 30 kg/m²) and at least one comorbidity for the treatment of obesity.

Weak recommendation against it, with very low quality of evidence.

Reason for the recommendation

Bariatric endoscopy in patients with overweight and at least one associated complication, compared to other non-surgical interventions, is a potential therapeutic option for achieving weight loss and improving metabolic and non-metabolic complications, with minimal risks of severe adverse events¹⁻³. The ERT found no clinical trials. In the absence of definitive efficacy and safety data, and considering the costs associated with the procedures proposed in this PICO, the use of bariatric endoscopy as a routine procedure in this patient category is not recommended

Considerations on subgroups of patients

The utility of bariatric endoscopy in patients with obesity and associated comorbidities cannot be excluded. In these patients, who are at high risk of developing renal and cardiovascular events, weight loss and improvement of comorbidities could justify such interventions even in the absence of clear evidence in this patient category. In fact, there is indirect evidence obtained from adults with higher BMI values that demonstrates clear beneficial effects of weight loss achieved through this type of surgery.

Implementation considerations

Healthcare providers should be informed of this recommendation through specific continuing medical education programs.

Evaluation and monitoring

Monitoring and evaluation of adherence to this guideline are challenging and could be achieved by assessing the proportion of patients with overweight receiving a bariatric endoscopy procedure. This monitoring could be done through records consultation.

Research priorities

More trials are needed in pediatric patients with obesity and associated comorbidities to strengthen this recommendation.

PICO 6: *In patients with insufficient weight loss or weight regain after metabolic and bariatric surgery, is bariatric endoscopy (suturing and endoluminal systems) preferable to psychological/nutritional and medical approaches for weight loss??*

Critical outcomes:

1. Remission of obesity-related medical conditions (Type 2 diabetes, hypertension, dyslipidemia, metabolic liver disease, obstructive sleep apnea syndrome, weight-bearing arthropathies, etc)
2. Improvement of glycometabolic compensation (HbA1c, FPG, lipid profile, blood pressure)
3. Reduction of body weight (BMI, percentage weight reduction, excess weight)
4. Reduction of major cardiovascular events.
5. Reduction of all-cause mortality.
6. Improvement in quality of life.
7. Reduced incidence of weight regain.
8. Reduced incidence of insufficient weight loss.
9. Perioperative mortality.
10. Serious periprocedural adverse events.
11. Nutritional deficiencies.
12. Total serious adverse events.

PICO

<i>Population</i>	Individuals who have failed metabolic and bariatric surgery.
<i>Intervention</i>	Endoscopic bariatric surgery
<i>Comparison</i>	Conservative pharmacological/non-pharmacological treatment, either conventional or intensive
<i>Critical outcomes:</i>	See Table "Critical and Non-Critical Outcomes."

EVALUATION

Relevance of the problem <i>Is the problem a priority?</i>		
Judgement	Evidence	Adjunctive considerations
Yes	Obesity, and obesity-related medical conditions are a growing public health problem in many countries due to increasing prevalence, significant health impact on affected individuals, and growing related economic burden ⁸⁻¹⁰ . Metabolic and bariatric surgery was developed to achieve substantial weight loss in patients with obesity. However, in some patients, weight regain or insufficient weight loss is observed, which can affect 15-20% of treated patients, resulting in additional costs ranging from \$15,000 to \$50,000 USD ²⁰ . In these patients, various strategies can be implemented, such as a new metabolic and bariatric surgical intervention, pharmacological and educational therapy ²¹ , or an endoscopic bariatric intervention. However, there is a lack of solid evidence demonstrating the superiority of one therapeutic approach over another	
Favorable effects <i>Of what extent are the favorable effects of the intervention?</i>		
Judgement	Evidence (see “Support Evidence”)	Adjunctive considerations (see “Support Evidence”)
Moderate	Six clinical trials with at least 24 weeks of follow-up were found, conducted on patients previously treated with metabolic and bariatric surgery (all studies utilized RYGB) with an entry BMI ranging from 38.4 kg/m² ^{22,23,40-43}. Of these, two studies explored the efficacy of transoral anastomosis^{23,43} reduction interventions, two focused on anastomosis coagulation with argon laser^{40,42}, and two investigated gastric plication^{22,41}. For some outcomes considered critical by the expert panel, it was not possible to obtain information from the six included trials on the	

	effects of bariatric endoscopy regarding: 1. Obesity-related complications and comorbidities 2. Major cardiovascular events 3. Incidence of weight regain 4. Insufficient weight loss 5. Nutritional deficiencies However, it was possible to evaluate the following outcomes that were reported in at least one of the included trials: <i>Body Weight</i> All six studies reported data on BMI at the end of the study (all had follow-ups between 26 and 52 weeks). Overall, bariatric endoscopy interventions compared to other therapies/placebo/standard of care significantly reduced BMI by 3.4 kg/m² (Figure 18), with no significant differences between the various interventions explored. Similar results were obtained in studies that assessed percentage weight loss, and the percentage of excess body weight lost^{22,40,42,43} (figure 19) and the percentage of excess body weight lost⁴³, although in the latter case, only a statistically non-significant trend was achieved (Figure 20). <i>Glycometabolic Compensation</i> Aside from fasting glucose at the end of the study, which showed a modest but significant reduction (Figure 21), no differences were reported for HbA1c or lipid profile between the intervention and control groups (Figura 22-25). Only one trial comparing gastric plication and a sham intervention reported data on blood pressure, showing no statistically significant differences⁴³. <i>Improvement in Quality of Life.</i> All studies, except for two^{22,42}, reported data on QoL at the end of the study, utilizing different assessment scales (SF-36²⁶, IWQoL^{23,41,43} and EQ5D^{23,40}), showing no effect of bariatric endoscopy^{23,41,43} or modest advantages, albeit significant, in some instances⁴⁰	
Unfavorable effects		

<i>Of what extent are the adverse effects of the intervention?</i>		
Judgement	Evidence	Adjunctive considerations
Little	<i>SAE Periprocedural</i> All studies report data on this outcome. The risk of severe periprocedural SAEs was approximately two times higher, although it did not reach statistical significance. (Figure 26). <i>Serious Adverse Events</i> All studies report data on this outcome. The risk of SAEs was significantly higher (approximately four times) and was entirely driven by studies involving gastric plication. (Figure 27). <i>Perioperative Mortality</i> All included studies report information on survival status at the end of the study. No deaths were reported.	
Level of evidence <i>What is the degree of evidence for the effects of the intervention?</i>		
Judgement	Evidence (see "GRADE evaluation")	Adjunctive considerations
Low	The judgment is made based on the assessable critical outcomes, taking the outcome with the worst evaluation (see Table 1).	
Value <i>Is there significant uncertainty about the value attributable to key outcomes?</i>		
Judgement	Evidence	Adjunctive considerations
Not relevant	No evidence of uncertainty. Improvement in obesity-related medical conditions, body weight, quality of life, micro- and macrovascular complications, mortality, and surgery-related adverse events are already listed as major goals for the treatment of obesity and associated conditions by major national and international guidelines ^{1,2,27,28} .	
Balance of effects <i>Does the balance of favorable and unfavorable effects favor the treatment under consideration or the comparison treatment?</i>		

Judgement	Evidence	Adjunctive considerations
Probably in favor	The balance of effects of bariatric endoscopy in the patient with class I obesity complicated by other diseases compared to other lifestyle modification interventions. appears to be favorable considering the small but significant effects on body weight and quality of life, without an increase in serious adverse events.	
Resources needed <i>What is the amount of expected costs?</i>		
Judgement	Evidence	Adjunctive considerations
Elevated	High costs mainly related to direct costs of bariatric endoscopy and hospitalization.	
Level of evidence sulle risorse necessarie <i>What is the degree of evidence for the effects of the intervention?</i>		
Judgement	Evidence	Adjunctive considerations
High	No specific studies exist.	
Cost-effectiveness <i>Does cost-effectiveness favor the treatment under consideration or the comparison treatment?</i>		
Judgement	Evidence (see "Pharmacoeconomic evidence")	Adjunctive considerations
Not Known	There are no available studies	
Equity <i>What would be the impact of the intervention on equity</i>		
Judgement	Evidence	Adjunctive considerations
Probably no impact	No specific data exist.	The number of public facilities capable of providing adequate bariatric endoscopy is limited and unevenly distributed throughout the territory, so a proportion of patients may be forced to turn to

		private, non-contracted facilities.
Acceptability <i>Is the intervention acceptable to all stakeholders?</i>		
Judgement	Evidence	Adjunctive considerations
Probably Yes	There is no available evidence.	Individual patients may have different attitudes toward medical, endoscopic and surgical therapy, depending on their personal assessments and priority scales.
Feasibility <i>Is the intervention feasible?</i>		
Judgement	Evidence	Adjunctive considerations
Probably Yes	Many centers in Italy are able to perform the bariatric endoscopy and assess indications for bariatric endoscopy and follow patients over time in order to prevent weight regain as well as any late side effects (malnutrition, dysvitaminosis, etc.). However, it is possible that some areas may not have all the necessary expertise thus reducing feasibility.	All centers should be monitored in order to see if they can follow the recommendations included in this LG.

SUMMARY OF EVALUATIONS

	JUDGEMENT						
Relevance of the problem	No ☐	Probably not ☐	Probably Yes ☐	Yes ☒		Variable ☐	Not Known ☐
Favorable effects	Insignificant ☐	Little ☐	Moderate ☒	Big ☐		Variable ☐	Not Known ☐
Unfavorable effects	Big ☐	Moderate ☐	Little ☒	Insignificant ☐		Variable ☐	Not Known ☐
Level of evidence	Very Low ☐	Low ☒	Moderate ☐	High ☐			No studies ☐
Value	Very relevant ☐	Probably relevant ☐	Probably not relevant ☐	Not relevant ☒			Not Known ☐
Balance of effects	Unfavorable ☐	Probably unfavorable ☐	Neutral ☐	Probably in favor ☒	In favor ☐	Variable ☐	Not Known ☐
Resources needed	Elevated ☒	Moderate ☐	Insignificant ☐	Moderate savings ☐	Large savings ☐	Variable ☐	Not Known ☐
Evidence on resources	Very Low ☐	Low ☐	Moderate ☐	High ☒			No studies ☐
Cost-effectiveness	Unfavorable ☐	Probably unfavorable ☐	Neutral ☐	Probably in favor ☒	In favor ☐	Variable ☐	Not Known ☐

		☐					
Equity	Reduced ☐	Probably reduced ☐	Probably no impact ☒	Probably increased ☐	Increased ☐	Variable ☐	Not Known ☐
Acceptability	Not ☐	Probably not ☐	Probably Yes ☒	Yes ☐		Variable ☐	Not Known ☐
Feasibility	Not ☐	Probably not ☐	Probably Yes ☒	Yes ☐		Variable ☐	Not Known ☐

LEVEL OF RECOMMENDATION

PICO 6

It is suggested to use revision bariatric endoscopy in patients with obesity (BMI ≥ 30 kg/m²) who experience weight regain or insufficient weight loss after metabolic and bariatric surgery for the treatment of obesity.

Weak recommendation in favor, with low quality of evidence.

Reason for the recommendation

Obesity and its related medical conditions are an increasing public health concern in many countries, due to the rising prevalence, the significant impact on the health of affected individuals, and the growing economic burden. Metabolic and bariatric surgery has been developed to achieve substantial weight loss in patients with obesity and related complications. However, some patients experience weight regain or insufficient weight loss, affecting up to 15-20% of those treated, resulting in additional costs of \$15,000 to \$50,000 USD²⁰. For these patients, various strategies are available, such as repeat metabolic and bariatric surgery, pharmacological and educational therapies²¹, or bariatric endoscopy. Currently, there is a lack of robust evidence to support the superiority of any one therapeutic approach over another. However, there is a lack of solid evidence demonstrating the superiority of one therapeutic approach over another. The ERT identified six clinical trials with at least 24 weeks of follow-up involving patients previously treated with metabolic and bariatric surgery (all studies focused on the RYGB intervention) with an average baseline BMI of 38.4 kg/m² ^{22,23,41-43}. Of these, two studies explored the effectiveness of transoral anastomosis reduction^{23,43}, two evaluated anastomosis coagulation interventions using argon laser^{40,42}, and two studied gastric plication procedures^{22,41}. Overall, bariatric endoscopic interventions, compared to other therapies, placebo, or standard of care, significantly reduced body weight by an average of 3 BMI points over 9 months, starting from an average baseline BMI of 38.4 kg/m² (Figures 18-20), and fasting glucose (Figure 21), but showed no effect on HbA1c and lipid profile (Figures 21-25). The incidence of serious adverse events was low (Figures 26, 27). Pharmacoeconomic data suggest a favorable cost-effectiveness profile for the surgical approach (Table 3). Based on these considerations, a weak recommendation can be made in favor of bariatric endoscopy as a revision treatment.

Considerations on subgroups of patients

There are no long-term data in the literature on weight maintenance following revision bariatric endoscopic procedures. Certain patient subgroups, such as those with obstructive sleep apnea syndrome, severe hepatic steatosis, etc., may experience fewer benefits²⁹.

Implementation considerations

Healthcare providers should be informed of this recommendation through specific continuing medical education programs.

Evaluation and monitoring

Monitoring and evaluating adherence to this guideline is challenging and could be carried out by assessing the proportion of patients with disease recurrence, insufficient weight loss, and/or

relapse of comorbidities after metabolic and bariatric surgery who undergo a bariatric endoscopic procedure.

Research priorities

More trials are needed in patients with disease recurrence, insufficient weight loss, and/or relapse of obesity-related medical conditions following metabolic and bariatric surgery to strengthen this recommendation.

