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Guideline

International Federation for the Surgery and Other Therapies for Obesity (IFSO) global consensus recommendations for optimizing outcomes after sleeve gastrectomy

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Introduction

Obesity is a global pandemic, with projections indicating that the number of adults who will live with overweight and obesity will reach 3.80 billion by 2050[1]. Metabolic bariatric surgery (MBS) is currently the most effective sustainable treatment for obesity and its associated complications[2,3], outperforming non-surgical methods[4,5]. Sleeve gastrectomy (SG) has been the most widely performed MBS procedure globally for the past decade[6,7]. However, similarly to other MBS procedures, it may carry less-than-ideal postoperative outcomes. With the currently available knowledge from RCTs[8–12], suboptimal initial clinical response and recurrent weight gain may be somewhat accentuated after SG compared with the 'gold standard' of Roux-en-Y gastric bypass (RYGB)[13]. Only two RCTs comparing these two MBS procedures currently have 10-year results available. The SM-BOSS trial showed that 33% of patients who underwent SG had a percentage total weight loss (%TWL) of less than 20% compared with 27% after RYGB and that 4% and 3% had a %TWL of less than 5% respectively[10]. In the SLEEVEPASS trial, 5% of SG patients had a %TWL below 5% compared with 3% after RYGB[11].

Suboptimal initial clinical response and recurrent weight gain may result in the recurrence of type 2 diabetes (T2D) and other obesity-related complications[14]. Relapse should not be interpreted as treatment failure, as even temporary remission is associated with meaningful health benefits. Additionally, recurrence of T2D may occur independently of recurrent weight gain in certain individuals, highlighting the complex pathophysiology of the disease[15]. At 10-years follow-up, remission rates of T2D after SG were 61% and 26% in the SM-BOSS RCT and the SLEEVEPASS RCT respectively[10,11]. This variation also underlines the effect of preoperative T2D duration on remission rates, as there were distinct differences between these RCTs at baseline with regard to T2D duration (1 year *versus* 5 years in the SM-BOSS RCT and the SLEEVEPASS RCT respectively)[16].

A major issue after SG is *de novo* gastro-oesophageal reflux disease (GORD) that needs to be taken into account in primary procedure selection. In the SLEEVEPASS RCT and the SM-BOSS RCT, 52% and 43% of patients developed *de novo* GORD respectively[10,11]. In the SLEEVEPASS trial, with 77% of the patients undergoing upper gastrointestinal endoscopy at 10 years, there was a difference in the prevalence of oesophagitis after SG compared with RYGB (31% *versus* 7% respectively)[11]. In contrast to previous retrospective cohort studies reporting high rates of Barrett's oesophagus[17–19], the SLEEVEPASS trial did not show a difference in the prevalence of Barrett's oesophagus (4% for both groups)[11]. Similar percentages of Barrett's oesophagus were observed in recent prospective cohorts[20,21].

There are important knowledge gaps in managing suboptimal initial clinical response, recurrent weight gain, and GORD at long-term follow-up after SG[14,22].To bridge these knowledge

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gaps, the International Federation for the Surgery of Obesity and Metabolic Disorders (IFSO) assembled a multidisciplinary panel of international experts in MBS, gastroenterology, internal medicine, endocrinology, and nutrition to develop evidence-based recommendations. Utilizing a Delphi process, the team identified areas of expert consensus after systematically reviewing the existing literature and outlined key areas requiring further research. While preventive strategies are essential in obesity care, this consensus focused on the management of suboptimal outcomes, such as recurrent weight gain and GORD, given the current lack of robust prospective data evaluating preventive interventions at the time of SG.

Methods

This consensus aimed to develop recommendations for the postoperative management of unfavourable outcomes after SG, including GORD, recurrent weight gain, and suboptimal clinical response. Preventive strategies during the primary procedure were considered outside the scope of this initiative.

Definitions

The 2024 IFSO consensus on definitions and clinical practice guidelines for obesity management defines a suboptimal initial clinical response to MBS as either a total body weight or BMI loss of less than 20% or insufficient improvement in an obesity-related complication (for example T2D) that significantly influenced the decision for surgery[14]. Additionally, late postoperative clinical deterioration after MBS is characterized by either recurrent weight gain exceeding 30% of the initial surgical weight loss or the worsening of an obesity-related complication that was a key indication for surgery[14].

The key element of these definitions is their composite nature, capturing both the magnitude of weight loss and the improvement (or deterioration) of obesity-related complications. While weight loss remains the principal driver of all favourable outcomes after MBS, remission of complications and prevention of their recurrence are equally essential measures of surgical success.

