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ORIGINAL CONTRIBUTIONS

IFSO Consensus on Definitions and Clinical Practice Guidelines for Obesity Management—an International Delphi Study

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Abstract

Introduction This survey of international experts in obesity management was conducted to achieve consensus on standardized definitions and to identify areas of consensus and non-consensus in metabolic bariatric surgery (MBS) to assist in an algorithm of clinical practice guidelines for the management of obesity.

Methods A three-round Delphi survey with 136 statements was conducted by 43 experts in obesity management comprising 26 bariatric surgeons, 4 endoscopists, 8 endocrinologists, 2 nutritionists, 2 counsellors, an internist, and a pediatrician spanning six continents over a 2-day meeting in Hamburg, Germany. To reduce bias, voting was unanimous, and the statements were neither favorable nor unfavorable to the issue voted or evenly balanced between favorable and unfavorable. Consensus was defined as ≥ 70% inter-voter agreement.

Results Consensus was reached on all 15 essential definitional and reporting statements, including initial suboptimal clinical response, baseline weight, recurrent weight gain, conversion, and revision surgery. Consensus was reached on 95/121 statements on the type of surgical procedures favoring Roux-en-Y gastric bypass, sleeve gastrectomy, and endoscopic sleeve gastroplasty. Moderate consensus was reached for sleeve gastrectomy single-anastomosis duodenoileostomy and none on the role of intra-gastric balloons. Consensus was reached for MBS in patients > 65 and < 18 years old, with a BMI > 50 kg/m^2, and with various obesity-related complications such as type 2 diabetes, liver, and kidney disease.

Key Points

- The value of an international multidisciplinary expert consensus in obesity management enabled the validation of standardized definitions and reporting standards applicable to the entire medical community treating patients with obesity facilitating research and clinical practice of MBS.
- Consensus was reached on most MBS issues, and areas of non-consensus were identified, assisting in clinical practice guidelines for the management of obesity.
- Inadequate weight loss or an unusually modest improvement in a clinically significant obesity complication was unanimously defined as "suboptimal initial response" (TWL <20%) and significant weight gain after initial postoperative weight loss was defined as "recurrent weight gain" (gaining >30% of the initial weight loss or worsening of an obesity complication).
- Sleeve gastrectomy was considered the most suitable choice for high-risk patients, pediatric patients, and patients >65 years old.
- Roux-en-Y gastric bypass and one-anastomosis gastric bypass are generally preferable to sleeve gastrectomy for adults with obesity and type 2 diabetes, unless otherwise contraindicated.

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Conclusions In this survey of 43 multi-disciplinary experts, consensus was reached on standardized definitions and reporting standards applicable to the whole medical community. An algorithm for treating patients with obesity was explored utilizing a thoughtful multimodal approach.

Keywords Obesity, Severe obesity · Metabolic bariatric surgery · Bariatric surgery · Bariatric endoscopy · Anti-obesity medications · Medical treatment · Definitions · Outcomes · Consensus · IFSO · Delphi survey

Introduction

The prevalence of obesity (BMI ≥ 30 kg/m^2) is anticipated to rise from 14% in 2020 to 24% over the next 15 years and hence predicted to affect nearly 2 billion adults, children, and adolescents by 2035 [1]. The rapid rise of obesity in children and adolescents is especially concerning, since obesity in adolescence typically persists into adulthood and predisposes individuals to numerous complications [2]. Most notable obesity-associated comorbidities and complications include type 2 diabetes mellitus (T2DM) [3], cardiovascular disease [4], obstructive sleep apnea (OSA) [5], increased risks of various cancers and mortality [6, 7], reduced quality of life (QOL) [8], and increased risk of death [9–11].

Obesity is a highly heterogeneous and progressive multifactorial disease [12]. Metabolic and bariatric surgery (MBS) is the most effective treatment for severe obesity, generating substantial, sustained weight reduction, along with improvements in comorbidities and quality of life, and increased life expectancy [10, 11]. Although MBS is the most effective anti-obesity intervention, there are large variations in treatment response after MBS [13, 14], mainly due to the heterogeneity of the disease. New anti-obesity medications (AOMs) and endoscopic bariatric procedures are extremely welcome additions to the treatment of obesity linked to promising weight loss and favorable associated metabolic changes, in selected patients [15]. With the increased availability of potent AOMs now and in the near future, the practice of combination therapy will grow as MBS and AOMs can work in synergy on the treatment of severe obesity and hopefully in enabling increased access to effective obesity treatments.

In addition to the two most common surgical procedures—sleeve gastrectomy (SG) and Roux-en-Y gastric bypass (RYGB)—there are numerous other MBS procedures and considerable variation between practices and regions [16]. Variations in reported MBS outcomes (e.g., lack of uniform standardized reporting definitions) are evident in the MBS literature and markedly limit the comparability of different studies, creating a major hindrance to evidence-based clinical obesity treatment algorithms. In 2015, the American Society for Metabolic and Bariatric Surgery (ASMBS) published reporting standards in MBS aiming to enhance the quality and comparability of MBS results [17]. However, only four studies published from 2015 to 2020 have used the recommended ASMBS reporting standards, resulting in low compliance and implementation of such standards in clinical practice [18]. This highlights the importance of having valid, simple-to-use definitions for both clinical practice and research that are acceptable and applicable to the surgical and medical communities.

The aim of this consensus meeting and Delphi survey of international experts in obesity management was to achieve consensus on standardized uniform reporting definitions and standards for the whole medical community to assist in developing clinical practice guidelines for the management of severe obesity and particularly for MBS. Specific aims were to identify areas of expert consensus to assist with algorithm development, combined with a thorough review of published literature, and to identify areas of non-consensus to flag topics warranting further research.

Methods

A three-round Delphi survey of 43 intercontinental, interdisciplinary experts in obesity management was conducted, beginning with in-person voting over 2 days in Hamburg, Germany, from March 9 to 10, 2023, followed by discussion and two rounds of online voting. The invited expert panel included bariatric surgeons, pediatric bariatric surgeons, bariatric endoscopists, endocrinologists, pediatricians, dieticians, psychologists, and counsellors with obesity management expertise. To be considered for the expert panel, clinicians had to have obesity management as a major focus of their practice, be considered experts by IFSO, have ≥ 10 years' experience managing patients with obesity, be fluent in both spoken and written English, and be willing to attend, preferably in person, a 2-day conference in Hamburg for expert lectures

on published evidence-based literature with graded-level evidence, open discussion, and a Delphi survey.