PICO 7: *In patients who have undergone metabolic and bariatric surgery, is timely endoscopic examination preferable to other diagnostic tests for the identification of post-surgical complications?*

Critical outcomes:

1. Reduced incidence of re-operations
2. Shorter hospital stays
3. Fewer hospitalizations
4. Reduced incidence of major cardiovascular events
5. Reduced all-cause mortality
6. Improved quality of life
7. Perioperative mortality
8. Serious periprocedural adverse events
9. Total serious adverse events

PICO

<i>Population</i>	Individuals with suspected SAE following metabolic and bariatric surgery
<i>Intervention</i>	Endoscopic diagnostics
<i>Comparison</i>	Other diagnostic methods
<i>Critical Outcomes</i>	See "Critical and Non-Critical Outcomes" Table

EVALUATION

Relevance of the problem <i>Is the problem a priority?</i>		
Judgement	Evidence	Adjunctive considerations
Yes	Obesity, and obesity-related medical conditions are a growing public health problem in many countries due to increasing prevalence, significant health impact on affected individuals, and growing related economic burden. Metabolic and bariatric surgery was developed to achieve substantial weight loss in patients with obesity. However, as is well known, this procedure is associated with an increase in potentially serious adverse events ^{1,11-13} . In cases of complications, a timely diagnosis could be achieved through endoscopic techniques, which in some cases also allow for the concurrent resolution of the complication. Nevertheless, there is a lack of solid evidence demonstrating the superiority of this diagnostic approach over others.	
Favorable effects <i>Of what extent are the favorable effects of the intervention?</i>		
Judgement	Evidence (see “Support Evidence”)	Adjunctive considerations (see “Support Evidence”)
Not Known	No randomized or observational studies have been found on this topic.	
Unfavorable effects <i>Of what extent are the adverse effects of the intervention?</i>		
Judgement	Evidence	Adjunctive considerations
Not Known	No randomized or observational studies have been found on this topic.	
Level of evidence <i>What is the degree of evidence for the effects of the intervention?</i>		
Judgement	Evidence (see “GRADE evaluation”)	Adjunctive considerations

No studies	No randomized or observational studies have been found on this topic.	
Value <i>Is there significant uncertainty about the value attributable to key outcomes?</i>		
Judgement	Evidence	Adjunctive considerations
Not relevant	No evidence of uncertainty. Timely recognition of a complication following metabolic and bariatric surgery is essential in the management of the postoperative patient.	
Balance of effects <i>Does the balance of favorable and unfavorable effects favor the treatment under consideration or the comparison treatment?</i>		
Judgement	Evidence	Adjunctive considerations
Not Known	It is not possible to evaluate the balance of effects of an endoscopic diagnostic approach in patients with complications following metabolic and bariatric surgery due to a lack of studies.	
Resources needed <i>What is the amount of expected costs?</i>		
Judgement	Evidence	Adjunctive considerations
Elevated	High costs, mainly related to the direct costs of bariatric endoscopy.	
Level of evidence sulle risorse necessarie <i>What is the degree of evidence for the effects of the intervention?</i>		
Judgement	Evidence	Adjunctive considerations
No studies	There are no available studies	
Cost-effectiveness <i>Does cost-effectiveness favor the treatment under consideration or the comparison treatment?</i>		
Judgement	Evidence (see "Pharmacoeconomic evidence")	Adjunctive considerations
Not Known	There are no available studies	
Equity		

<i>What would be the impact of the intervention on equity</i>		
Judgement	Evidence	Adjunctive considerations
Probably no impact	No specific data exist.	The number of public facilities capable of providing adequate endoscopic diagnostics, while not limited in terms of overall numbers, is not evenly distributed across the territory. As a result, some patients may be forced to turn to non-conventionally affiliated private facilities.
Acceptability <i>Is the intervention acceptable to all stakeholders?</i>		
Judgement	Evidence	Adjunctive considerations
Probably Yes	There is no available evidence.	
Feasibility <i>Is the intervention feasible?</i>		
Judgement	Evidence	Adjunctive considerations
Probably Yes	Many centers in Italy are able to perform adequate endoscopic diagnostics and follow patients over time in order to manage complications from metabolic and bariatric surgery. However, it is possible that some areas may not have all the necessary expertise thus reducing feasibility.	All centers should be monitored in order to see if they can follow the recommendations included in this LG.

SUMMARY OF EVALUATIONS

	JUDGEMENT						
Relevance of the problem	Not ☐	Probably not ☐	Probably Yes ☐	Yes ☒		Variable ☐	Not Known ☐
Favorable effects	Insignificant ☐	Little ☐	Moderate ☐	Big ☐		Variable ☐	Not Known ☒
Unfavorable effects	Big ☐	Moderate ☐	Little ☐	Insignificant ☐		Variable ☐	Not Known ☒
Level of evidence	Very Low ☐	Low ☐	Moderate ☐	High ☐			No studies ☒
Value	Very relevant ☐	Probably relevant ☐	Probably not relevant ☐	Not relevant ☐			Not Known ☒
Balance of effects	Unfavorable ☐	Probably unfavorable ☐	Neutral ☐	Probably in favor ☐	In favor ☐	Variable ☐	Not Known ☒
Resources needed	Elevated ☒	Moderate ☐	Insignificant ☐	Moderate savings ☐	Large savings ☐	Variable ☐	Not Known ☐
Evidence on resources	Very Low ☐	Low ☐	Moderate ☐	High ☐			No studies ☒
Cost-effectiveness	Unfavorable ☐	Probably unfavorable ☐	Neutral ☐	Probably in favor ☐	In favor ☐	Variable ☐	Not Known ☒

		☐					
Equity	Reduced ☐	Probably reduced ☐	Probably no impact ☒	Probably increased ☐	Increased ☐	Variable ☐	Not Known ☐
Acceptability	Not ☐	Probably not ☐	Probably Yes ☒	Yes ☐		Variable ☐	Not Known ☐
Feasibility	Not ☐	Probably not ☐	Probably Yes ☒	Yes ☐		Variable ☐	Not Known ☐

LEVEL OF RECOMMENDATION

PICO 7

No preference is expressed either in favor of or against the endoscopic approach for diagnosing post-procedural complications of metabolic and bariatric surgery.

Recommendation is neutral, with very low quality of evidence

Reason for the recommendation

Obesity and its related medical conditions are a growing public health problem in many countries due to the increasing prevalence, significant impact on the health of affected individuals, and the rising economic burden associated with it. Metabolic and bariatric surgery has been developed to achieve significant weight loss in patients with obesity. However, as is well known, it is associated with an increased risk of potentially severe adverse events^{1,11-13}. In the case of complications, timely diagnosis can be made using endoscopic techniques that, in some cases, also allow for simultaneous resolution of the complication.

The ERT found no studies, neither controlled nor observational, that would enable an objective evaluation of the clinical question. The costs of diagnostics are certainly high; however, considering the costs of alternative instrumental diagnostics and the possibility of conducting a potentially resolving therapeutic act during the diagnostic phase, the panel does not express a preference either in favor of or against the endoscopic approach.

Considerations on subgroups of patients

None.

Implementation considerations

Healthcare providers should be informed of this recommendation through specific continuing medical education programs.

Evaluation and monitoring

Monitoring and evaluating adherence to this guideline is quite challenging and could be done by assessing the proportion of patients with surgical complications who have undergone endoscopic diagnostics. This monitoring can be carried out through the consultation of annual reports.

Research priorities

More trials are needed in patients with disease recurrence, insufficient weight loss, and/or relapse of comorbidities following metabolic and bariatric surgery to strengthen this recommendation.

PICO 8: *In patients with complications (e.g., leaks, dehiscence, bleeding, stenosis, anastomotic ulcers, dumping syndrome) following metabolic and bariatric surgery, is an endoscopic approach preferred over non-endoscopic interventions for the treatment of post-surgical complications??*

Critical outcomes:

1. Reduction of surgical reinterventions
2. Decrease in length of hospital stay
3. Reduction in hospitalizations
4. Decrease in all-cause mortality
5. Improvement in quality of life
6. Perioperative mortality
7. Serious peri-procedural adverse events
8. Total serious adverse events

PICO

<i>Population</i>	Individuals with adverse events following metabolic and bariatric surgery
<i>Intervention</i>	Endoscopic bariatric surgery
<i>Comparison</i>	Non-endoscopic treatment
<i>Critical outcomes</i>	See Table "Critical and Non-Critical Outcomes"

EVALUATION

Relevance of the problem <i>Is the problem a priority?</i>		
Judgement	Evidence	Adjunctive considerations
Yes	Obesity and its related medical conditions are a growing public health problem in many countries due to increasing prevalence, significant health impact on affected individuals, and growing related economic burden. Metabolic and bariatric surgery has been developed to achieve significant weight loss in patients with obesity. However, as is well known, it is associated with an increased risk of potentially serious adverse events ^{1,11-13} . In the event of complications, management can be performed through a repeat surgical intervention or an endoscopic approach. However, there is a lack of solid evidence showing the superiority of one therapeutic approach over the other.	
Favourable effects <i>Of what extent are the favorable effects of the intervention?</i>		
Judgement	Evidence (see “Support Evidence”)	Adjunctive considerations (see “Support Evidence”)
Moderate	A single recently published trial was identified, conducted on patients with gastrocutaneous dehiscence or fistulas after LSG who did not respond to medical therapies. Patients were randomized to either surgical or endoscopic therapy. Only two outcomes considered critical by the panel were reported in this publication: 1. Perioperative mortality 2. Serious peri-procedural adverse events Patients allocated to surgery experienced a significant increase in fistula recurrence within the first week. Two patients in the surgical group died, whereas no deaths were reported in the endoscopic surgery group.	
Unfavorable effects <i>Of what extent are the adverse effects of the intervention?</i>		

Judgement	Evidence	Adjunctive considerations
Little	<i>Peri-procedural SAE</i> No serious events reported. <i>Serious Adverse Events</i> No serious events reported. <i>Perioperative Mortality</i> No deaths reported.	
Level of evidence <i>What is the degree of evidence for the effects of the intervention?</i>		
Judgement	Evidence (see “GRADE evaluation”)	Adjunctive considerations
Low	The judgment is made based on the evaluable critical outcomes, taking into account the outcome with the worst assessment (see Table 1).	
Value <i>E Is there significant uncertainty about the value attributable to key outcomes?</i>		
Judgement	Evidence	Adjunctive considerations
Not relevant	here is no evidence of uncertainty. Timely treatment of complications related to metabolic and bariatric surgery is a crucial aspect of the surgical management of obesity ^{1,2,14,27} .	
Balance of effects <i>Does the balance of favorable and unfavorable effects favor the treatment under consideration or the comparison treatment?</i>		
Judgement	Evidence	Adjunctive considerations
Probably in favor	The balance of effects related to the endoscopic treatment of complications from metabolic and bariatric surgery, compared to a repeat surgical intervention, appears to be favorable due to the lower number of recurrences and peri-procedural adverse events.	
Resources needed <i>What is the amount of expected costs?</i>		
Judgement	Evidence	Adjunctive considerations

Large savings	Although there are no specific studies on the topic, compared to the surgical approach for resolving complications, endoscopic treatment certainly offers economic advantages.	
Degree of evidence on resources needed <i>What is the degree of evidence on the resources needed?</i>		
Judgement	Evidence	Adjunctive considerations
No studies	No studies	
Cost-effectiveness <i>Does cost-effectiveness favor the treatment under consideration or the comparison treatment?</i>		
Judgement	Evidence (see “Pharmacoeconomic evidence”)	Adjunctive considerations
Probably in favor	Although there are no specific studies on the topic, compared to the surgical approach for managing complications, endoscopic treatment offers both clinical and economic advantages (though the latter have not been specifically studied in this context).	
Equity <i>What would be the impact of the intervention on equity?</i>		
Judgement	Evidence	Adjunctive considerations
Probably no impact	No specific data exist.	The number of public facilities capable of providing adequate bariatric endoscopy treatment is limited and unevenly distributed throughout the territory, so a proportion of patients may be forced to turn to private, non-contracted facilities..
Acceptability <i>Is the intervention acceptable to all stakeholders?</i>		
Judgement	Evidence	Adjunctive considerations
Probably yes	There is no available evidence.	None.

Feasibility Is the intervention feasible?		
Judgement	Evidence	Adjunctive considerations
Probably yes	Numerous centers in Italy are equipped to perform surgical and endoscopic interventions aimed at addressing side effects from metabolic and bariatric surgery. However, certain areas may lack all the necessary expertise, which can limit the feasibility of these treatments.	All centers should be monitored in order to see if they can follow the recommendations included in this LG.

SUMMARY OF EVALUATIONS

	JUDGEMENT						
Relevance of the problem	Not ☐	Probably Not ☐	Probably Yes ☐	Yes ☒		Variable ☐	Not Known ☐
Favorable effects	Insignificant ☐	Little ☐	Moderate ☒	Big ☐		Variable ☐	Not Known ☐
Unfavorable effects	Big ☐	Moderate ☐	Little ☐	Insignificant ☒		Variable ☐	Not Known ☐
Level of evidence	Very Low ☒	Low ☐	Moderate ☐	High ☐			No studies ☐
Value	Very relevant ☐	Probably relevant ☐	Probably not relevant ☐	Not relevant ☒			Not known ☐
Balance of effects	Unfavorable ☐	Probably unfavorable ☐	Neutral ☐	Probably in favor ☒	In favor ☐	Variable ☐	Not known ☐
Necessary resources	Elevated ☐	Moderate ☐	Insignificant ☐	Moderate savings ☐	Large savings ☒	Variable ☐	Not known ☐
Evidence resources on	Very low ☐	Low ☐	Moderate ☐	High ☐			No studies ☒
Cost-effectiveness	Unfavorable ☐	Probably unfavorable ☐	Neutral ☐	Probably in favor ☒	In favor ☐	Variable ☐	Not known ☐

		☐					
Equity	Reduced ☐	Probably reduced ☐	Probably no impact ☒	Probably increased ☐	Increased ☐	Variable ☐	Not known ☐
Acceptability	Not ☐	Probably not ☐	Probably yes ☒	Yes ☐		Variable ☐	Not known ☐
Feasibility	Not ☐	Probably not ☐	Probably yes ☒	Yes ☐		Variable ☐	Not known ☐

LEVEL OF RECOMMENDATION

PICO 8

The use of bariatric endoscopy is suggested for patients with surgical complications (particularly dehiscence and fistulas) following metabolic and bariatric surgery, as a treatment for these complications.

Weak recommendation in favor, with low quality of evidence

Reason for the recommendation

Obesity and its related medical conditions are a growing public health issue in many countries due to increasing prevalence, significant health impact on affected individuals, and rising associated economic burden. Metabolic and bariatric surgery has been developed to achieve substantial weight loss in patients with complicated obesity. However, as is well known, this type of surgery is associated with an increased risk of potentially serious adverse events^{1,11-13}. In the case of complications, management can be performed with a repeat surgical intervention or an endoscopic approach. However, there is a lack of strong evidence showing the superiority of one therapeutic approach over the other.

A single recently published trial⁴⁴ was identified, conducted on patients with gastrocutaneous dehiscence or fistulas after LSG who did not respond to medical therapies. Patients were randomized to surgical or endoscopic therapy. Those allocated to surgery had a significant increase in fistula recurrence within the first week. Two patients in the traditional surgery group died, whereas no deaths were reported in the endoscopic surgery group. For other complications, there are only meta-analyses of observational studies, which nonetheless appear to show a favorable profile of efficacy and safety for endoscopic surgery⁴⁵⁻⁴⁷. Pharmacoeconomic data demonstrate a favorable cost-effectiveness profile for the endoscopic approach (Table 3). Based on these considerations, a weak recommendation can be made in favor of the endoscopic approach for managing complications following metabolic and bariatric surgery.

Considerations on subgroups of patients

None.

Implementation considerations

Healthcare providers should be made aware of the content of this recommendation through specific continuing medical education programs.

Evaluation and monitoring

Monitoring and evaluating adherence to this guideline is challenging and could be achieved by assessing the proportion of patients with disease recurrence or insufficient weight loss after metabolic and bariatric surgery who receive a bariatric endoscopy procedure. This monitoring can be conducted through the review of medical records.

Research priorities

A higher number of trials conducted in patients with insufficient weight loss or weight regain following metabolic and bariatric surgery in order to increase the strength of this recommendation..

SUPPORTING EVIDENCE

Main search criteria Age ≥ 14 years with overweight or obesity (BMI ≥ 27 kg/m²).