Despite an initial literature review, the evidence was heterogeneous and insufficient to support strong clinical recommendations. Therefore, a Delphi methodology was selected to integrate multidisciplinary expert opinion where evidence was lacking, a common approach in guideline development when RCT data are scarce.

Partner organizations and selection of experts

The core scientific committee (R.V.C., M.K., M.L., Y.S., and C.P.) assembled a multidisciplinary team of 42 international experts from important obesity societies, including The Obesity Society (TOS), the World Obesity Federation (WOF), the World Gastroenterology Organisation (WGO), and the European Association for the Study of Obesity (EASO), to formulate evidence-based recommendations. All voting members were carefully selected from academic institutions, with no industry representatives involved, including an internationally recognized Delphi expert (R.L.), alongside specialists in MBS, gastroenterology, internal medicine, endocrinology, and nutrition. See the Collaborators section at the end of this article and the *supplementary material* for the names and details of the included experts.

Review of evidence

The systematic review team (M.K., C.P., and Y.S.) started the review centred on predefined research questions addressing the management of *de novo* or persistent GORD, suboptimal initial clinical response or recurrent weight gain, and suboptimal remission or recurrence of metabolic syndrome after SG. Considering the objectives of the consensus conference and the limited availability of high-grade evidence in certain areas, the literature review included RCTs, systematic reviews, and observational studies. The literature review was distributed to all participants in preparation for the Delphi process. A detailed description of the systematic review methodology is provided in the *supplementary material*. This includes the search strategy, study selection criteria, and summary of included evidence.

The initial 53 statements were drafted by the core scientific committee (R.V.C., M.K., M.L., Y.S., and C.P.) based on the predefined research questions and a structured synthesis of the available evidence from the systematic review. Each statement was formulated to reflect either areas of potential consensus or points of known clinical variability. Draft statements were iteratively reviewed and refined by the core group to ensure clarity, clinical relevance, and alignment with the objectives of the consensus. The independent Delphi expert further reviewed the statements for internal consistency and methodological rigor before circulation.

Pre-meeting and in-person Delphi process

Upon completion of the draft consensus document, an independent Delphi process was conducted by an outside expert with some knowledge of all included subspecialties. The modified Delphi methodology followed the RAND/University of California at Los Angeles (UCLA) Appropriateness Method, as outlined in the *RAND Methodological Guidance for Conducting and Critically Appraising Delphi Panels*[23]. The Delphi process consisted of two parts, with the first part being online—it was initiated on 10 December 2024, by e-mail among the full expert panel (see the Collaborators section at the end of this article and the *supplementary material*). Each expert had 2 weeks to return their initial vote and comments for each statement.

Each expert returned their completed questionnaire to the Delphi expert without sharing their votes or comments with the other expert panel members. The online voting part was conducted in three rounds, revising the non-consensus statements based on expert feedback from the Delphi expert. Revised statements were returned to the expert panel members for new voting and additional comments. The second part of the Delphi process was conducted in person on 19 February 2025 in Mumbai, India.

The Delphi expert counted the votes for each statement to discern the percentage of consensus support for each statement. Statements that received 100% consensus support were considered grade A+, statements that received 90–99.9% consensus support were considered grade A, statements that received 80–89.9% consensus support were considered grade B, statements that received 70–79.9% consensus support were considered grade C, and statements that received 66–69.9% consensus support were considered grade D. Statements that received less than 66% support were considered to have failed consensus[23].

After three rounds of the online Delphi process, statements that were considered grade A or higher were closed for further voting. Statements that were considered less than grade A but had conflicting or insufficient expert feedback, suggesting a higher consensus would be possible by accurately editing the statement, were tabled for further discussion during the in-person Delphi process. During the in-person Delphi process, each statement not considered to be grade A+ or A was again

presented to the expert panel for further discussion, including the revised statements developed during the online Delphi process. After discussing the statement, a new vote was taken using a smartphone app to maintain the confidentiality of the vote. If a revised statement did not reach grade A consensus, the discussion was reopened, to edit the statement further, and a new vote was taken. During the in-person Delphi process, 24 of the original 53 statements were voted to be deleted by the expert panel due to redundancy with other statements, a lack of relevancy to the aims of the consensus document, scarcity of the available data, or conflicts with other statements. Three new statements were added and voted on during the in-person Delphi process. Due to the multidisciplinary composition of the expert panel—which included both surgical and non-surgical specialists—voting on highly technical, surgery-specific statements was limited to those members with direct operative expertise. In practice, any recommendation that fell clearly outside an individual's core domain was presented but not voted on by non-surgeon participants. This ensured that each statement received feedback only from those best qualified to judge its technical validity, thereby preserving the rigor and relevance of the consensus process.