Survey Development

In January 2023, each expert participant was asked to contribute 3–5 statements within their field for consideration by a core advisory group comprised of IFSO members and an MD-PhD level expert in Delphi surveys. This yielded > 300 submitted statements. Over six virtual meetings of the core advisory group, these were pared down to 136 statements subdivided into four Modules: 1, definitions (15 statements); 2, conservative and medical management (21 statements); 3, endoscopy (14 statements); and 4, metabolic bariatric surgery (86 statements). These 136 statements spanning Modules 1–4 then were balanced by the Delphi expert to minimize the risk that the survey instrument itself might induce bias by using response options other than agree/disagree, converting as many statements as possible into non-judgmental statements (neither favorable nor unfavorable to the concept presented), balancing all remaining statements to ensure roughly equal numbers of favorable and non-favorable statements, and adjusting the response options so favorable options were equally distributed in response order. The survey was then reviewed by all advisory group members for a pilot test and final editing. Consensus was defined as ≥ 70% inter-voter agreement, and a valid vote as voter participation ≥ 80%. Voting on statements specifically addressing the technical aspects of MBS was restricted to clinicians with sufficient expertise on the issue.

Given the critical importance of establishing consensus on definitions prior to progressing to statements on treatment specifics, the advisory panel dedicated Day #1 of the conference to Module 1, with open discussion prior to voting, and Day #2 to Modules 2–4, using published Delphi survey guidelines [19]. The current literature and level of evidence on all statements were presented by the specific experts to the whole consensus group prior to open discussion and voting. The 2-day conference in-person discussion and voting and online voting procedures are depicted in detail in both text and schematic form in online Supplement 1.

Data Analysis

Data analysis was completed between rounds to identify statements with 70% consensus reached or not reached, and whether adequate voter participation had been achieved. Statements not achieving either 70% consensus or 80% eligible voter participation were included in the next round of voting.

Results

The 43-member expert panel included 17 from Europe, 13 from North America, six from Latin America, 5 from the Middle East and Northern Africa, and 2 from Asia-Oceania. There were 26 bariatric surgeons including 2 pediatric bariatric surgeons, among whom 11 also performed endoscopic bariatric procedures. The remaining expert panel members were four endoscopists, eight endocrinologists, one internist, one pediatrician, two nutritionists, and two counsellors (psychology, exercise).

The final survey had 136 statements, with one deleted from Module 4 because it duplicated an earlier statement. Forty-seven statements underwent change after Round 1 to such a degree that the Round 1 results were considered invalid and considered new statements in Round 2A.

Since we considered it critical to achieve consensus on all the definition statements (Module 1), and considerable discussion occurred to achieve this, consensus was reached on all 15 at a mean level of 90.1% consensus. There was great variability over Modules 2–4 on both the percentage of statements on which consensus was reached (50.0–95.2%) and the overall mean level of consensus achieved (66.7–86.9%). Consensus was reached on 68/85 MBS statements with a mean level of consensus of 79.6% (Supplementary Table A). Among the 38 statements that required two rounds of voting, consensus only was reached on 13: both statements on definitions and 11 of the 28 MBS statements. All seven statements on endoscopy failing to achieve consensus in Round 1 also failed in Round 2 (Supplementary Table B).

Module 1—Definitions

Module 1 results for 15 definitions statements are listed in Table 1. A suboptimal initial response was unanimously defined as inadequate weight loss or an unusually modest improvement in a clinically significant obesity complication, and 39/40 experts agreed that the severity of a suboptimal response should guide treatment. Similar to suboptimal response, late postoperative deterioration was defined as recurrent weight gain or worsening of a significant obesity complication. Baseline weight in patients who undergo MBS was defined as that measured before starting preoperative weight reduction. With respect to the use of re-operative MBS to address either a suboptimal initial response, later clinical deterioration, or adverse events, experts agreed that surgical or endoscopic procedures to

convert to a new type of MBS (conversion surgery) or to reestablish normal anatomy (reversal surgery) in major adverse events should be clearly distinguished and considered separately from procedures to modify or revise a previous operation (modification or revision surgery). Experts agreed that the presumed mechanism of action should not be used to describe MBS procedures, which instead should be labelled by the anatomical changes made. There was strong consensus on omitting demeaning terms like "super-obesity" to describe a BMI > 50 kg/m^2 and on replacing such terms with a BMI-based classification system (e.g., class IV, BMI 50-60 kg/m^2; class V, BMI > 60 kg/m^2).

Modules 2–4

Results for Modules 2–4 are summarized in Tables 2, 3, 4, 5, and 6, with all statements pertaining to conservative and medical management in Table 2; endoscopy, Table 3; specific MBS procedures, Table 4; special circumstances related to patient BMI and age ($\leq 18, \geq 65$), Table 5; and obesity complications, Table 6.

Discussion

In this IFSO-sponsored expert consensus survey, we achieved unanimous consensus on all reporting definitions and reporting standards. This was accomplished by a multidisciplinary expert group, paving the way to implementing these definitions in clinical practice and research within both the surgical and medical communities. The other focus of this survey was to address MBS topics where long-term evidence-based data remain insufficient. It serves as a next step following the joint IFSO and World Gastroenterology Organization (WGO) Delphi survey conducted in the spring of 2022 examining all non-surgical approaches to obesity management, including patient assessment and preparation for MBS.

Our first major objective, which we considered vital to constructing any MBS guidelines, was to achieve consensus on essential definitions pertaining to surgical management of obesity—including definitions for weight loss attributable to MBS (versus concomitant therapies), baseline weight, suboptimal initial clinical response, recurrent weight gain, and distinguishing conversion from revision surgery. This we achieved, through considerable discussion and major modifications to original statements. As weight loss is the driving force behind positive outcomes after MBS, all statements on weight loss were written to standardize reporting, starting from baseline weight to nadir weight loss 2 years after surgery to recurrent weight gain. However, as the outcome of MBS is a composite endpoint, obesity comorbidities and complications are included in the definitions.