Search string (until 1/2/2024)

Pubmed: # 2,577:

Search: (obesity or overweight) and (surgery or endoscopic or POSE or aspiration or DJBL or gastroplasty or balloon) Filters: Randomized Controlled Trial

((("obeses"[All Fields] OR "obesity"[MeSH Terms] OR "obesity"[All Fields] OR "obese"[All Fields] OR "obesities"[All Fields] OR "obesity s"[All Fields] OR ("overweight"[MeSH Terms] OR "overweight"[All Fields] OR "overweighted"[All Fields] OR "overweightness"[All Fields] OR "overweights"[All Fields])) AND ("surgery"[MeSH Subheading] OR "surgery"[All Fields] OR "surgical procedures, operative"[MeSH Terms] OR ("surgical"[All Fields] AND "procedures"[All Fields] AND "operative"[All Fields]) OR "operative surgical procedures"[All Fields] OR "general surgery"[MeSH Terms] OR ("general"[All Fields] AND "surgery"[All Fields]) OR "general surgery"[All Fields] OR "surgery s"[All Fields] OR "surgeries"[All Fields] OR "surgeries"[All Fields] OR ("endoscope s"[All Fields] OR "endoscoped"[All Fields] OR "endoscopes"[MeSH Terms] OR "endoscopes"[All Fields] OR "endoscope"[All Fields] OR "endoscopic"[All Fields] OR "endoscopically"[All Fields] OR "endoscopy"[MeSH Terms] OR "endoscopy"[All Fields] OR "endoscopic"[All Fields]) OR "POSE"[All Fields] OR ("aspirant"[All Fields] OR "aspirants"[All Fields] OR "aspirate"[All Fields] OR "aspirates"[All Fields] OR "aspiring"[All Fields] OR "aspirational"[All Fields] OR "aspirations, psychological"[MeSH Terms] OR ("aspirations"[All Fields] AND "psychological"[All Fields]) OR "psychological aspirations"[All Fields] OR "aspirations"[All Fields] OR "aspirative"[All Fields] OR "aspirator"[All Fields] OR "aspirators"[All Fields] OR "aspire"[All Fields] OR "aspired"[All Fields] OR "aspires"[All Fields] OR "aspiring"[All Fields] OR "respiratory aspiration"[MeSH Terms] OR ("respiratory"[All Fields] AND "aspiration"[All Fields]) OR "respiratory aspiration"[All Fields] OR "aspirated"[All Fields] OR "aspiration"[All Fields]) OR "DJBL"[All Fields] OR ("gastroplasty"[MeSH Terms] OR "gastroplasty"[All Fields] OR "gastroplasties"[All Fields]) OR ("balloon"[All Fields] OR "balloon s"[All Fields] OR "balloons"[All Fields])))) AND (randomizedcontrolledtrial[Filter])

Translations

obesity: "obeses"[All Fields] OR "obesity"[MeSH Terms] OR "obesity"[All Fields] OR "obese"[All Fields] OR "obesities"[All Fields] OR "obesity's"[All Fields]

overweight: "overweight"[MeSH Terms] OR "overweight"[All Fields] OR "overweighted"[All Fields] OR "overweightness"[All Fields] OR "overweights"[All Fields]

surgery: "surgery"[Subheading] OR "surgery"[All Fields] OR "surgical procedures, operative"[MeSH Terms] OR ("surgical"[All Fields] AND "procedures"[All Fields] AND "operative"[All Fields]) OR "operative surgical procedures"[All Fields] OR "general surgery"[MeSH Terms] OR ("general"[All Fields] AND "surgery"[All Fields]) OR "general surgery"[All Fields] OR "surgery's"[All Fields] OR "surgeries"[All Fields] OR "surgeries"[All Fields]

endoscopic: "endoscope's"[All Fields] OR "endoscoped"[All Fields] OR "endoscopes"[MeSH Terms] OR "endoscopes"[All Fields] OR "endoscope"[All Fields] OR "endoscopic"[All Fields] OR "endoscopically"[All Fields] OR "endoscopy"[MeSH Terms] OR "endoscopy"[All Fields] OR "endoscopic"[All Fields]

aspiration: "aspirant"[All Fields] OR "aspirants"[All Fields] OR "aspirate"[All Fields] OR "aspirates"[All Fields] OR "aspirating"[All Fields] OR "aspirational"[All Fields] OR "aspirations, psychological"[MeSH Terms] OR ("aspirations"[All Fields] AND "psychological"[All Fields]) OR "psychological aspirations"[All Fields] OR "aspirations"[All Fields] OR "aspirative"[All Fields] OR "aspirator"[All Fields] OR "aspirators"[All Fields] OR "aspire"[All Fields] OR "aspired"[All Fields] OR "aspires"[All Fields] OR "aspiring"[All Fields] OR "respiratory aspiration"[MeSH Terms] OR ("respiratory"[All Fields] AND "aspiration"[All Fields]) OR "respiratory aspiration"[All Fields] OR "aspirated"[All Fields] OR "aspiration"[All Fields]

gastroplasty: "gastroplasty"[MeSH Terms] OR "gastroplasty"[All Fields] OR "gastroplasties"[All Fields]

balloon: "balloon"[All Fields] OR "balloon's"[All Fields] OR "balloons"[All Fields]

Embase: #1,484

('obesity'/exp OR obesity) AND ('surgery'/exp OR surgery) AND [embase]/lim NOT ([embase]/lim AND [medline]/lim) AND 'randomized controlled trial'/de

PICO 2: Obesity class I

Figure 1 – Effects of endoscopic bariatric surgery compared to non-surgical obesity treatments or placebo/standard of care (SoC) on BMI at the end of the study, categorized by type of intervention (IGB: Intragastric Balloon; BTA: Botulinum Toxin-A).

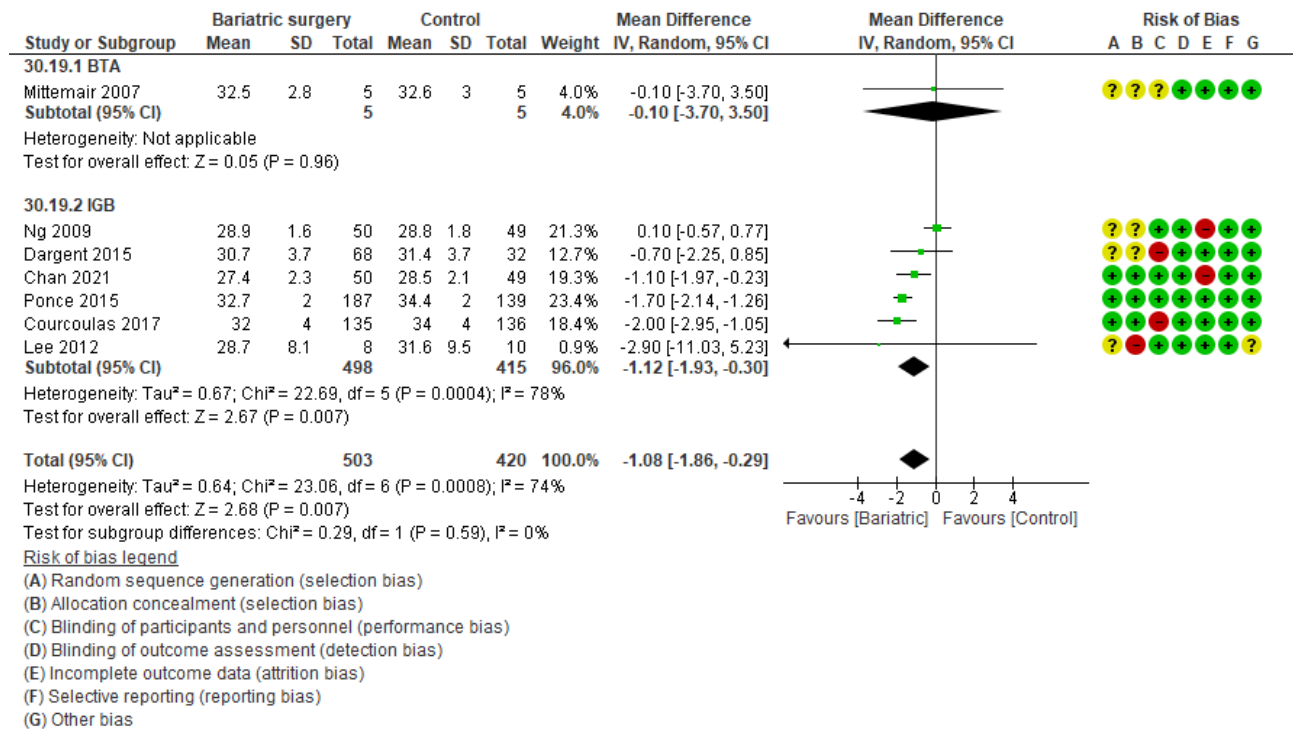


Figure 2 – Effects of the intragastric balloon compared to non-surgical obesity treatments or placebo/standard of care (SoC) on BMI at the end of the study, categorized by type of control.

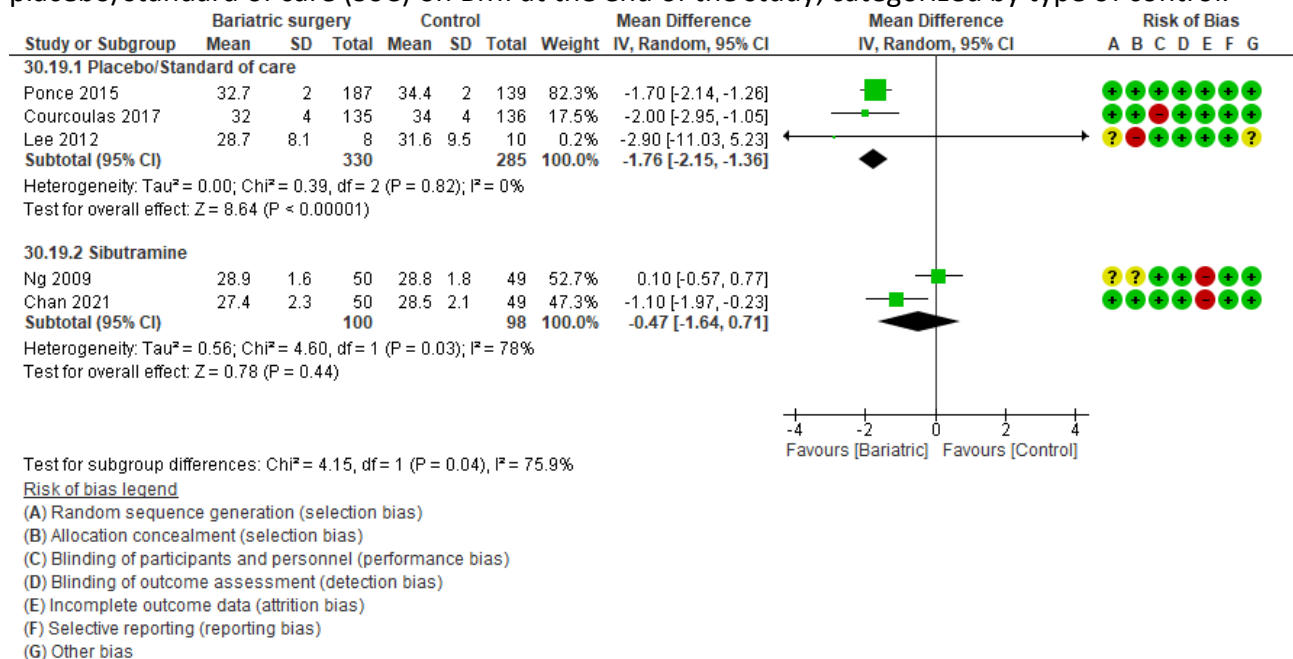
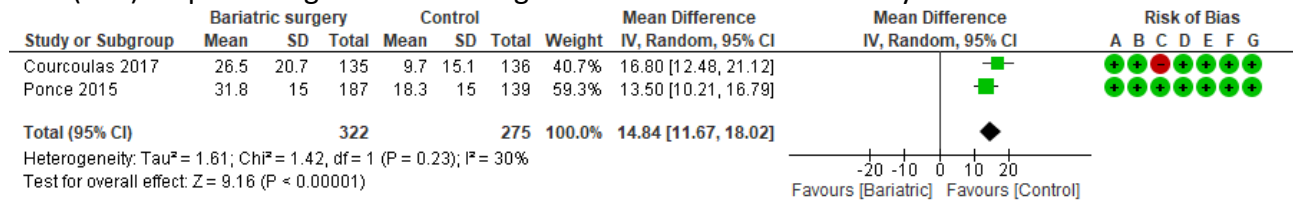


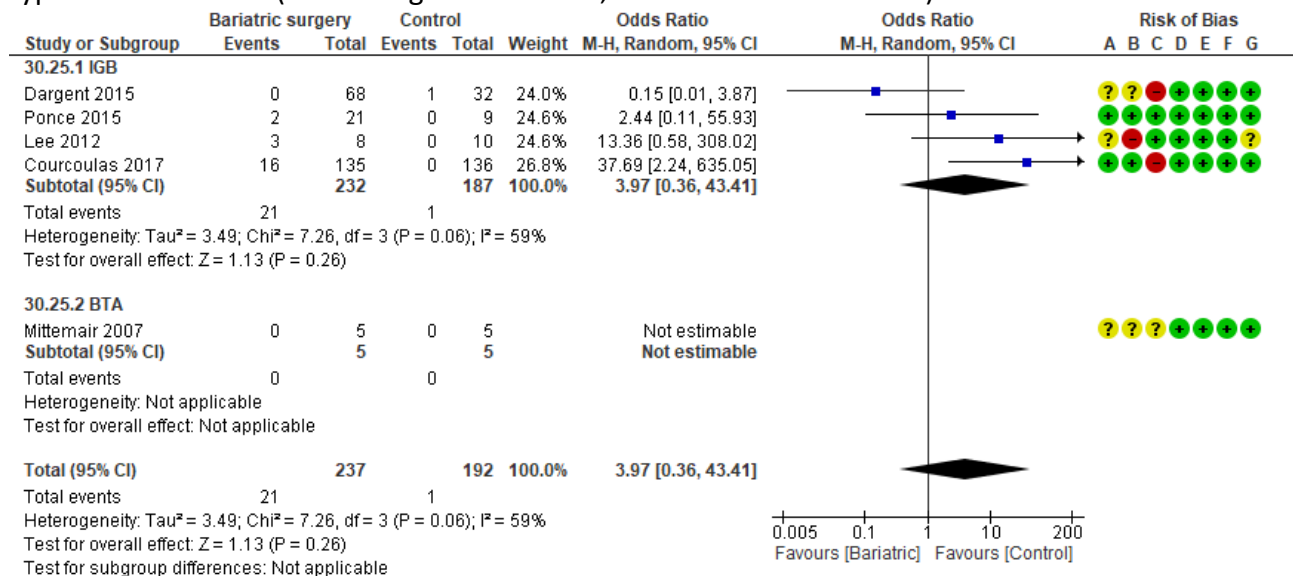
Figure 3 – Effects of endoscopic bariatric surgery (intra gastric balloon) compared to standard of care (SoC) on percentage of excess weight lost at the end of the study.