Results

The statements derived from the Delphi process, along with the consensus grade, percentage of agreement, number of voting rounds, and total votes, are comprehensively presented in *Table 1* (module 1), *Table 2* (module 2), and *Table 3* (module 3).

Discussion

This evidence-based consensus aimed to optimize SG outcomes by addressing persistent or *de novo* GORD, suboptimal initial clinical response, recurrent weight gain, and recurrence of obesity-related complications to bridge the current knowledge gaps in long-term follow-up results after SG. While certain anatomical factors related to GORD and recurrent weight gain are acknowledged, preventive strategies during primary SG were outside the scope of this Delphi process. Grade A or A+ consensus statements emphasized the necessity of comprehensive clinical evaluation of patients experiencing GORD non-responsive to proton-pump inhibitor (PPI) medications after SG. When considering conversion surgery from SG to another MBS procedure or revising the current SG, patients need to undergo tailored assessment, including imaging, endoscopy, and oesophageal physiology studies. RYGB was recommended as the primary surgical procedure for managing persistent GORD after SG, with concomitant hiatal hernia repair advised when present. Although one-anastomosis gastric bypass was recognized as an alternative, experts highlighted its documented increased risk of bile reflux, underscoring the need for careful patient selection. Furthermore, limited evidence regarding the efficacy of endoscopic interventions was explicitly acknowledged, emphasizing the necessity for further research.

SG may induce *de novo* GORD in up to 23% of patients[10,11,17,18,20]. To guide optimal surgical strategies, in addition to multidisciplinary assessment, objective preoperative assessments were recommended to identify underlying conditions, such as oesophageal motility disorders, strictures, anatomical abnormalities (for example retained fundus), sleeve dilatation, or hiatal hernias[24–26]. Explicit recommendations included comprehensive evaluations of anatomical factors, such as gastric volume, antral size, distance from the initial staple line to the pylorus, and possible intrathoracic migration of the sleeve[27–29]. Conversion from SG to RYGB consistently effectively addresses persistent GORD symptoms while concurrently supporting sustainable weight loss[30,31]. Although routine hiatal hernia repair during conversions remains debated due to the current knowledge gap on the definition of a clinically relevant hiatal hernia and the optimal treatment strategy, existing

Table 1 Delphi results, module 1: *de novo* or persistent GORD

Statement	Grade	Percentage consensus	Number of total voting rounds	Number of total votes
The anatomic alterations in SG impact the natural anti-reflux barrier, which can result in *de novo* or worsening GORD in some patients.	A+	100	1	39
For patients with post-SG-related reflux that is refractory to pharmacological therapy (for example PPIs), it is recommended that they be investigated with imaging, endoscopy, and/or oesophageal physiology studies.	A	97	1	39
There are pharmacological options available to manage post-SG-related GORD.	A+	100	1	39
For patients with refractory post-SG-related GORD, surgery should be considered.	A	95	1	37
Although the current evidence is limited, endoscopic interventions may be considered for selected patients with such refractory GORD.	F	44	1	39
Objective evidence of GORD is necessary before revision/conversion surgery for SG-related GORD.	A+	100	1	39
A preoperative endoscopy is strongly recommended for all patients before a revisional/conversional procedure for GORD after SG.	A	92	1	39
Preoperative oesophageal physiology studies may be considered before a revision/conversion procedure for SG-related GORD.	A	95	1	39
When surgery is indicated for SG-related GORD, conversion to RYGB is the recommended option.	A+	100	1	39
When a revision/conversion surgery is indicated and a relevant hiatal hernia is identified, it is recommended that the hiatus be repaired in addition to the planned surgery.	A	95	1	38
SG conversion into OAGB may expose the patient to bile reflux.	A+	100	1	37

GORD, gastro-oesophageal reflux disease; SG, sleeve gastrectomy; PPIs, proton pump inhibitors; RYGB, Roux-en-Y gastric bypass; OAGB, one-anastomosis gastric bypass.