The uniform standardized use of these definitions paves the way to enhancing comparability of the reoperations and their indications within the field of obesity treatment and MBS. The current literature mixes revisional surgery and conversion surgery terms, not to mention the variability of indications for reoperation. The firm consensus of our experts was to clearly differentiate these terms as modification or revision procedures are typically designed to optimize the effectiveness of previous operations, while conversion procedures most commonly introduce additional mechanisms of therapeutic action. For the accurate categorization of different procedures, the consensus was reached that MBS procedures should be labelled by the anatomical changes made intraoperatively (e.g., gastric bypass), rather than by presumed mechanisms of action (e.g., restriction, malabsorption, or hypo-absorption). The rationale was that the mechanisms by which MBS procedures work are complex, frequently multi-faceted (e.g., involving other factors like hormonal and neuronal effects), and often incompletely understood.

The biological basis of obesity and the response to MBS underscore the importance of recognizing that a suboptimal clinical response rarely reflects either substandard surgical skill or technique. Similarly, it is rarely caused by noncompliance or other aberrant or inadequate behavior by the patient. Thus, the language we use to describe less robust clinical outcomes must avoid being judgemental, ascribing blame, or drawing unproven, causal inferences. Thus, by consensus, we recommend that less than ideal weight loss or clinical improvement after MBS be described as a "suboptimal clinical response" or "suboptimal weight loss," rather than "non-response" or an "inadequate" response to treatment. Similarly, consensus was reached on using "recurrent weight gain" for those who experience significant weight gain after initial postoperative weight loss.

Within the normal distribution of weight loss response to MBS, there is no specific magnitude of weight loss that clearly differentiates between treatment success and suboptimal response. There is some evidence that 20% of total body weight loss is associated with reduced cardiovascular risk [20, 21], so many clinicians and investigators have used this criterion to assess clinical responses to MBS. It is recognized that the magnitude of weight loss has widely different clinical effects in different patients, and a categorical definition of weight loss should not be used as the single determinant of the need for additional clinical intervention. Through this Delphi process, unanimous consensus was achieved on using the following reporting standards for "suboptimal initial clinical

Table 1 Module 1—reporting definitions and standards

Statements		*N*	Rounds required	Most common selection	Percentage consensus
Reporting definitions					
1	A suboptimal initial response to metabolic/bariatric surgery is demonstrated either by inadequate weight loss OR by an unusually modest improvement in a significant obesity complication	41	1	Agree	100.0%
2	A late post-operative clinical deterioration is demonstrated either by recurrent weight gain OR by worsening of a significant obesity complication that occurs after an initially adequate post-operative clinical response	38	1	Agree	97.4%
3	The degree to which the clinical response to metabolic/bariatric surgery is suboptimal or there is a late post-operative clinical deterioration can vary widely from patient to patient. The severity of the suboptimal response should guide clinical treatment	40	1	Agree	97.5%
4	The baseline weight for assessing weight loss after MBS should be a weight determined before starting preoperative weight reduction	43	3	Agree	95.3%
5	In patients who have been treated with AOM before undergoing MBS, who STOP it at the time of or shortly after surgery, the baseline weight for assessing the effect of surgery on bodyweight should generally be a weight determined BEFORE the AOM was started	43	2	Agree	95.3%
6	In patients who have been treated with AOM before undergoing MBS and CONTINUE this medication post-op., the baseline weight used to assess the effect of surgery on body weight should generally be measured on the day of surgery	44	3	Agree	88.4%
7	The initial surgical weight loss (defined as maximum weight loss within the first 2 years after MBS) should be determined in a manner that excludes any post-plateau weight loss caused by adding AOM, any endoscopic intervention, or any calorie-restricted diet	38	2	Agree	84.2%
8*	Surgical or endoscopic procedures to convert to a new type of metabolic/bariatric operation (conversion surgery) and those to re-establish normal anatomy (reversal surgery) should be clearly distinguished and considered separately from procedures to modify or enhance the effects of a previous operation (revision or modification surgery)	40	1	Agree	97.5%
9*	Modification or revision procedures are typically designed to optimize the effectiveness of previous operations, while conversion procedures most commonly introduce additional mechanisms of therapeutic action	40	1	Agree	95.0%
10	The term "obesity complication" mostly describes diseases, conditions, and symptoms for which there is published evidence that obesity is a contributing cause or exacerbating factor. When such a causative relationship has not been established or accepted, the associated disorder is more accurately labelled an obesity comorbidity	41	2	Agree	80.5%
11	When considering the effects of MBS on intestinal nutrient absorption, diminished absorption (hypo-absorption or malabsorption) of micronutrients should be clearly distinguished from the hypo-absorption or malabsorption of macronutrients or ingested calories	42	2	Agree	85.7%
12	Characterization of the absorptive effects of an MBS procedure should not be used to imply that these effects are the mechanisms of action of weight loss associated with the operation. It is preferable to describe such procedures by their anatomical features (e.g., "bypass," "diversion," or more generally, "gastrointestinal") rather than by their inferred mechanism of action	41	2	Agree	95.1%
13	Characterization of the changes in the physical structure of the gut produced by an MBS procedure – including the size & shape of GI segments or anastomoses – should not be used to imply that these changes "restrict" food intake as a mechanism of associated weight loss. It is preferable to describe such procedures by their anatomical features (e.g., "gastrectomy," "banding" or, more generally, "gastric") rather than by their inferred mechanism of action	41	2	Agree	95.1%
Reporting standards					
14	In general, a suboptimal initial clinical response to MBS is demonstrated either by total body weight or BMI loss of less than 20% OR by inadequate improvement in an obesity complication that was a significant indication for surgery	40	1	Agree	85.0%
15	In general, a late post-operative clinical deterioration after MBS is demonstrated either by recurrent weight gain of more than 30% of the initial surgical weight loss OR by worsening of an obesity complication that was a significant indication for surgery	39	1	Agree	71.8%

N, number of voters in deciding round; *MBS*, metabolic bariatric surgery; *AOM*, anti-obesity medication; *GI*, gastrointestinal; *BMI*, body mass index. All statements reached at least 70% consensus

*Instructions provided to the experts before they voted on statements 8 and 9 were to first read through both sentences to provide context and then vote on each statement separately