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

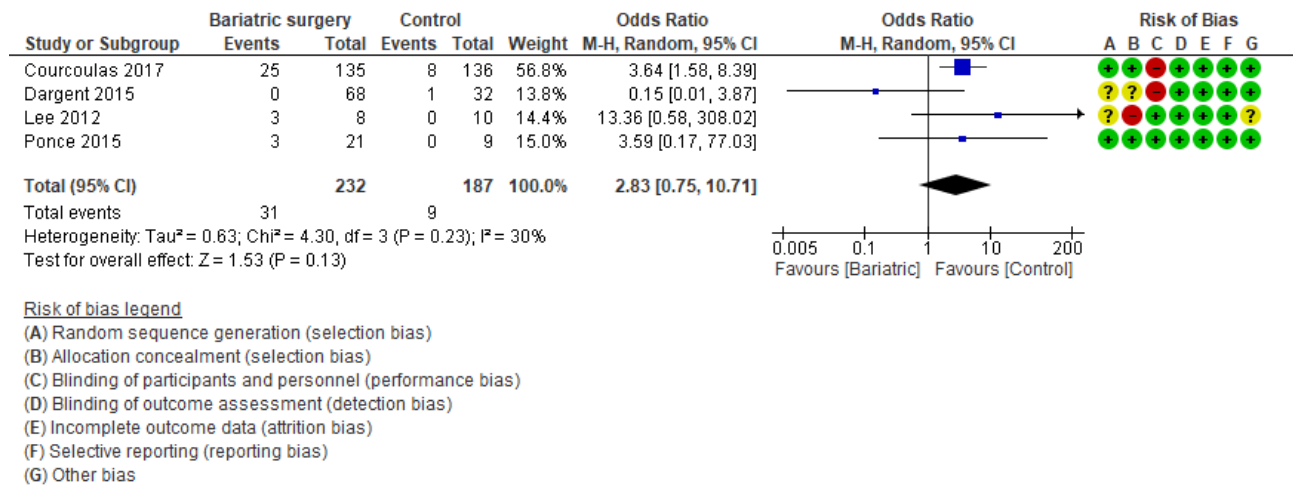
Figure 4 – Effects of endoscopic bariatric surgery compared to non-surgical treatments for obesity or placebo/standard of care (SoC) on the risk of serious periprocedural adverse events, divided by type of intervention (IGB: Intra gastric Balloon; BTA: Botulinum Toxin-A).



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

Figure 5 – Effects of endoscopic bariatric surgery compared to non-surgical treatments for obesity or placebo/standard of care (SoC) on the risk of serious adverse events, divided by intervention type (all studies included in the analysis were conducted with IGB: Intragastric Balloon).



PICO 3: Obesity classe ≥II

Figure 6 – Effects of endoscopic bariatric surgery compared to non-surgical treatments for obesity or placebo/standard of care (SoC) on BMI at the end of the study, divided by intervention type (space-occupying devices: IGB and suturing interventions: POSE/ESG).

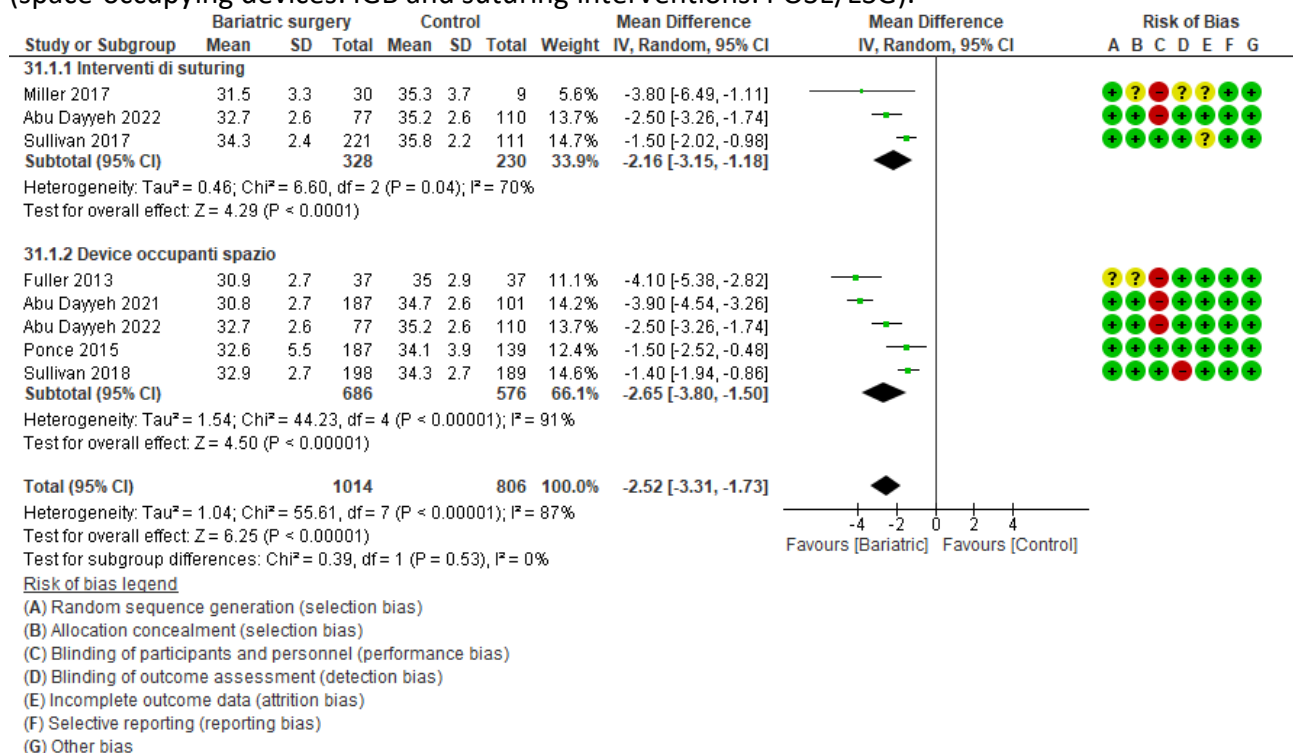


Figure 7 – Effects of endoscopic bariatric surgery compared to non-surgical treatments for obesity or placebo/standard of care (SoC) on percentage of weight loss at the end of the study, divided by intervention type (space-occupying devices: IGB and suturing interventions: POSE/ESG).

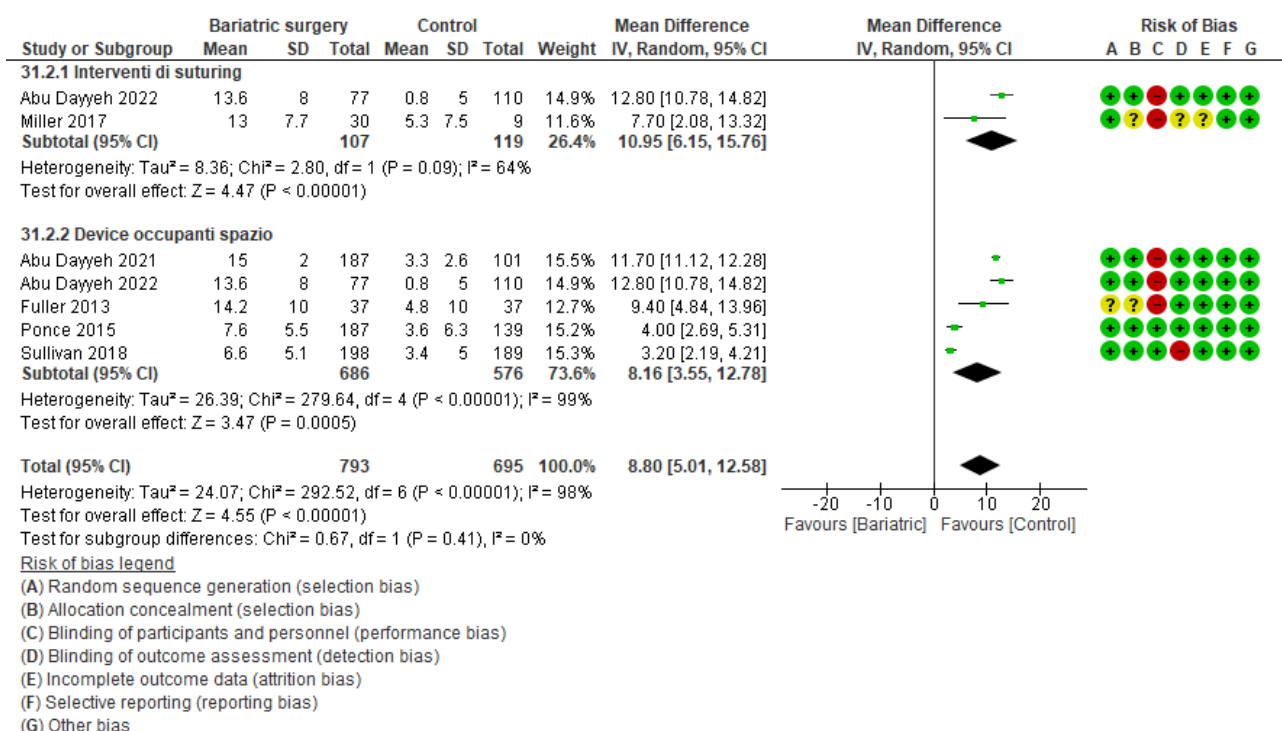


Figure 8 – Effects of endoscopic bariatric surgery compared to non-surgical treatments for obesity or placebo/standard of care (SoC) on percentage of excess weight lost at the end of the study, divided by intervention type (space-occupying devices: IGB and suturing interventions: POSE/ESG).

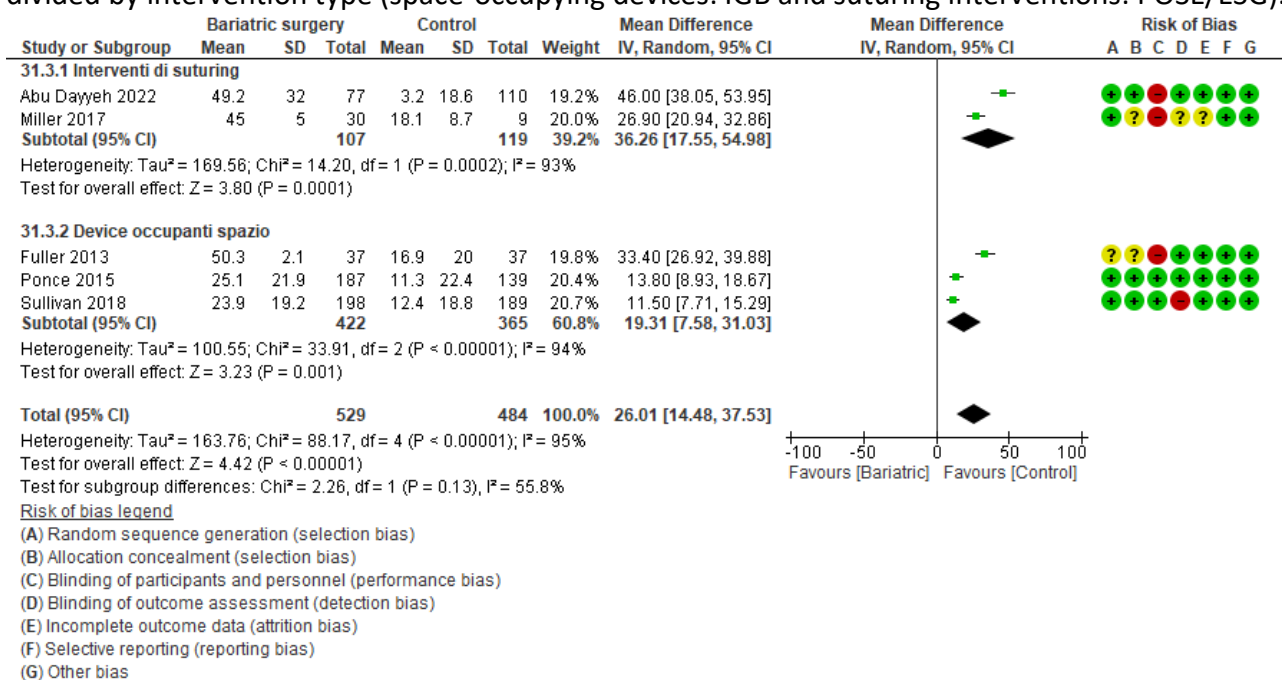


Figure 9 – Effects of endoscopic bariatric surgery compared to non-surgical treatments for obesity or placebo/standard of care (SoC) on fasting glucose at the end of the study, divided by intervention type (space-occupying devices: IGB and suturing interventions: POSE/ESG).

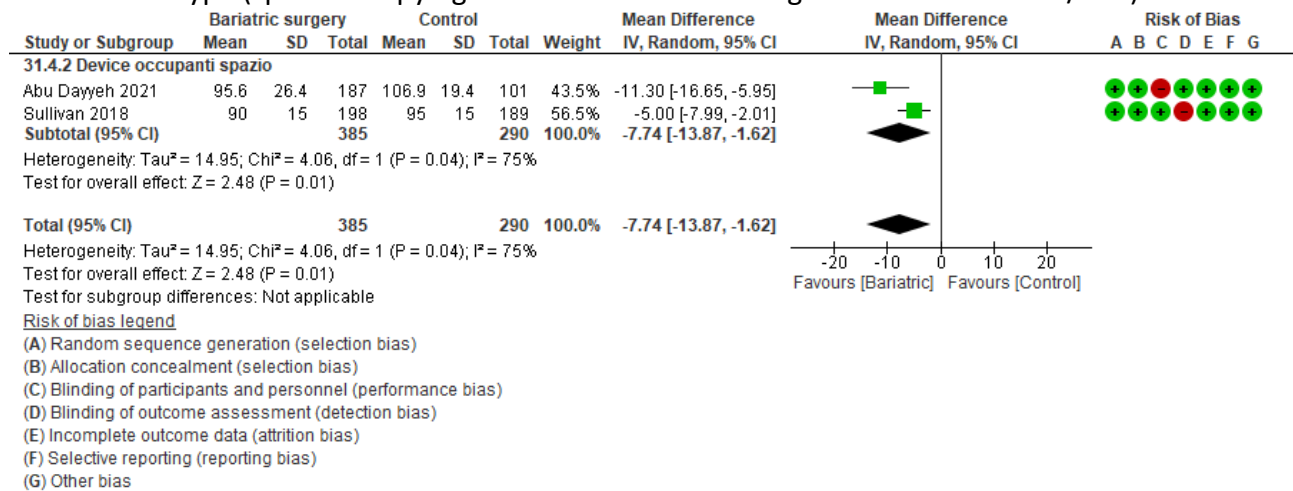


Figure 10 – Effects of endoscopic bariatric surgery compared to non-surgical treatments for obesity or placebo/standard of care (SoC) on HbA1c at the end of the study, divided by intervention type (space-occupying devices: IGB and suturing interventions: POSE/ESG).