Table 2 Delphi results, module 2: suboptimal initial clinical response or recurrent weight gain

Statement	Grade	Percentage consensus	Number of total voting rounds	Number of total votes
SoCR or RWG may be expected in some patients following metabolic/bariatric surgery.	A	97	2	39
Current evidence shows that SG is associated with higher odds of RWG up to 10 years of follow-up compared to RYGB.	A	97	2	39
Future research should focus on identifying predictors that can help mitigate SoCR or RWG after SG.	A+	100	1	39
Patients with RWG after SG treatment with OMMs should be considered prior to revision/conversion surgery.	A+	100	1	40
As in non-surgical patient populations with obesity, the weight loss response to OMMs in patients after SG is heterogeneous.	A	90	2	39
Currently, liraglutide has the most evidence demonstrating efficacy in clinical trials for treating RWG or recurrent metabolic disease after SG. Additional clinical studies are needed for other OMMs.	A	98	1	40
R-ESG combined with lifestyle intervention is a new management option for selected adults with RWG after SG.	F	55	1	38
A structural evaluation (for example by 3D volumetric tomography scan or an upper gastrointestinal series) is suggested for patients with RWG after SG if revision/conversion surgery is considered.	A	97	1	39
A multidisciplinary approach is recommended for any patient with RWG after SG.	A	92	1	38
Conversion of SG to biliopancreatic diversion with duodenal switch or SADI-S achieves the most significant weight loss and improvement in obesity-related complications but with a greater risk for adverse events.	A+	100	1	39
In the case of SG with RWG without GORD, a conversion to OAGB may be considered an alternative to other bypass procedures.	B	84	1	38
During the conversion of SG to any bypass procedure, if the biliopancreatic limb length is longer than 150 cm, it is recommended that the common channel length be measured.	A	92	1	38
Conversion of SG to RYGB is a viable option for SoCR or RWG. Consideration should be given to a longer biliopancreatic limb.	A	97	2	38
There is a body of clinical evidence that supports the use of conversion surgery for patients with RWG after SG with or without recurrent metabolic disease or anatomical complications (for example GORD/hiatal hernia/oesophagitis), though such surgery may be associated with a greater risk of surgical complications than the primary surgery.	A	91	3*	44
OMMs are safe and can be prescribed as a first-line treatment modality for patients with RWG, whether or not they also have recurrent metabolic disease following SG.	A	96	1†	45
Despite published level 1B evidence, there is no long-term data on the efficacy of OMMs for a SoCR or RWG after MBS.	A+	100	1†	45

*This statement's consensus was determined after three rounds of the pre-meeting Delphi process and not voted on further at the in-person meeting. †This statement's consensus was determined after one round of the pre-meeting Delphi process and not voted on further at the in-person meeting. SoCR, suboptimal initial clinical response; RWG, recurrent weight gain; SG, sleeve gastrectomy; RYGB, Roux-en-Y gastric bypass; OMMs, obesity management medications; R-ESG, revisional endoscopic sleeve gastroplasty; 3D, three-dimensional; SADI-S, single-anastomosis duodenal-ileostomy with SG; GORD, gastro-oesophageal reflux disease; OAGB, one-anastomosis gastric bypass; MBS, metabolic bariatric surgery.

Table 3 Delphi results, module 3: suboptimal remission or recurrence of metabolic syndrome

Statement	Grade	Percentage consensus	Number of total voting rounds	Number of total votes
The efficacy of SG on glycaemic control in patients with T2D and HTN progressively reduces over time. Patients who experience initial remission of metabolic diseases after SG should be monitored for relapse of these conditions.	A	98	1*	45
More research is needed to assess the impact of SG on the long-term outcomes of T2D, HTN, dyslipidaemia, MASLD, chronic kidney disease, and the complications related to these conditions.	A	92	1	39
More research is needed to delineate the factors leading to the lack of resolution and the relapse of T2D and HTN after initial remission following SG.	A	96	1*	44
RWG in medium- to long-term follow-up after SG is associated with worsening metabolic outcomes, including relapse of T2D.	A	91	1*	45
The severity of T2D before SG predicts the likelihood of remission, with more severe T2D being associated with a lower incidence of remission, while earlier surgical intervention tends to result in greater and more durable improvements in glycaemic control.	A	93	1*	45

*This statement's consensus was determined after one round of the pre-meeting Delphi process and not voted on further at the in-person meeting. SG, sleeve gastrectomy; T2D, type 2 diabetes; HTN, hypertension; MASLD, metabolic-associated steatotic liver dysfunction; RWG, recurrent weight gain.

literature does generally support the symptomatic improvement of patients with concurrent hiatal hernia repair[32–35].

This consensus strongly supported utilizing obesity management medications before considering revisional surgery in patients experiencing suboptimal initial clinical response or recurrent weight gain after SG[22,36]. Clinical trials, particularly with liraglutide, have significantly improved weight loss and glycaemic control for recurrent weight gain or suboptimal response after SG[37,38]. Despite the strong recommendation of obesity management medications within postoperative management strategies[36], the expert consensus underscored the need for further studies to validate the long-term efficacy, safety, and optimal timing of medication within comprehensive postoperative management algorithms, reinforcing the recent IFSO consensus on obesity management medications in the context of MBS[22].