Table 2 Module 2—conservative management and anti-obesity medications (AOM). N, number of voters in deciding round; MBS, metabolic and bariatric surgery; AOM, anti-obesity medication Shaded cells indicate non-consensus

Table 2: Module 2 – Conservative management and anti-obesity medications (AOM) **Statements**	N	Rounds required	Most common selection	Percentage consensus
NUTRITION, LIFESTYLES, AND COUNSELLING				
All patients with a mental health diagnosis that is not currently being treated should undergo an assessment with a mental professional prior to MBS.	43	1	Agree	100.0%
Increasing physical activity and exercise has no clinically-significant physical or psychological benefits in MBS patients.	40	1	Disagree	97.5%
Due to the significant caloric restriction that individuals experience after MBS and to minimize any muscle loss associated with weight loss, a minimum of 60 grams of dietary protein is required daily after all MBS procedures.	40	1	Agree	92.5%
As hypo-absorptive MBS procedures result in greater protein loss, it is important to ensure a minimum of 80 to 100 grams of dietary protein per day.	40	1	Agree	92.5%
Individuals need some form of behavioural intervention to modify physical activity and sedentary behaviours, both before and after MBS.	40	1	Agree	85.0%
A rehabilitation program considering protein intake along with strength training should be prescribed individually both before and after MBS to avoid sarcopenia and related complications in individuals over 65.	40	1	Agree	85.0%
All patients with a **known or suspected** mental health diagnosis should undergo an assessment with a mental health professional prior to MBS, even if it is currently being treated.	42	1	Agree	83.3%
Studies to identify sarcopenia are advisable in at-risk individuals both before and after MBS.	40	1	Agree	80.0%
Objectively, most individuals who engage in low levels of moderate-to-vigorous intensity physical activity and have high levels of sedentary time before surgery make only modest improvements in these during the initial year after MBS.	40	1	Agree	75.0%
Every patient should undergo an assessment with a mental health professional prior to MBS.	43	2	Agree	58.1%
ANTI-OBESITY MEDICATION (AOM)				
Response to weight management treatments should be reviewed frequently and altered/supplemented if there is a suboptimal response or additional weight loss is required.	40	1	Agree	97.5%
Weight management should not be restricted to a step-wise approach, but be tailored to an individual's health status.	39	1	Agree	97.4%
Adjuvant AOM SHOULD/SHOULD NOT be offered to adults and children who require additional anti-obesity treatment after MBS.	39	1	Should	94.9%
Prior weight loss attempts SHOULD/SHOULD NOT be a pre-requisite to offering AOM to people with moderate to severe obesity.	40	1	Should	92.5%
Anti-obesity medications (AOMs) are appropriate for use in young people with obesity who are between 12 and 18 years old.	40	1	Agree	92.5%
Setmelanotide SHOULD/SHOULD NOT be offered to children ≥ 6 years old and people with genetic mutations/syndromic obesity (detected by an approved laboratory), in accordance with its licensed indications.	38	1	Should	92.1%
Individuals with obesity SHOULD/SHOULD NOT be offered long term treatment with AOM irrespective of any adiposity-related complications.	40	1	Should	87.5%
If available, genetic screening for monogenic obesity and syndromic obesity SHOULD/SHOULD NOT be performed (by an approved laboratory) in people with a BMI ≥40 kg/m2 and a history of childhood-onset obesity and hyperphagia.	40	1	Should	82.5%
In general, long-term treatment with AOM should be offered to individuals with overweight and ≥1 adiposity-related complications, individuals with overweight and ≥1 sub-optimally-controlled adiposity-related complications, or both.	40	1	Both	80.0%
Common side effects are typically transient and occur early in the use of AOMs.	40	1	Agree	80.0%
AOMs are inappropriate for long-term use in young people from 12-18 years old for the treatment of obesity.	40	1	Disagree	72.5%
OVERALL MEAN LEVEL OF CONSENSUS = 86.6% NUTRITION, LIFESTYLES & COUNSELLING = 84.9%; AOM = 88.1%				

Table 3 Module 3—endoscopic therapy. N, number of voters in deciding round; ESG, endoscopic sleeve gastroplasty; IGB, intra-gastric balloon; MBS, metabolic and bariatric surgery; AOM, anti-obesity medication. Shaded cells indicate non-consensus

Table 3: Module 3 - Endoscopic Therapy **Statements**	N	Rounds required	Most common selection	Percentage consensus
ENDOSCOPIC SLEEVE GASTROPLASTY (ESG)				
ESG combined with lifestyle intervention is preferable to lifestyle interventions alone, for the management of adults with **class II obesity.**	39	1	Agree	89.7%
ESG combined with lifestyle intervention is an acceptable management option for adults with class III obesity who either do not qualify (given medical or psychological comorbidities) or do not wish to pursue MBS.	42	1	Agree	87.5%
ESG combined with lifestyle intervention is preferable to lifestyle interventions alone, for the management of adults with **class I obesity.**	38	1	Agree	78.9%
In individuals with class I obesity and comorbidities, ESG is effective at inducing sustained weight loss that remains at 12-24 months follow-up.	38	1	Agree	76.3%
In individuals with class I obesity and comorbidities, ESG is superior to LIFESTYLE CHANGES/AOM/NEITHER/BOTH.	39	1	Lifestyle changes	74.4%
ESG combined with lifestyle intervention is preferable to lifestyle interventions alone, for the management of adolescents with **class II obesity.**	40	1	Agree	72.5%
In individuals with class I obesity and comorbidities, ESG is **not suitable** if an individual does not want surgical treatment.	39	2	Disagree	71.8%
ESG combined with lifestyle intervention is preferable to lifestyle interventions alone, for the management of adolescents with **class I obesity.**	41	2	Agree	56.1%
To achieve weight control and improved comorbidities in individuals with Class 1 obesity and obesity-related complications, the best nonsurgical treatment consists of… (A) AOM alone; (B) ESG alone; (C) AOM + ESG	41	2	AOM alone	56.1%
INTRAGASTRIC BALLOON THERAPY (IGB)				
IGB therapy combined with lifestyle intervention is preferable to lifestyle interventions alone, for the management of adolescents with **class II obesity.**	42	2	Disagree	59.5%
IGB therapy combined with lifestyle intervention is preferable to lifestyle interventions alone, for the management of adolescents with **class I obesity.**	42	2	Disagree	54.8%
IGB therapy combined with lifestyle intervention is preferable to lifestyle interventions alone, for the management of adults with **class II obesity.**	41	2	Agree	53.7%
IGB therapy combined with lifestyle intervention is preferable to lifestyle interventions alone, for the management of adults with **class I obesity.**	41	2	Disagree	51.2%
IGB therapy combined with lifestyle intervention is an acceptable management option for adults with class III obesity who either do not qualify (given medical or psychological comorbidities) or do not wish to pursue MBS.	41	2	Disagree	51.2%
OVERALL MEAN LEVEL OF CONSENSUS = 66.7% MEAN for ESG = 77.3%; MEAN for OGB = 54.1%				