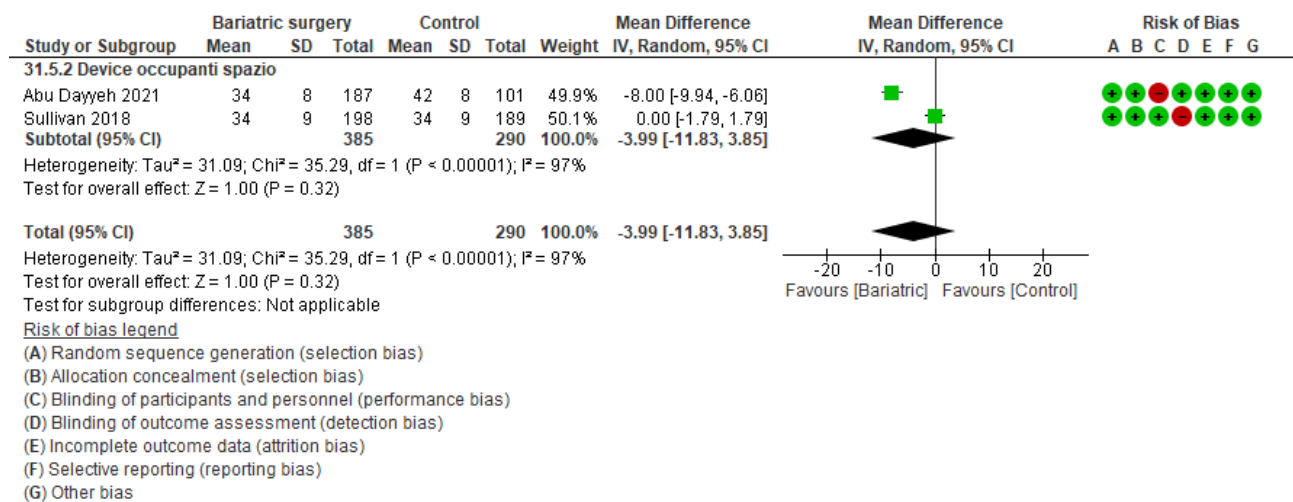


Figure 11 – Effects of endoscopic bariatric surgery compared to non-surgical treatments for obesity or placebo/standard of care (SoC) on total cholesterol at the end of the study, divided by intervention type (space-occupying devices: IGB and suturing interventions: POSE/ESG).

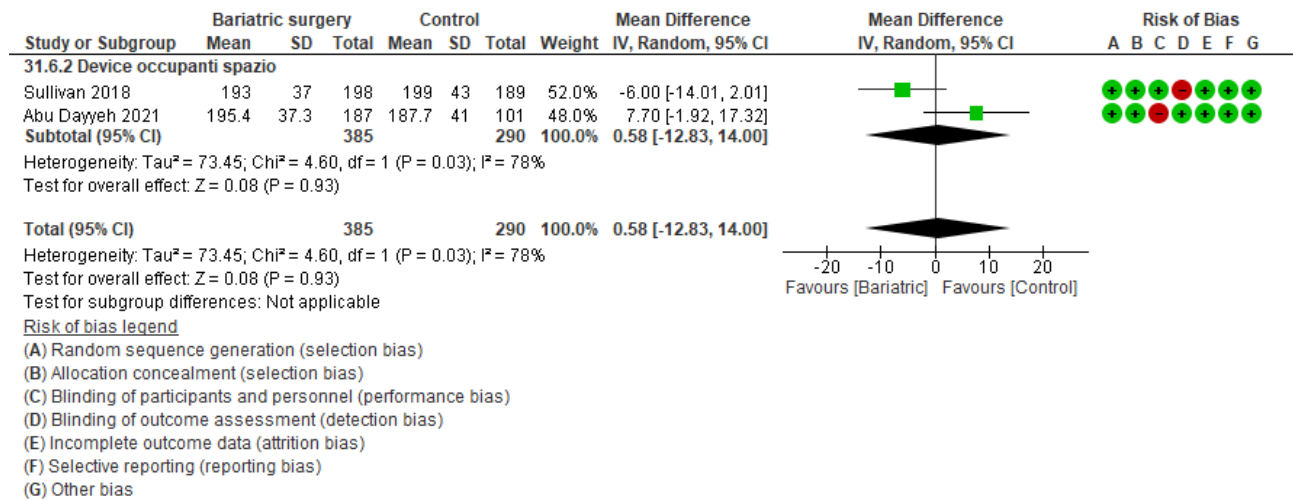


Figure 12 – Effects of endoscopic bariatric surgery compared to non-surgical treatments for obesity or placebo/standard of care (SoC) on HDL cholesterol at the end of the study, divided by intervention type (space-occupying devices: IGB and suturing interventions: POSE/ESG).

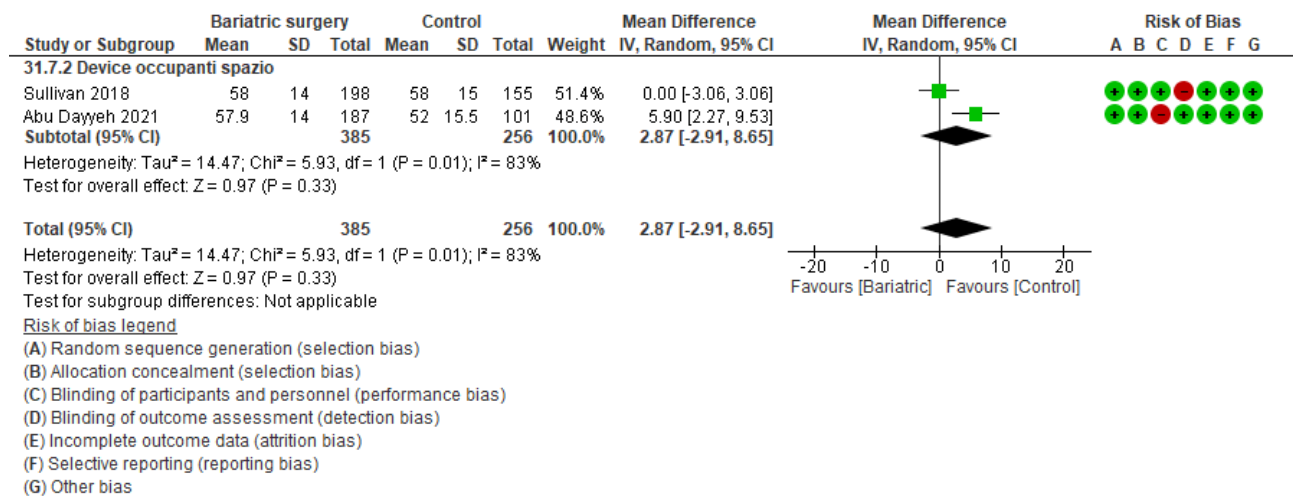


Figure 13 – Effects of endoscopic bariatric surgery compared to non-surgical treatments for obesity or placebo/standard of care (SoC) on triglycerides at the end of the study, divided by intervention type (space-occupying devices: IGB and suturing interventions: POSE/ESG).

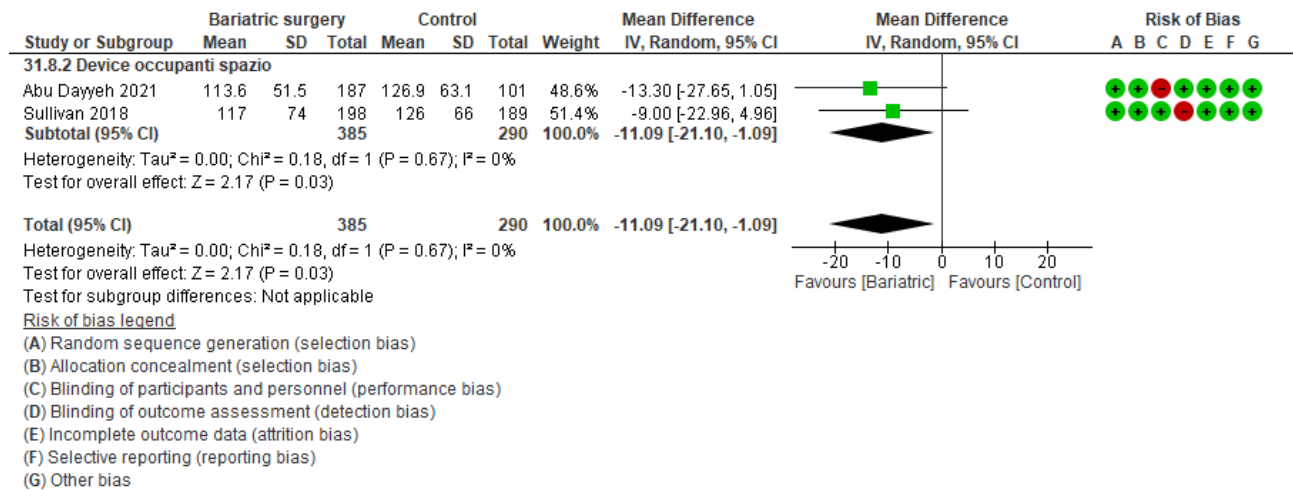


Figure 14 – Effects of endoscopic bariatric surgery compared to non-surgical treatments for obesity or placebo/standard of care (SoC) on systolic blood pressure at the end of the study, divided by intervention type (space-occupying devices: IGB and suturing interventions: POSE/ESG).

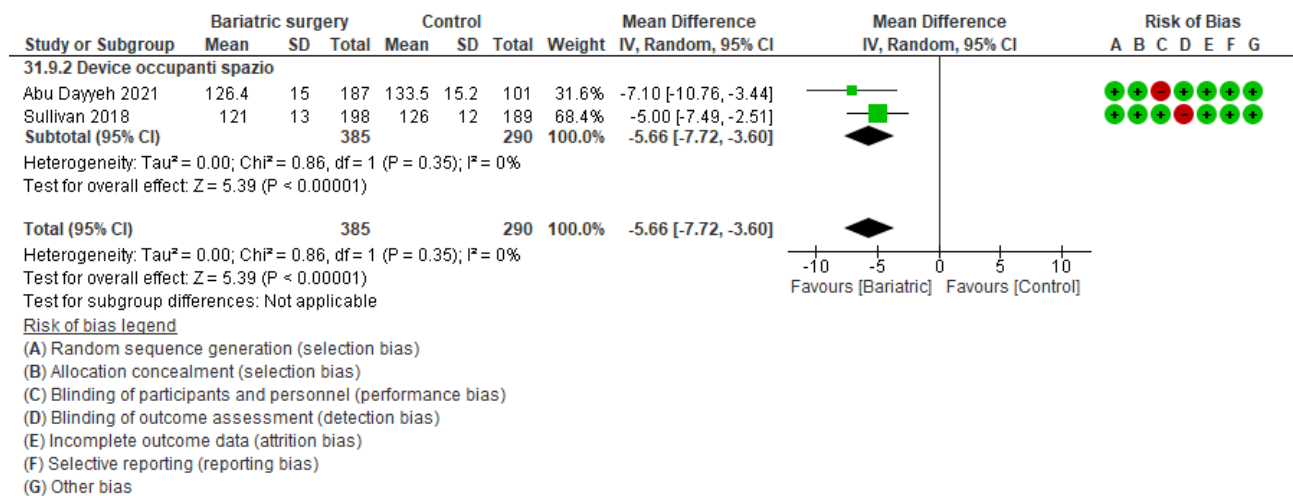


Figure 15 – Effects of endoscopic bariatric surgery compared to non-surgical treatments for obesity or placebo/standard of care (SoC) on diastolic blood pressure at the end of the study, divided by intervention type (space-occupying devices: IGB and suturing interventions: POSE/ESG).

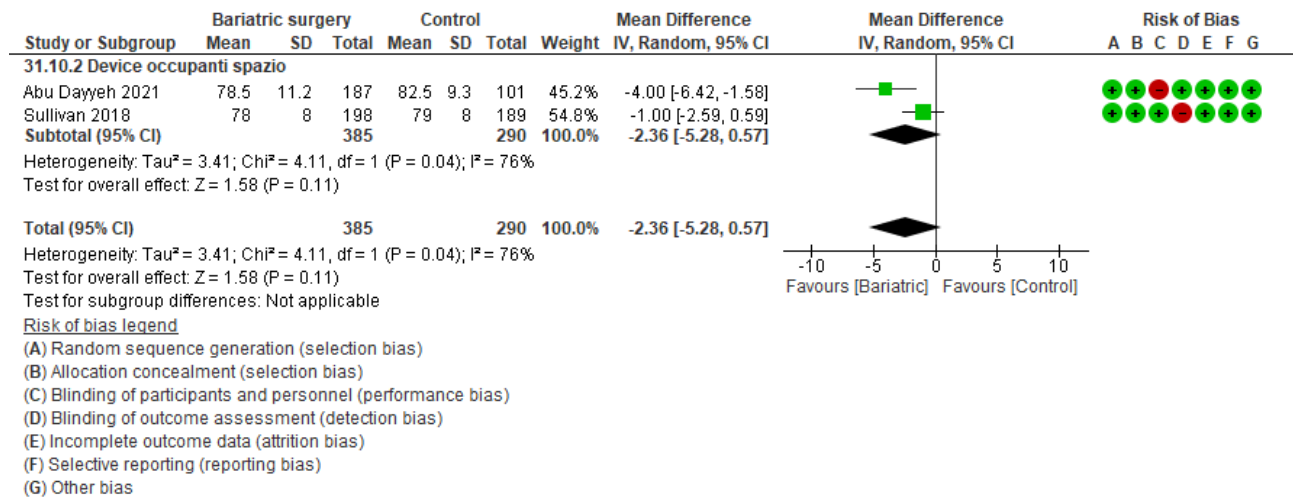


Figure 16 – Effects of endoscopic bariatric surgery compared to non-surgical treatments for obesity or placebo/standard of care (SoC) on the risk of serious periprocedural adverse events, divided by intervention type (space-occupying devices: IGB and suturing interventions: POSE/ESG).