The consensus addressed several surgical revisions (re-sleeve) and conversion strategies (SG to RYGB, one-anastomosis gastric bypass, single-anastomosis duodeno-ileal bypass, biliopancreatic diversion with duodenal switch, and transit bipartition). Grade A+ consensus explicitly recognized biliopancreatic diversion with duodenal switch and single-anastomosis duodeno-ileal bypass as effective for substantial weight reduction and resolution of obesity-related complications, albeit acknowledging higher risks of adverse nutritional effects[39–43]. As both procedures retain the sleeve anatomy, they may also preserve the associated predisposition to GORD, although long-term comparative data on reflux outcomes after these conversions remain limited. Despite the somewhat scarce literature, RYGB was acknowledged as the most valuable alternative[39–44], with a recommendation of longer biliopancreatic limb lengths to optimize outcomes in selected cases[40,45,46]. Conversion to one-anastomosis gastric bypass was recognized as a potential option for managing GORD post-SG, though the elevated risk of bile reflux warrants caution[47–50]. The supporting evidence for transit bipartition is notably limited, restricting any explicit recommendations. Lack of data was also the issue for revisional endoscopic sleeve gastroplasty; robust clinical trials are needed to evaluate its long-term safety and effectiveness. Technical recommendations during bypass conversions emphasized bowel length measurements to maintain a common channel greater than 300–400 cm, thus preventing malnutrition and nutritional deficiencies[46,51]. Revisional surgeries were recognized as effective, supported by some evidence indicating varying degrees of weight loss, metabolic disease remission, and other obesity-related complications after procedures such as biliopancreatic diversion with duodenal switch, one-anastomosis gastric bypass, and RYGB[40]. However, research is needed to fill existing evidence gaps, mainly comparing the safety and efficacy of revisional surgery with modern pharmacotherapy[22,36].

There are major limitations to this Delphi consensus. First, are the acknowledged limitations of expert consensus methodologies, including potential biases and subjectivity. However, substantial efforts, including systematic literature review, multidisciplinary expert engagement, and independent Delphi oversight, were explicitly implemented to mitigate these limitations, adding to the current literature on optimizing the long-term outcomes after SG.

Although nutritional surveillance is a key element of long-term postoperative care after SG[52], it was considered outside the scope of this consensus, which focused on selected adverse outcomes with high variability and limited guidance. Future efforts may consider developing specific recommendations for micronutrient monitoring and supplementation strategies.

This consensus provides healthcare professionals with detailed, clear, evidence-based expert recommendations to optimize outcomes after SG. Areas requiring further research were explicitly identified to address current major knowledge gaps, supporting continuous improvement in patient care and clinical practice.

Collaborators

Members of the Global Consensus Recommendations for Optimizing Outcomes after Sleeve Gastrectomy: M. Ackerman (endocrinology, Argentina); N. Alfaris (endocrinology, Saudi Arabia); A. Aly (metabolic bariatric surgery (MBS), Australia); A. Aminian (MBS, USA); S. Aparicio (MBS, Bolivia); J. Ard (obesity medicine, USA); C. Boza (MBS, Chile); W. Brown (MBS, Australia); B. A. Dayyeh (bariatric endoscopy, USA); C. Domene (MBS, Brazil); M. Felsenreich (MBS, Austria); K. Gawdat (MBS, Cairo); A. Haddad (MBS, Jordan); M. Herrera (MBS, Mexico); K. Higa (MBS, USA); K. Kasama (MBS, Japan); L. Kow (MBS, Australia); W. J. Lee (MBS, Taiwan); N. D. Lorenzo (MBS, Italy); S. Mattar (MBS, USA); A. Miras (endocrinology, Ireland); V. Moize (nutritionist, Spain); A. Nimeri (MBS, USA); C. Peng (MBS, China); A. S. Pernaute (MBS, Spain); R. Peterli (MBS, Switzerland); T. Petry (endocrinology, Brazil); J. Ponce (MBS, USA); Y. Preiss (endocrinology, Chile); N. Reddy (gastroenterology, India); R. Rosenthal (MBS, USA); S. A. Sabah (MBS, Kuwait); A. Schroeder (obesity nurse, Australia); A. Shabbir (MBS, Singapore); C. Stier (bariatric endoscopy, MBS, Germany)

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Author contributions

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Supplementary material

Supplementary material is available at *BJS* online.

Data availability

No data are presented.

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