response" as initial total body weight loss < 20% or inadequate improvement in an obesity complication that was a significant indication for surgery and "recurrent weight gain" as recurrent weight gain > 30% or worsening of an obesity complication that was a significant indication for surgery. Given the different effectiveness of each MBS procedures [13, 14] and variable effects in different populations, these criteria should be applied to individual patients combined with expert clinical judgement.

As in the previous IFSO/WGO survey, ensuring adequate nutritional supplementation was strongly agreed upon, as was acceptance of the roles of AOM spanning virtually all clinical scenarios: as first-line therapy, in young and old patients, before and after MBS, and for both short-term and long-term use. Like other chronic diseases, the treatment of obesity should follow the principles of chronic disease management with a combination of treatment options. For obesity, combination therapies failed to progress in the past due to the lack of effective AOMs. With the increased availability of current available potent AOMs and in the pipeline, the practice of combination therapy will likely increase as MBS and AOMs can work in synergy. Conversely, amongst our experts panel, considerable disagreement/non-consensus was observed regarding the role of metabolic bariatric endoscopy due to a lack of strong scientific evidence in the literature, though the use of ESG, combined with lifestyle interventions, was consistently supported in patients with class I and II obesity, with or without obesity-related complications, and with class III obesity who either do not qualify for or choose not to pursue MBS.

Numerous studies have demonstrated that MBS is significantly more effective than dietary and lifestyle changes alone at inducing weight loss, reducing complications,

Table 4 Module 4A—surgical procedures. N, number of voters in deciding round; AOM, anti-obesity medication; BMI, body mass index; DS, duodenal switch; GERD, gastro-esophageal reflux disease; GJ, gastro-jejunal; MBS, metabolic and bariatric surgery; OAGB, one-anastomosis gastric bypass; RYGB, Roux-en-Y gastric bypass; RY-DS, Roux-en-Y duodenal switch; SADI, single-anastomosis duodenal-ileal bypass; SADI-S, SADI with sleeve gastrectomy; LGB, laparoscopic gastric banding; T2DM, type 2 diabetes mellitus; VTE, venous thromboembolism. Shaded cells indicate non-consensus.

Statements	N	Rounds required	Most common selection	Percentage consensus
ROUX-EN-Y GASTRIC BYPASS (RYGB)				
In individuals with evidence of a large hiatal hernia and/or severe gastro-oesophageal disease or Barrett's oesophagus, RYGB IS/IS NOT preferable to SG.	40	1	Is	97.5%
The best option to treat medically uncontrolled GERD after a SG is conversion into a RYGB.	38	1	Agree	97.4%
In individuals with class 1 obesity and early-stage diabetic kidney disease, with poor control despite medical treatment, RYGB SHOULD/SHOULD NOT BE recommended.	36	1	Should	91.7%
Revision of RYGB to address suboptimal weight loss would include pouch trimming (with or without band placement), GJ anastomosis size reduction, or limb length modification.	37	1	Agree	78.4%
Unless contraindicated, gastric bypass (including RYGB & one-anastomosis procedures) is generally preferable to SG for adults with T2DM and obesity.	41	1	Agree	78.0%
Preferred treatment for hypoglycemic syndrome after RYGB, persisting despite adequate nutritional counselling, consists of: Medication (e.g., diazoxide, acarbose, octreotide, GLP1-mimetic)/Reducing the pace of gastric pouch emptying endo- or laparoscopically/Reversal to normal anatomy/None of the above	37	1	Medication	75.7%
Recurrent anastomotic (marginal) ulcers after a RYGB should be treated surgically by: Accurate vagotomy/Reducing pouch size, resecting anastomosis & creating a new anastomosis (preferably by hand)/Resecting the remnant/None of the above.	27	1	Reducing pouch…	74.1%
For a revisional surgery to address suboptimal weight loss after RYGB, given the risk of nutritional adverse events, revising the size of pouch and GJ anastomosis should NOT be done during the same operation as limb length modification.	32	2	Disagree	67.7%
In the absence of GERD symptoms or Barrett´s esophagus, the most appropriate surgical option for suboptimal weight loss after a sleeve gastrectomy would be conversion to: RYGB/OAGB/DS-SADI.	36	2	RYGB*	60.5%
SLEEVE GASTRECTOMY (SG)				
Gastroesophageal reflux disease (GERD), suboptimal weight loss, and recurrent weight gain are the main reasons for revisions after SG.	37	1	Agree	100.0%
Sleeve gastrectomy is a suitable procedure for high-risk individuals as the first step of a staged surgical approach.	42	1	Agree	95.2%
Sleeve gastrectomy is a suitable procedure for high-risk individuals as a stand-alone procedure.	41	1	Agree	92.7%
Individuals experiencing T2DM recurrence without suboptimal weight loss or recurrent weight gain after a SG are candidates for optimized adjuvant medical treatment.	35	1	Agree	91.4%
In the absence of GERD symptoms or Barrett´s esophagus, suboptimal weight loss after sleeve gastrectomy can be treated by... Adding an AOM/converting the SG to some other MBS procedure/BOTH/NEITHER.	40	1	Both	87.5%
Improved patient selection preoperatively for GERD risk WILL/WILL NOT significantly reduce the rate of sleeve gastrectomy conversions to bypass.	37	1	Will	83.8%
Sleeve gastrectomy is not the ideal procedure for individuals with severe T2DM on insulin.	35	1	Agree	80.0%
At long-term follow-up, the main concern, pertaining to the risk of sleeve gastrectomy-associated reflux is… GERD symptoms, like heartburn or regurgitation/endoscopic findings, like esophagitis or Barrett's oesophagus.	38	1	Endoscopic findings	76.3%
A preoperative gastroscopy **SHOULD/SHOULD NOT** be performed routinely for individuals considering sleeve gastrectomy.	40	1	Should	75.0%
Generally, sleeve gastrectomy is the preferred procedure for elderly individuals (>65 years old) because of its excellent safety profile.	40	1	Agree	75.0%
SINGLE-ANASTOMOSIS DUODENO-ILIAL BYPASS (SADI) + DUODENAL SWITCH = SADI-S				
Individuals who undergo SADI-S must be under surveillance and supplemented for life.	36	1	Agree	100.0%
In a metabolically-challenged patient, hypo-absorptive procedures – especially those involving a duodeno-ileostomy – should only be performed by experienced surgeons at high-volume centres (≥ 25 cases per year)	34	1	Agree	88.2%
Suitable candidates for classic Duodenal Switch or SADI-S would be individuals with a BMI >50 kg/m2 and previous SG / severe or uncontrolled T2DM / Both / Neither.	35	2	Both BMI>50 & severe DM	77.1%
Indications for a primary SADI-S include poorly-controlled T2DM.	35	1	Agree	71.4%
Indications for a primary SADI-S include a BMI ≤ 45kg/m2.	36	2	Agree	66.7%