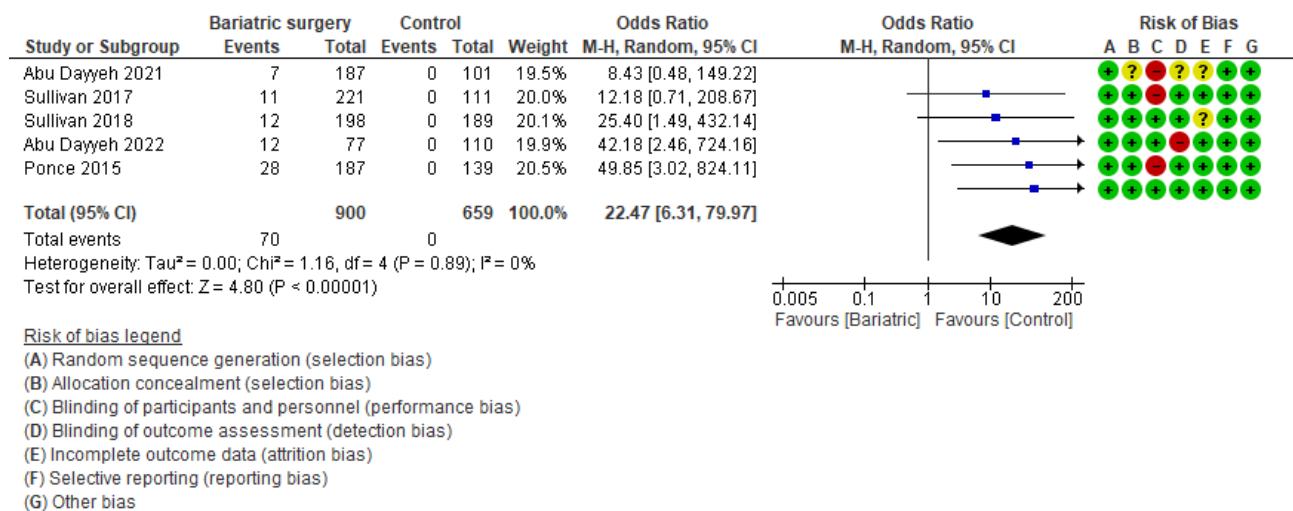
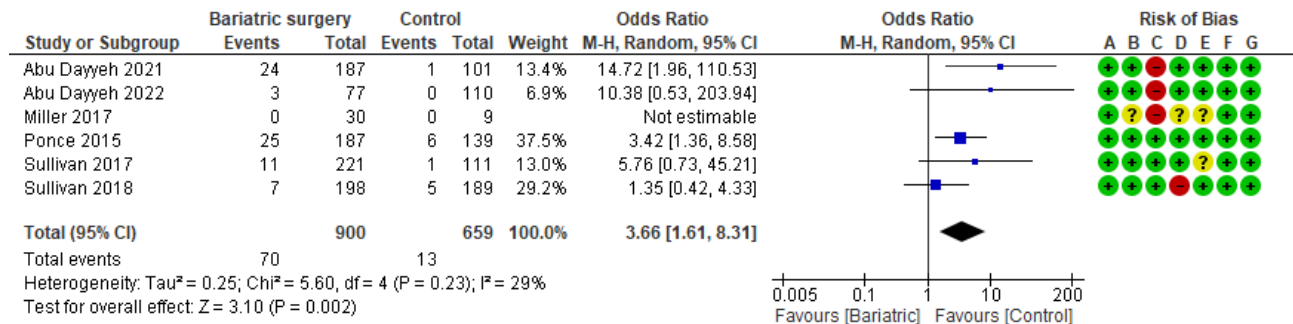


Figure 17 – Effects of endoscopic bariatric surgery compared to non-surgical treatments for obesity or placebo/standard of care (SoC) on the risk of serious adverse events at the end of the study, divided by intervention type (space-occupying devices: IGB and suturing interventions: POSE/ESG).



PICO 6: Revisional Surgery

Figure 18 – Effects of revisional endoscopic bariatric surgery compared to non-surgical treatments for obesity or placebo/SoC on BMI at study end, categorized by intervention type (TORe: transoral anastomosis reduction; Argon plasma coagulation: coagulation of the anastomosis with argon laser; Gastric plication: gastric plication).

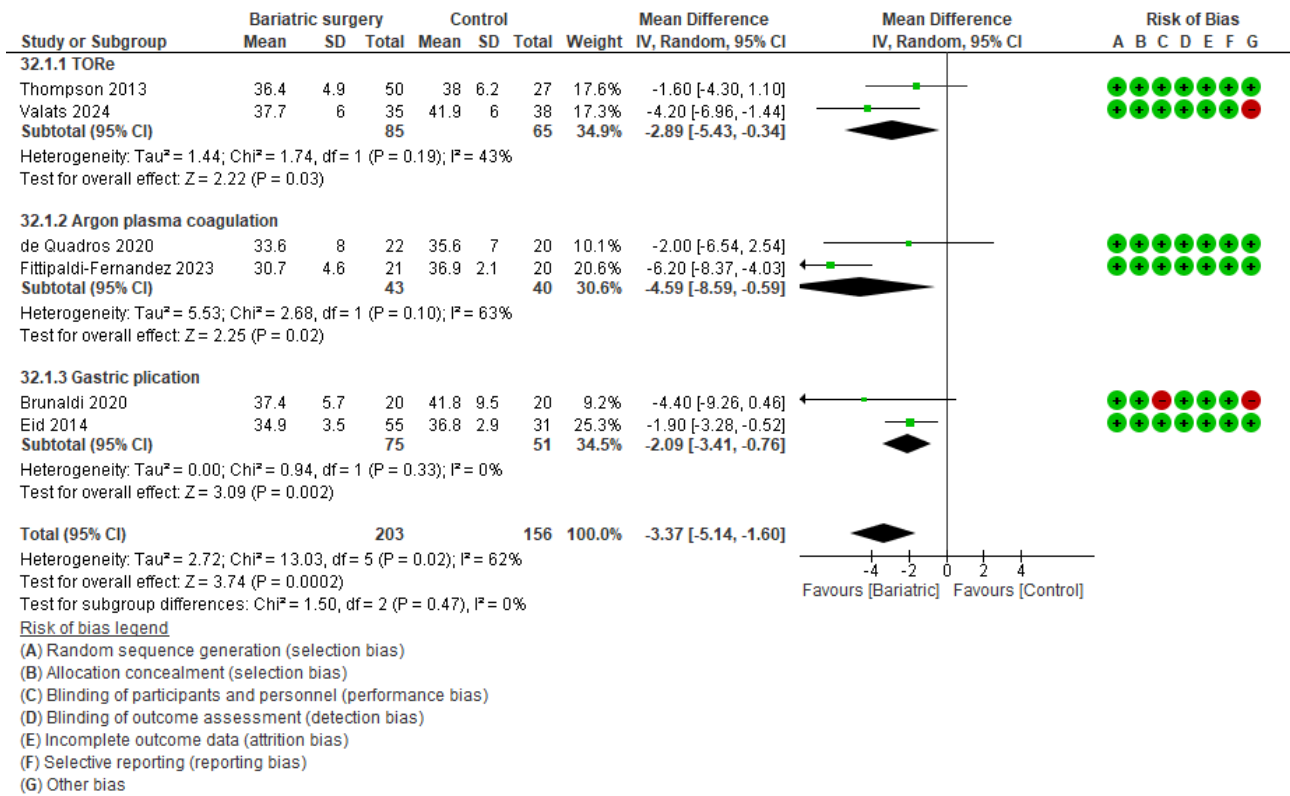


Figure 19 – Effects of revisional endoscopic bariatric surgery compared to non-surgical treatments for obesity or placebo/SoC on percentage of body weight loss at study end, categorized by intervention type (TORe: transoral anastomosis reduction; Argon plasma coagulation: coagulation of the anastomosis with argon laser; Gastric plication: gastric plication).

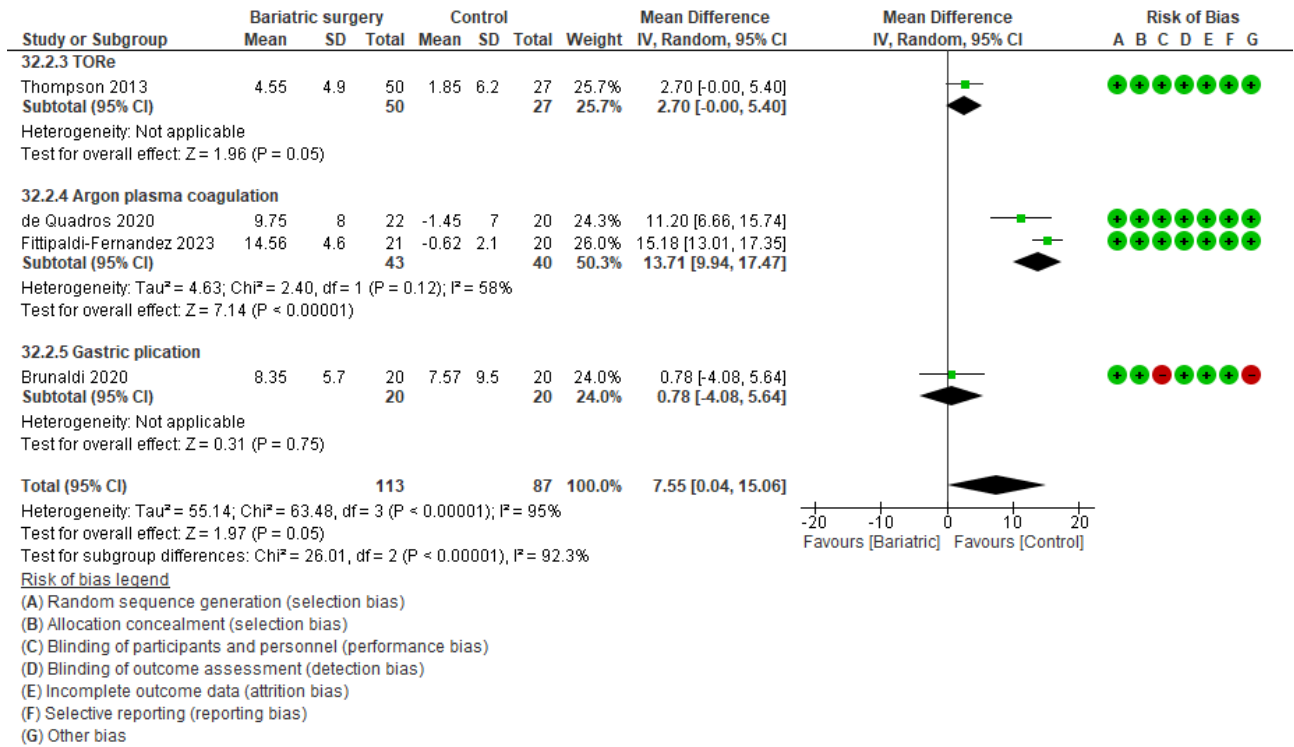


Figure 20 – Effects of revisional endoscopic bariatric surgery compared to non-surgical treatments for obesity or placebo/SoC on percentage of excess body weight loss at study end, categorized by intervention type (TORe: transoral anastomosis reduction; Argon plasma coagulation: coagulation of the anastomosis with argon laser; Gastric plication: gastric plication).

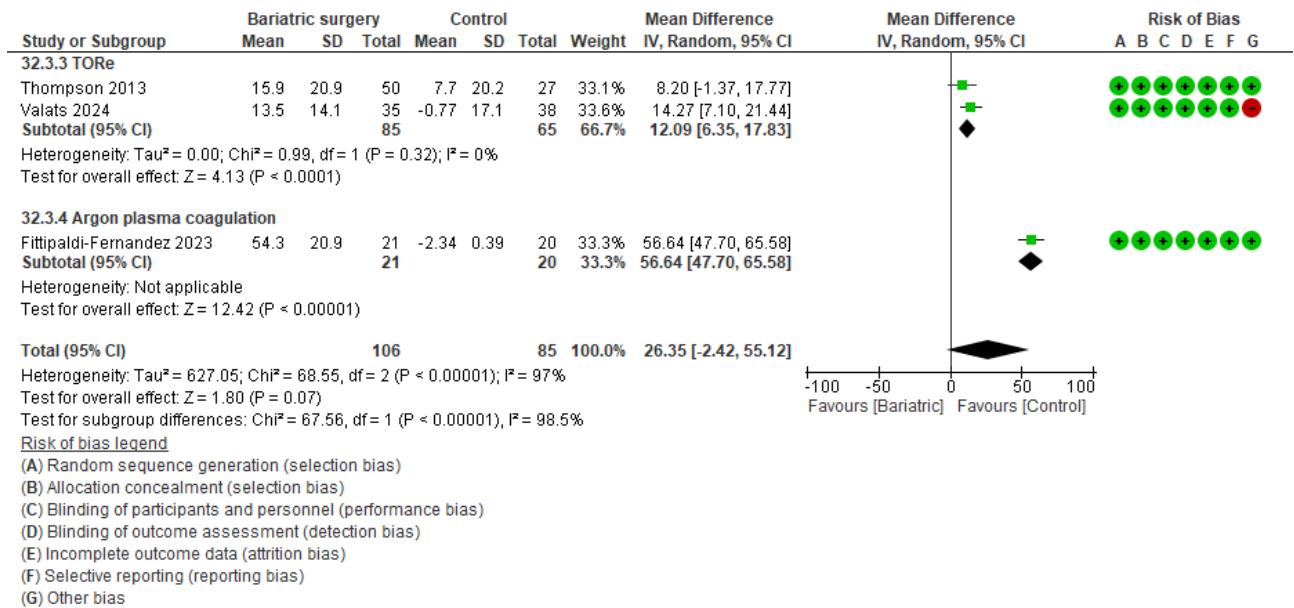


Figure 21 – Effects of revisional endoscopic bariatric surgery compared to non-surgical treatments for obesity or placebo/SoC on fasting glucose at study end, categorized by intervention type (TORe: transoral anastomosis reduction; Argon plasma coagulation: coagulation of the anastomosis with argon laser; Gastric plication: gastric plication).

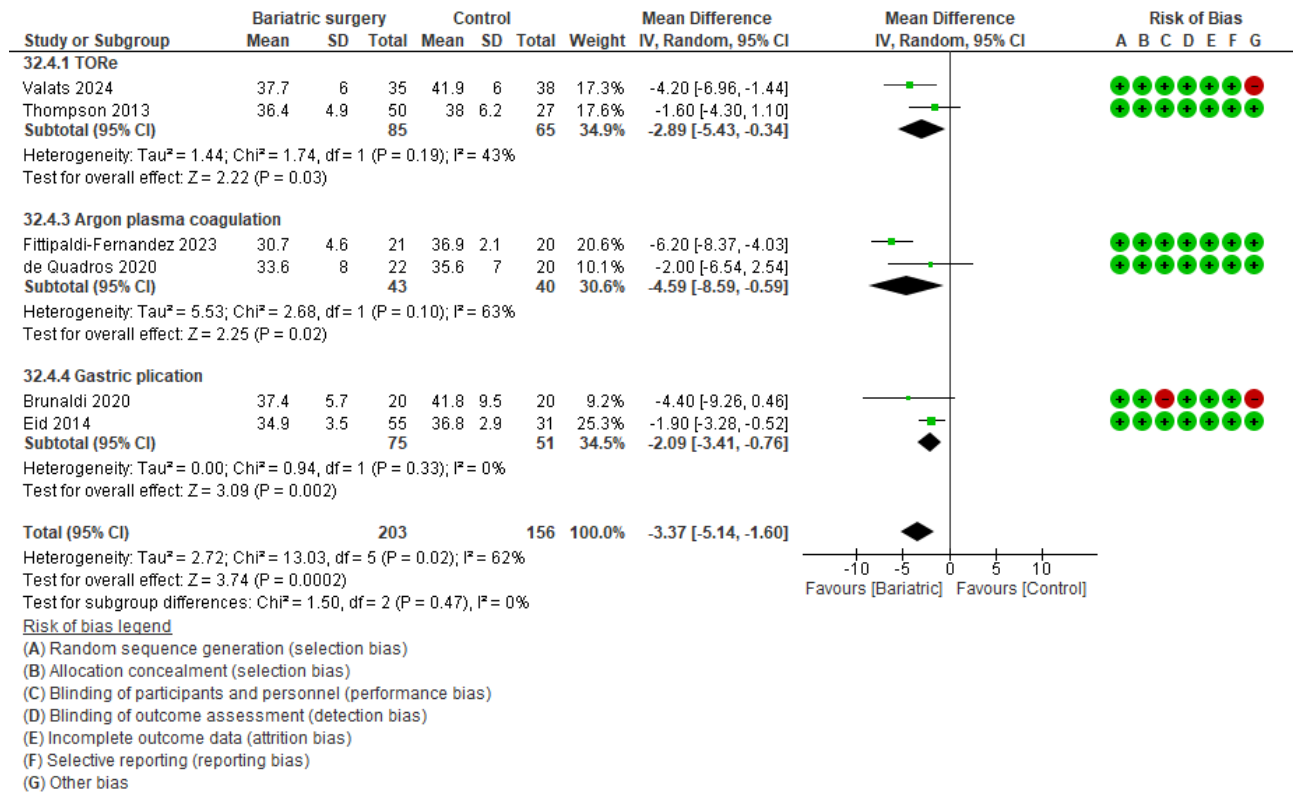


Figure 22 – Effects of revisional endoscopic bariatric surgery compared to non-surgical treatments for obesity or placebo/SoC on HbA1c at study end, categorized by intervention type (TORe: transoral anastomosis reduction; Argon plasma coagulation: coagulation of the anastomosis with argon laser; Gastric plication: gastric plication).