Table 4 (continued)

Considering that hypo-absorptive MBS procedures are associated with a higher risk of malnutrition, they SHOULD NOT BE/CAN STILL BE undertaken in adolescents (< 18 years old).	42	2	Should not be	66.7%
Comparing weight loss outcomes between SADI-S (with a common limb length of 250 - 300 cm) and classic Roux-en-Y DS... SADI-S is superior/Classic DS in superior/Weight loss is comparable	36	2	SADI-S & RYDS comparable	63.0%
Compared with classic Roux-en-Y Duodenal Switch, SADI-S provides a better quality of life.	33	2	Agree	51.5%
ONE-ANASTOMOSIS GASTRIC BYPASS (OAGB)				
With OAGB, a biliopancreatic limb of 200 cm or longer may increase the risk of protein deficiency.	39	1	Agree	100.0%
OAGB SHOULD/SHOULD NOT be considered a carcinogenic procedure.	37	1	Should NOT	83.8%
OAGB **IS/IS NOT** better than RYGB for individuals with a BMI >50 kg/m^2.	31	1	Is NOT	80.6%
Unless contraindicated, gastric bypass (including RYGB & one-anastomosis procedures) is generally preferable to SG for adults with T2DM and obesity.	41	1	Agree	78.0%
LAPAROSCOPIC GASTRIC BANDING (LGB)				
Long-term follow-up (≥10 years) after LGB reveals a high-rate of band-related reoperations and device explants.	38	1	Agree	94.7%
Laparoscopic gastric banding (LGB) is an effective treatment option for suitable individuals with obesity.	40	2	Disagree	60.0%
OTHER				
Weight gain recurrence requires a thorough evaluation before even considering a patient a candidate for modifying a prior MBS procedure.	37	1	Agree	100.0%
Suboptimal weight loss has different implications than recurrent weight gain when considering which type of intervention to consider next.	35	1	Agree	85.7%
A hiatal hernia assessment REQUIRES/DOES NOT REQUIRE laparoscopic evaluation at the start of MBS.	32	1	Requires	81.3%
Modification of a prior MBS procedure can be considered for weight issues alone (e.g., when BMI>35 kg/m2), even when preexisting obesity-related complications are cured or are in remission.	40	1	Agree	80.0%
OVERALL MEAN LEVEL OF CONSENSUS = 80.2% RYGB = 80.1%; SG = 82.4%; SADI-S = 71.7%; OAGB = 85.6%; LGB = 77.4%; OTHER = 86.8%				

comorbidities, and mortality, and improving patients' overall quality of life [6, 8, 10, 11, 22–24]. Such reductions in complications and comorbidities include improvements in existing conditions and their prevention, including the prevention of various cardiometabolic diseases and cancers demonstrated also in multiple meta-analyses [25–34]. But questions persist as to when MBS might be contraindicated and which procedure to select in different situations.

Worldwide, SG has become the most common MBS procedure performed, and our experts agreed that it is the most suitable choice for high-risk patients, pediatric patients, and seniors > 65. However, our experts also agreed that SG is less suitable in patients with certain obesity complications such as poorly controlled T2DM, GERD, or NASH. It was also the most commonly selected procedure for patients with a BMI ≥ 50 kg/m^2 (by 66.7%), though no consensus was achieved. Voting on biliopancreatic diversion with duodenal switch (BPD-DS) and sleeve gastrectomy single-anastomosis duodenoileostomy (SADI), the consensus was that suitable candidates include patients with a BMI > 50 kg/m^2 and with severe or uncontrolled diabetes. However, those who undergo SADI-S will require surveillance and nutritional supplements for life. Voting on one-anastomosis gastric bypass (OAGB), there was 100% consensus that a biliopancreatic limb ≥ 200 cm increases the risk of protein deficiency and that, unless otherwise contraindicated, both RYGB and OAGB are generally preferable to SG for adults with both T2DM and obesity.

Every expert consensus survey has the potential for bias, given that clinicians considered experts in a particular practice must utilize it to be considered experts. We tried to minimize such bias in numerous ways, including seeking the opinions of 17 multi-disciplinary non-surgeons with expertise in obesity management; by including experts from every continent; by taking several steps, like statement balancing, to minimize any bias inherent in the survey itself; and by assistance of an internationally recognized expert in Delphi surveys.

Table 5 Module 4B—special circumstances by body mass index and age. N, number of voters in deciding round; AOM, anti-obesity medication; BMI, body mass index; DS, duodenal switch; ESG, endoscopic sleeve gastroplasty; GERD, gastro-esophageal reflux disease; HTN, hypertension; MBS, metabolic and bariatric surgery; OAGB, one-anastomosis gastric bypass; RYGB, Roux-en-Y gastric bypass; RY-DS, Roux-en-Y duodenal switch; SADI, single-anastomosis duodenal-ileal bypass; SADI-DS, SADI with duodenal switch; SADI-S, SADI with sleeve gastrectomy; T2DM, type 2 diabetes mellitus. Shaded cells indicate non-consensus. *Other procedures with percentage votes = SADI/DS 26.3%, OAGB 13.2%. **Other procedures with percentage votes = SADI/DS 12.8%, SG 10.3%, OAGB 10.3%. ***Other procedures with percentage votes = RYGB 25.0%, OAGB 13.9%

Statements	N	Rounds required	Most common selection	Percentage consensus
BODY MASS INDEX (BMI) > 50 kg/m²				
In describing people with a BMI > 50kg/m2, it is strongly preferable to use a BMI-based classification like class IV (BMI 50-60) or class V (BMI > 60). Terms like "super" obesity are perceived as demeaning or stigmatizing.	41	2	Agree	90.7%
In individuals with a BMI >50 kg/m², EMBT is necessary prior to MBS.	34	1	Disagree	100.0%
In individuals with a BMI >50 kg/m², endoscopic sleeve gastroplasty is appropriate.	34	1	Disagree	94.1%
Individuals with a BMI >50 kg/m² who undergo MBS need weight-adjusted pharmaco-prophylaxis to help prevent VTE.	32	2	Agree	91.7%
For patient outcomes, robotic surgery IS/IS NOT advantageous over laparoscopic surgery in individuals with a BMI >50 kg/m².	34	1	Is NOT	91.2%
Based on differences related to severity and physiopathology, individuals whose BMI is >50 BMI would be more accurately classified as having grade IV obesity.	36	1	Agree	83.3%
Individuals whose BMI is >50 kg/m² should be considered to have a more severe form of obesity and metabolic disease than grade III obesity.	38	1	Agree	81.6%
In individuals undergoing MBS, morbidity and mortality rates increase with increasing BMI above 50 kg/m².	37	1	Agree	81.1%
OAGB **IS/IS NOT** better than RYGB for individuals with a BMI >50 kg/m².	31	1	Is NOT	80.6%
If a hiatal hernia is found during MBS in a patient with a BMI >50 kg/m², it SHOULD/SHOULD NOT be repaired at the same time.	30	1	Should	80.0%
Individuals with a BMI >50 kg/m² must be considered for a staged approach, beginning with a sleeve gastrectomy.	35	2	Disagree	74.3%
Considering safety and efficacy, the most appropriate MBS for most patients with a BMI >50 kg/m² is SG / RYGB / OAGB / DS-SADI.	39	2	RYGB**	66.7%
A recent cardiac consultation IS/IS NOT mandatory prior to MBS for ALL individuals with a BMI >50 kg/m².	37	2	Is NOT	61.5%
Considering safety and efficacy, the most appropriate MBS for most patients with a BMI >50 kg/m² and a previous SG is RYGB / OAGB / DS-SADI.	38	2	SADI/DS***	61.1%
Pre-operative weight loss is necessary for individuals with a BMI >50 kg/m².	42	2	Disagree	59.5%
All individuals with a BMI >50 kg/m² should be placed on a very low-calorie diet immediately prior to surgery (MBS) for a minimum of two weeks.	40	2	Agree = Disagree	50.0%
BODY MASS INDEX (BMI) = 30-35 kg/m²				
For individuals with a BMI 30-35 kg/m² and T2DM who do not achieve substantial, durable weight loss and diabetes improvement with reasonable nonsurgical methods, MBS SHOULD/SHOULD NOT generally be offered for suitable individuals.	40	1	Should	97.5%
For individuals with a BMI 30-35 kg/m² and obesity-related complications, but no T2DM, who do not achieve substantial, durable weight loss and improvement in their complications with reasonable nonsurgical methods, MBS SHOULD/SHOULD NOT generally be offered for suitable individuals.	41	1	Should	95.1%
For individuals with a BMI 30-35 kg/m² and no obesity-related complications who do not achieve substantial, durable weight loss with reasonable nonsurgical methods, MBS SHOULD/SHOULD NOT generally be offered for suitable individuals.	39	2	Should	78.0%
AGE ≥65 YEARS OLD				
In individuals over 65 years old, MBS has been shown to be safe, result in sustained reduction in medication use, and associated with significantly-improved quality of life.	37	1	Agree	100.0%
Because elderly individuals [>65 years] are considered at high risk due to their age and greater risk of metabolic diseases, the safety of MBS and reducing postoperative complications are of the utmost importance.	36	1	Agree	100.0%
MBS is generally suitable for individuals over the age of 65 with obesity class II or higher.	42	2	Agree	88.1%
MBS is generally suitable for individuals over age 65 with class 1 obesity and T2DM, who do not achieve diabetes control with reasonable non-surgical methods.	41	2	Agree	87.8%
Generally, sleeve gastrectomy is the preferred procedure for elderly individuals (>65 years old) because of its excellent safety profile.	40	1	Agree	75.0%
Older individuals are more prone to developing postoperative complications after MBS than younger patients.	40	1	Agree	75.0%
Older individuals should primarily be offered MBS procedures based upon…	41	2	Both safety & effectiveness	68.3%
The effectiveness of MBS is reduced in the elderly.	41	2	Agree	57.5%
Considering that hypo-absorptive MBS procedures are associated with a higher risk of malnutrition, they SHOULD NOT BE/CAN STILL BE undertaken in individuals over 65 years old.	42	2	Should NOT be	52.4%
AGE ≤ 18 YEARS OLD				
For pediatric individuals with class 1 obesity and type 2 diabetes, MBS **IS/IS NOT** a reasonable treatment option	42	2	IS	85.7%
Sleeve gastrectomy should not be performed in young individuals because the procedure is irreversible.	36	1	Disagree	77.8%
MBS is generally suitable for individuals under the age of 18 with class 1 obesity and T2DM, who do not achieve diabetes control with reasonable non-surgical methods.	42	1	Agree	76.2%
MBS is generally suitable for individuals under the age of 18 with obesity class II or higher.	42	1	Agree	73.8%
Sleeve gastrectomy is preferable to RYGB as a first MBS procedure for most pediatric patients who meet criteria for MBS.	42	1	Agree	71.4%
Pediatric patients with syndromic obesity should be considered for MBS… (A) If their BMI is ≥35 kg/m2 or 120% of the 95th percentile & they have clinically significant obesity-related complications; (B) If their BMI is ≥40 kg/m2 or 140% of the 95th percentile (whichever is lower), even without clinically significant obesity-related complications; (C) Either A or B; (D) Neither	40	2	Both	70.0%
Considering that hypo-absorptive MBS procedures are associated with a higher risk of malnutrition, they SHOULD NOT BE/CAN STILL BE undertaken in adolescents (< 18 years old).	42	2	Should not be	66.7%
Endoscopic sleeve gastroplasty (ESG) SHOULD/SHOULD NOT be an option for adolescents above 12 years of age with class 1 obesity.	40	2	Should NOT be	52.5%
OVERALL MEAN LEVEL OF CONSENSUS = 76.1% BMI >50 = 78.9%; BMI 30-35 = 90.2%; Age 65+ = 78.2%; Age < 18 = 71.8%				