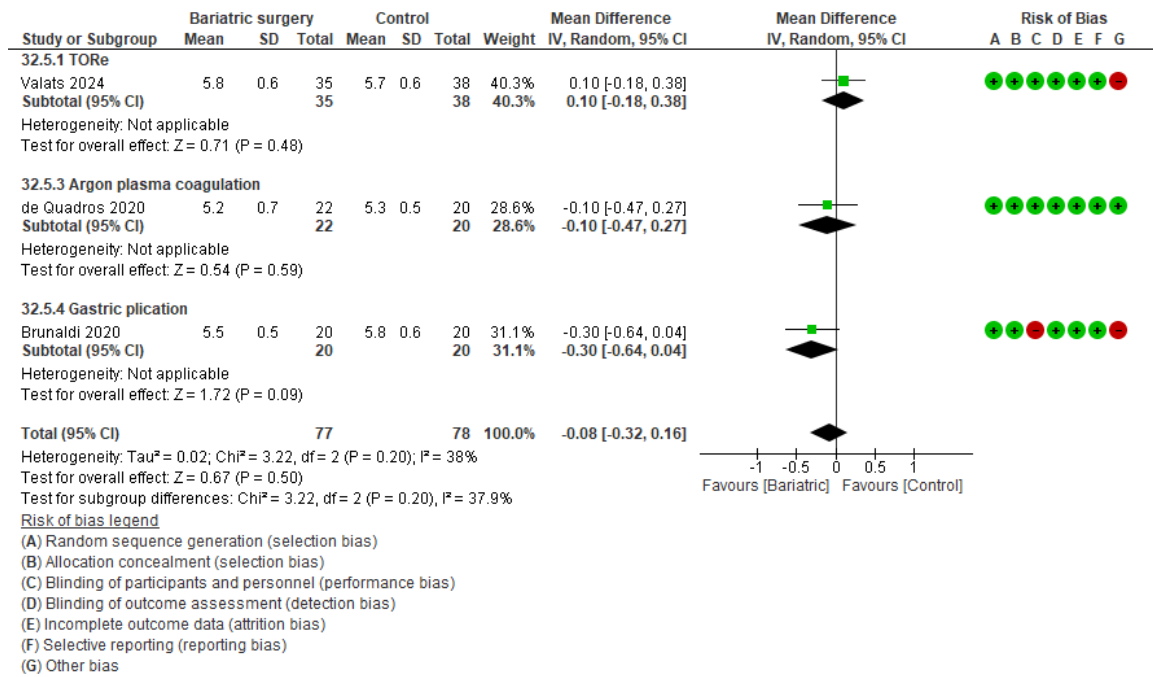


Figure 23 – Effects of revisional endoscopic bariatric surgery compared to non-surgical treatments for obesity or placebo/SoC on total cholesterol at study end, categorized by intervention type (TORe: transoral anastomosis reduction; Argon plasma coagulation: coagulation of the anastomosis with argon laser; Gastric plication: gastric plication).

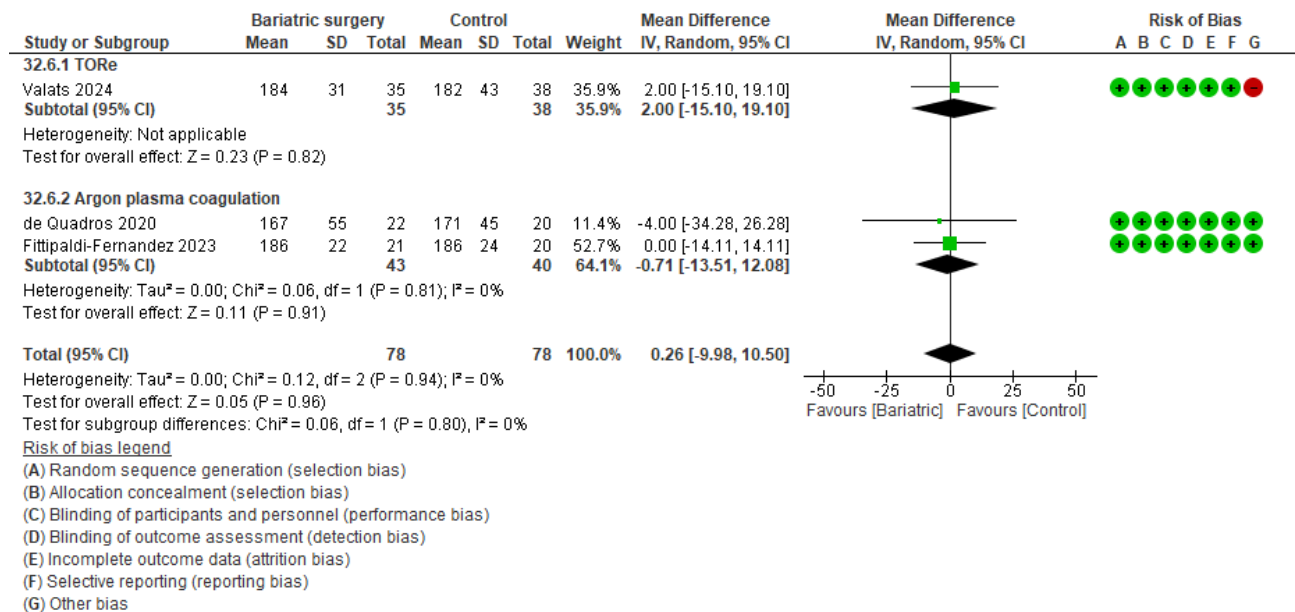


Figure 24 – Effects of revisional endoscopic bariatric surgery compared to non-surgical treatments for obesity or placebo/SoC on HDL cholesterol at study end, categorized by intervention type (TORe: transoral anastomosis reduction; Argon plasma coagulation: coagulation of the anastomosis with argon laser; Gastric plication: gastric plication).

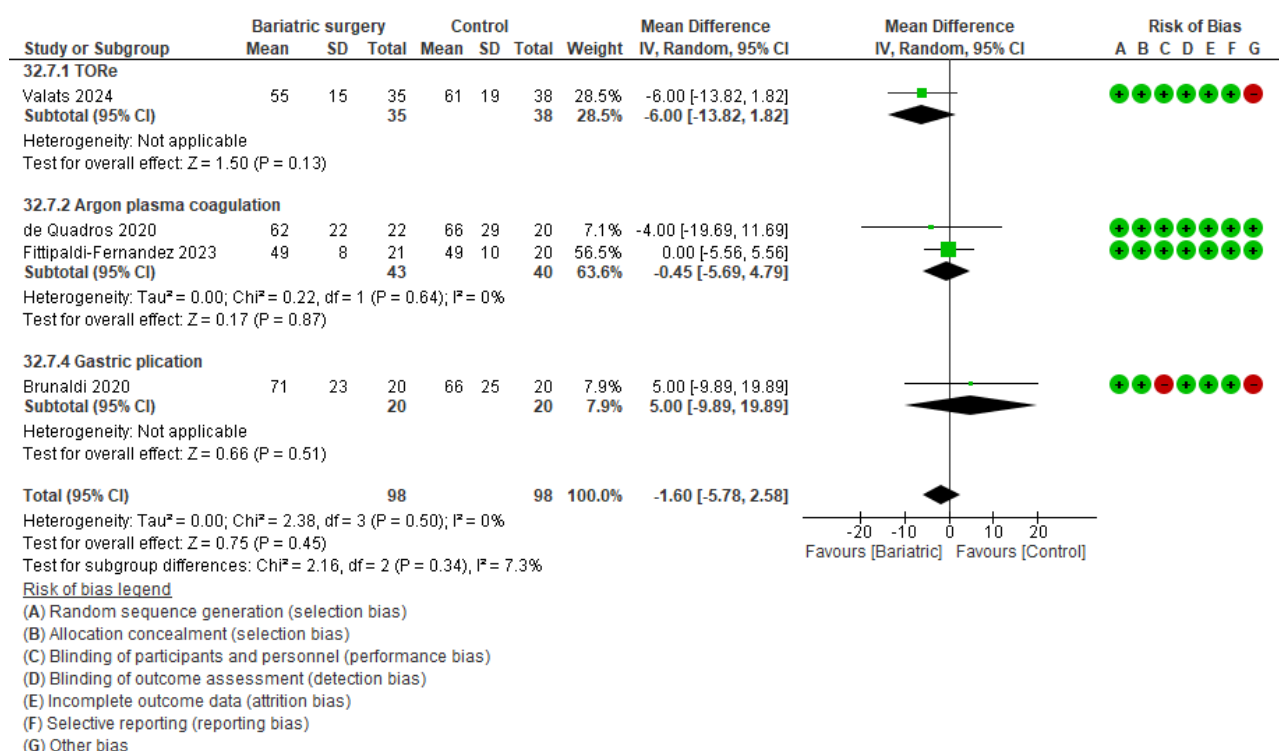


Figure 25 – Effects of revisional endoscopic bariatric surgery compared to non-surgical treatments for obesity or placebo/SoC on triglycerides at study end, categorized by intervention type (TORe: transoral anastomosis reduction; Argon plasma coagulation: coagulation of the anastomosis with argon laser; Gastric plication: gastric plication).

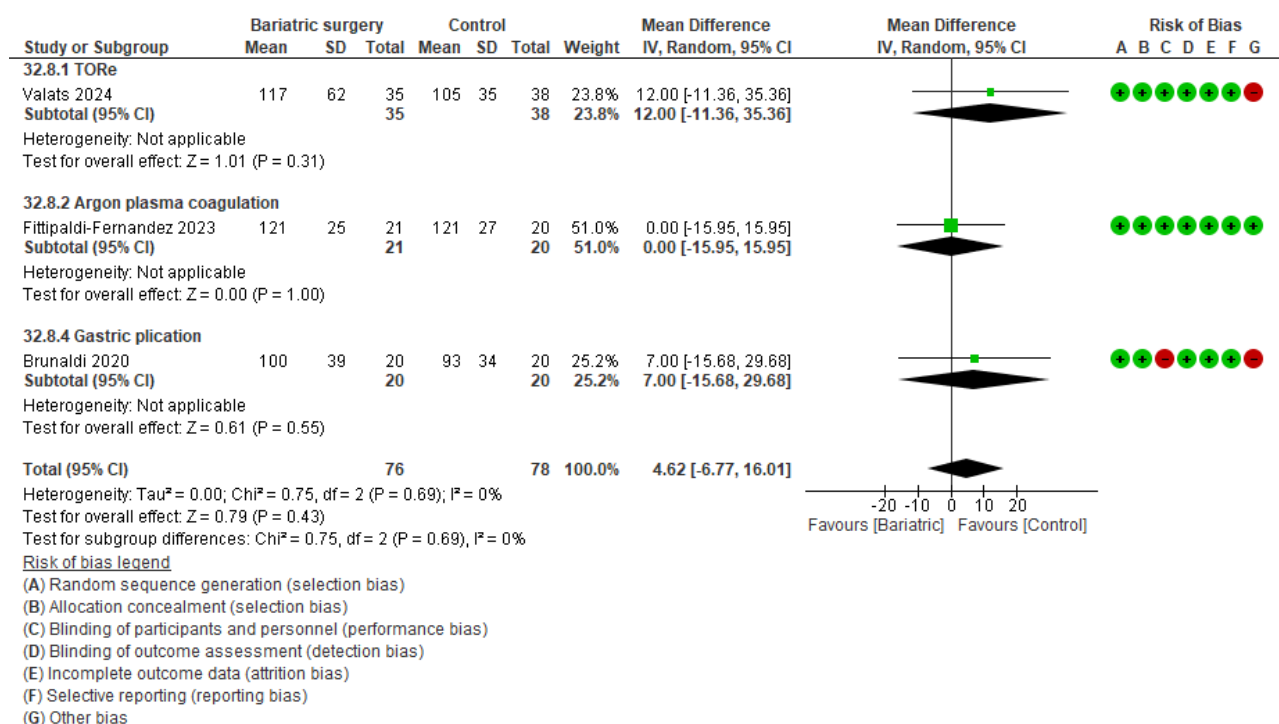


Figure 26 – Effects of revisional endoscopic bariatric surgery compared to non-surgical treatments for obesity or placebo/SoC on the risk of serious periprocedural adverse events, categorized by

intervention type (TORe: transoral anastomosis reduction; Argon plasma coagulation: coagulation of the anastomosis with argon laser; Gastric plication: gastric plication).