Table 6 Module 4C—complications of obesity. N, number of voters in deciding round; AOM, anti-obesity medication; BMI, body mass index; CV, cardiovascular; DS, duodenal switch; ESG, endoscopic sleeve gastroplasty; GERD, gastro-esophageal reflux disease; GLP, glucagon-like peptide; HTN, hypertension; MBS, metabolic and bariatric surgery; NASH, non-alcoholic steatohepatitis; OAGB, one-anastomosis gastric bypass; RYGB, Roux-en-Y gastric bypass; RY-DS, Roux-en-Y duodenal switch; SADI, single-anastomosis duodenal-ileal bypass; SADI-DS, SADI with duodenal switch; SADI-S, SADI with sleeve gastrectomy; T2DM, type 2 diabetes mellitus; VTE, venous thromboembolism. Shaded cells indicate non-consensus. *Other selections with percentage of votes = class II and III obesity 31.7%, class III obesity 7.3%, not I, II or III 7.3%

Statements	N	Rounds required	Most common selection	Percentage consensus
DIABETES AND METABOLIC SYNDROME				
For individuals with a BMI 30-35 kg/m^2 and T2DM who do not achieve substantial, durable weight loss and diabetes improvement with reasonable nonsurgical methods, MBS SHOULD/SHOULD NOT generally be offered for suitable individuals.	40	1	Should	97.5%
Individuals experiencing T2DM recurrence without suboptimal weight loss or recurrent weight gain after a SG are candidates for optimized adjuvant medical treatment.	35	1	Agree	91.4%
In a metabolically-challenged patient, hypo-absorptive procedures – especially those involving a duodeno-ileostomy – should only be performed by experienced surgeons at high-volume centres (≥ 25 cases per year)	34	1	Agree	88.2%
In a metabolically-challenged patient, a hiatal hernia SHOULD/SHOULD NOT be repaired independent of the type of approach (1 or 2 steps) or type of operation.	30	1	Should	86.7%
Sleeve gastrectomy is not the ideal procedure for individuals with severe T2DM on insulin.	35	1	Agree	80.0%
In adults with Class 1 obesity, RYGB and SG are comparably effective at achieving T2DM remission.	41	2	Disagree	78.0%
Considering safety and efficacy, the most appropriate MBS for most patients with severe T2DM is SG / RYGB / OAGB / DS-SADI.	40	2	RYGB	77.5%
In individuals with diabetes mellitus, MBS is better than pharmacotherapy with a GLP-1 receptor agonist at reducing CV mortality.	38	1	Agree	76.3%
In individuals with obesity class 1 and T2DM, surgical treatment IS/IS NOT more effective than medical treatment at reducing CV risk.	37	1	Is	73.0%
In a metabolically-challenged patient, a two-step approach (e.g., sleeve gastrectomy + second procedure) SHOULD/SHOULD NOT be considered.	33	1	Should	72.7%
LIVER DISEASE				
MBS can be considered in selected individuals with compensated cirrhosis.	41	1	Agree	97.6%
NASH and/or advanced liver fibrosis increases the risk postoperative complications.	35	1	Agree	82.9%
Considering safety and efficacy, the most appropriate MBS for most patients with NASH is SG / RYGB / OAGB / DS-SADI.	38	2	RYGB	78.9%
MBS should be recommended in individuals with NASH and (A) Obesity class III; (B) Obesity class II or III; (C) Obesity class I, II, or III; (D) None of the above	41	2	Obesity classes I-III*	53.7%
KIDNEY DISEASE				
MBS IS/IS NOT a safe and effective option to treat level 1 and 2 nephropathies of diverse etiology (e.g., obesity, HTN, & T2DM).	38	1	Is	97.4%
MBS IS/IS NOT effective at inducing remission of albuminuria in individuals with early-stage diabetic kidney disease (Level 1)	39	1	Is	97.4%
Published evidence SUPPORTS/DOES NOT SUPPORT using MBS as a bridge to transplantation in end-stage CKD individuals.	32	1	Supports	93.8%
In individuals with class 1 obesity and early-stage diabetic kidney disease, with poor control despite medical treatment, RYGB SHOULD/SHOULD NOT BE recommended.	36	1	Should	91.7%
In individuals with obesity class 1 and early-stage diabetic kidney disease, kidney disease remission rates are no different between medical and surgical treatment.	33	1	Disagree	75.8%
VENOUS THROMBOEMBOLISM (VTE)				
Since most post-MBS VTE events occur after hospital discharge, patients with known risk factors for VTE would likely benefit from extended pharmaco-prophylaxis after discharge.	39	1	Agree	97.4%
Currently-published data do not support routinely measuring anti-factor-Xa levels post-operatively to monitor adequacy of VTE thromboprophylaxis.	31	1	Agree	96.8%
In addition to lower extremity compression, all MBS patients must have perioperative chemoprophylaxis against venous thromboembolism (VTE).	37	1	Agree	86.5%
OVERALL MEAN CONSENSUS LEVEL = 85.5% DM/MS = 83.3%; LIVER = 78.3%; KIDNEY = 91.2%; VTE = 93.6%				

We acknowledge that consensus surveys rely on opinions, rather than experimentally generated data and represent level V evidence. On the other hand, our experts were all widely renowned experts in obesity management, most contributing extensively to obesity research, and were, thus, both highly familiar with and qualified to interpret their expansive knowledge of the literature. Ultimately, these consensus results will be used as an adjunct to a thorough literature review to guide clinical practice and assist in creating an algorithm to aid clinicians in their decisions when treating patients with obesity.

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Declarations

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