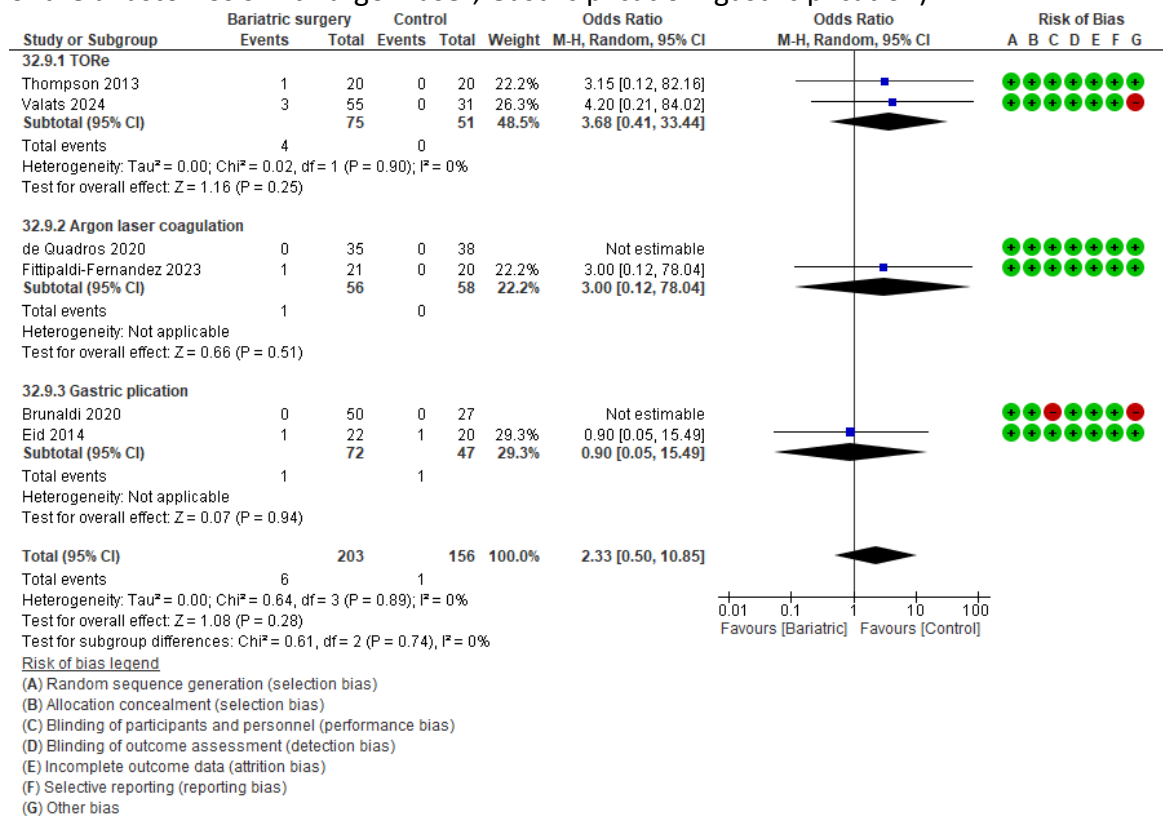


Figure 27 – Effects of revisional endoscopic bariatric surgery compared to non-surgical treatments for obesity or placebo/SoC on the risk of serious adverse events during follow-up, categorized by intervention type (TORe: transoral anastomosis reduction; Argon plasma coagulation: coagulation of the anastomosis with argon laser; Gastric plication: gastric plication).

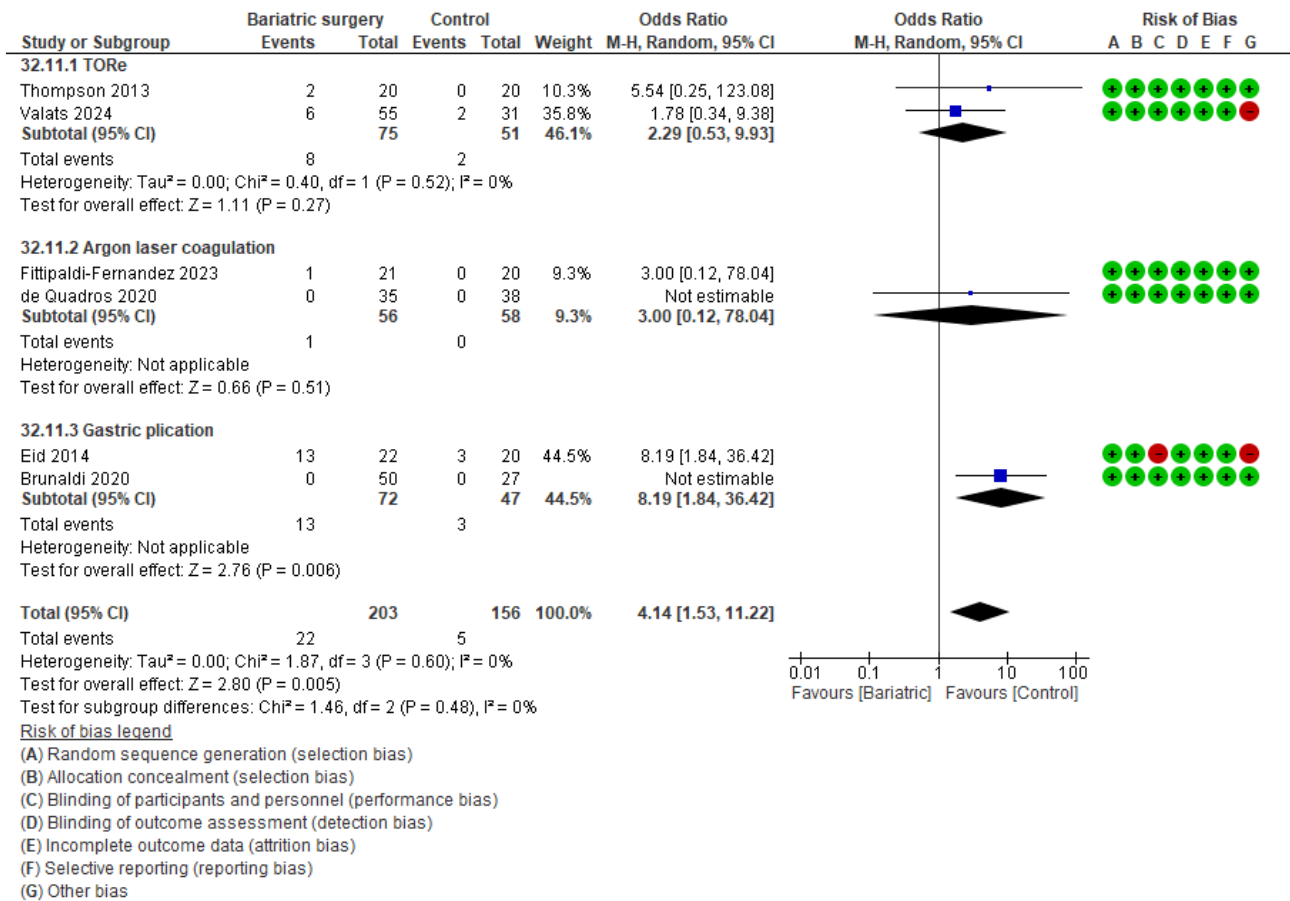


Table 2S – GRADE evaluation for individual critical outcomes for each PICO.

Clinical question (PICO): 2

Certainty assessment							No of patients		Effect		Certainty	Importance
No of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Intervention	Control	Relative (95% CI)	Absolute (95% CI)		

Fasting plasma glucose at the end of the study

100 (1 RCT)	serious ^a	not important	not important	very serious ^c	none	⊕○○○ Very low	32	68	-	The average fasting blood glucose was 96 mg/dl	100 (1 RCT)	CRI TIC AL
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BMI at the end of the study

923 (7 RCT)	serious ^a	serious ^b	not important	not important	strong association	⊕⊕⊕○ Moderate	420	503	-	The average BMI at the end of the study was 30.4 Kg/m ²	MDC 1.08 Kg/m ² lower (from 1.86 lower to 0.29 lower)	CR ITI CA L
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Certainty assessment							No of patients		Effect		Certainty	Importance
No of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Intervention	Control	Relative (95% CI)	Absolute (95% CI)		

Percentage of weight lost

597 (2 RCT)	serious ^a	not important	not important	not important	strong association	⊕⊕⊕⊕ High	275	322	-	The average percentage of excess weight loss was 9.8%.	MDC 14.8% greater (from 11.67 higher to 18.02 higher)	CRITI CAL
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Serious adverse events at the end of the study

419 (4 RCT)	serious ^a	not important	not important	not important	none	⊕⊕⊕○ Moderate	9/187 (4.8%)	31/232 (13.4%)	OR 2.83 (0.75 a 10.71)	48 per 1.000	77 more for 1.000 (from 12 less 303 more)	CRITI CAL
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Periprocedural serious adverse events at the end of the study

Certainty assessment							No of patients		Effect		Certainty	Importance
No of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Intervention	Control	Relative (95% CI)	Absolute (95% CI)		
429 (5 RCT)	serious ^a	serious ^b	not important	not important	none	⊕⊕○○ Low	1/192 (0.5%)	21/237 (8.9%)	OR 3.97 (0.36 a 43.41)	5 per 1.000	15 more for 1.000 (from 3 less to 180 more)	CRITICAL

CI: Confidence interval; MDC: Mean difference; OR: Odds ratio

Explanations

- a. Studies "open label"
- b. High heterogeneity ($I^2 \geq 50\%$).
- c. Enrolled case series small in number

Clinical question (PICO): 3

Certainty assessment							No of patients		Effect		Certainty	Importance
No of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Intervention	Control	Relative (95% CI)	Absolute (95% CI)		

Fasting plasma glucose at the end of the study

Certainty assessment							No of patients		Effect		Certainty	Importance
No of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Intervention	Control	Relative (95% CI)	Absolute (95% CI)		
675 (2 RCT)	Randomized trials	serious ^a	serious ^b	not important	serious ^c	strong association	290	385	-	MDC 7.74 lower (13.87 lower to 1.62 lower)	⊕⊕○○ Low	CRITICAL

BMI at the end of the study

1633 (7 RCT)	Randomized trials	serious ^a	serious ^b	not important	not important	strong association	696	937	-	MDC 2.53 lower (from 3.45 lower to 1.62 lower)	⊕⊕⊕○ Moderate	CRITICAL
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Percentage of weight lost

1301 (6 RCT)	Randomized trials	serious ^a	serious ^b	not important	serious ^c	strong association	585	716	-	MDC 8.1 greater (from 3.85 higher to 12.34 greater)	⊕⊕⊕○ Moderate	CRITICAL
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Serious adverse events at the end of the study

Certainty assessment							No of patients		Effect		Certainty	Importance
No of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Intervention	Control	Relative (95% CI)	Absolute (95% CI)		
1559 (6 RCT)	Randomized trials	serious ^a	not important	not important	not important	strong association	13/659 (2.0%)	70/900 (7.8%)	OR 3.66 (1.61 a 8.31)	49 more for 1.000 (from 12 more to 124 more)	⊕⊕⊕⊕ High	CRITICAL

Periprocedural serious adverse events at the end of the study

1559 (6 RCT)	Randomized trials	serious ^a	not important	not important	not important	strong association	13/659 (2.0%)	70/900 (7.8%)	OR 3.66 (1.61 a 8.31)	49 more for 1.000 (from 12 more to 124 more)	⊕⊕⊕⊕ High	CRITICAL
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CI: Confidence interval; **MDC:** Mean difference; **OR:** Odds ratio

Explanations

- a. Studies "open label"
- b. High heterogeneity ($I^2 \geq 50\%$).
- c. Enrolled case series small in number

Clinical question (PICO): 6

Certainty assessment	No di pazienti	Effect	Certezza	Im
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No of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Intervention	Control	Relative (95% CI)	Absolute (95% CI)		Importance
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BMI at the end of the study

359 (6 RCT)	Randomized trials	not important	Serious ^b	not important	Serious ^c	strong association	156	203	-	MDC 3.37 lower (from 5.14 lower to 1.6 lower)	⊕⊕⊕○ Moderate	CRITICAL
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Percentage of weight lost

200 (4 RCT)	Randomized trials	not important	Serious ^b	not important	Serious ^c	none	87	113	-	MDC 7.55 greater (from 0.04 higher to 15.06 higher)	⊕⊕○○ Low	CRITICAL
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Serious adverse events at the end of the study

359 (6 RCT)	Randomized trials	Serious ^a	not important	not important	Serious ^c	strong association	5/156 (3.2%)	22/203 (10.8%)	OR 4.14 (1.53 a 11.22)	89 more for 1.000 (from 16 more to 239 more)	⊕⊕⊕○ Moderate	CRITICAL
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Periprocedural serious adverse events at the end of the study

Certainty assessment							No di pazienti		Effect		Certezza	Im po rta nc e
No of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Intervento	Controllo	Relative (95% CI)	Absolute (95% CI)		
359 (6 RCT)	Randomized trials	not important	not important	not important	serious ^b	none	1/156 (0.6%)	6/203 (3.0%)	OR 2.33 (0.50 a 10.85)	8 more for 1.000 (from 3 less to 59 more)	⊕⊕⊕○ Moderate	CRITICAL

CI: Confidence interval; **MDC:** Mean difference; **OR:** Odds ratio

Explanations

- a. Studies "open label"
- b. High heterogeneity ($I^2 \geq 50\%$).
- c. Enrolled case series small in number

For PICO 1, 4, 5, and 7, no studies were found, and therefore the quality of evidence is rated as 'very low.' For PICO 8, there is only one study of good quality, but in this case, the quality of evidence is judged to be 'low.'

Pharmacoeconomic evidence

Search string (until 1/2/2024)

(economic or cost or cost-effectiveness) and (obesity or overweight) and (balloon OR endoscopic OR sleeve OR aspiration OR BTA)

PICO

Population	Age ≥ 14 years with overweight or obesity
Intervention	Bariatric endoscopy procedures
Comparison	Non-surgical treatment (usual) ^b
Outcome	Incremental cost-effectiveness ratio or net monetary benefit
Study design	Cost-effectiveness analysis, cost-utility analysis

Results

N=127 items

For results, please refer to the relevant sections within the various PICO.

Table 3S – Economic evaluation of bariatric endoscopic interventions.

Author	Country/ Valuation	Popolation	Types of intervention	Outcome	Incremental cost	Cost per QALY gained	Authors' conclusions
ESG							
Saumoy (2023) ⁵¹	US Dollars, 2021	1) IMC 25- 29.9kg/m ² with or without obesity- related medical conditions, 2) BMI 30-34.9 kg/m ² with or without obesity- related medical conditions, 3) BMI 35-39.9 kg/m ² with or without obesity- related medical conditions, 4) BMI >40 kg/m ² with or without obesity-related medical conditions,	ESG pharmacolo gical treatment (semaglutid e) or lifestyle intervention s or LSG	Reduction in the risk of weight regain.	Class I: 2,537\$ Class II: 7,326\$ Class III: 5,856\$	I: Class I: 16.252\$ II: Class II: 15,474\$ I: Class III: 14,478\$	Cost-effective treatment for class I obesity, while for classes II and III, the most cost-effective treatment has been LSG

Author	Country/ Valuation	Popolation	Types of intervention	Outcome	Incremental cost	Cost per QALY gained	Authors' conclusions
Kelly (2023) ⁵²	Regno Unito, GBP £, 2018	IMC 35-39.9 kg/m ² with or without comorbidities,	ESG vs lifestyle intervention	weight loss and all-cause mortality	3,024£	GBP £15,909	Cost-effective treatment for class II obesity compared to medical/educational therapy
IGB							
Mital (2021) ⁵³	Australia, US Dollars, 2020	1) BMI 25-29.9 kg/m ² with or without obesity-related medical conditions, 2) BMI 30-34.9 kg/m ² with or without obesity-related medical conditions, 3) BMI 35-39.9 kg/m ² with or without obesity-related medical conditions, 4) BMI>40 kg/m ² with or without	IGB vs LSG, gastric bypass	Weight loss at 4 months.	2,373\$	14,460\$	Cost-effective treatment compared to medical/educational therapy, but not compared to metabolic and bariatric surgery

Author	Country/ Valuation	Popolation	Types of intervention	Outcome	Incremental cost	Cost per QALY gained	Authors' conclusions
		obesity-related medica conditions					

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