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Original article

International expert consensus on definitions and management of weight recurrence and suboptimal response after metabolic and bariatric surgery: a Delphi study

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Abstract

Background: Weight recurrence and suboptimal response after metabolic and bariatric surgery (MBS) lack standardized definitions and management approaches, creating barriers to evidence-based treatment decisions and coordinated care across multiple specialties.

Objectives: To establish international expert consensus on terminology, diagnostic approaches, and management strategies for suboptimal response and weight recurrence after MBS.

Setting: International Delphi study across multiple countries and health care systems.

Methods: A two-round modified Delphi study was conducted with 66 international experts across five specialties (MBS, obesity medicine, gastroenterology, endocrinology, dietetics and nutrition, and psychology). A 164-item questionnaire was developed, spanning seven dimensions: conservative management, diagnostic methods, endoscopic interventions, quantitative thresholds, risk factors, surgical interventions, and terminology. Consensus was defined a priori as $\geq$70% agreement. Inter-rater reliability was assessed using Gwet's AC1 coefficient.

Results: Response rates were 54.5% (Round 1) and 57.6% (Round 2). Consensus achievement improved significantly between rounds (26.2% to 40.9% of items). Experts reached unanimous agreement on core management principles including individualized patient care (100%) and the appropriateness of specialists prescribing antiobesity medications (100%). Strong consensus emerged on standardized terminology with "suboptimal" as the preferred term (89.5%) and %TWL as the optimal measurement approach (94.6). For quantitative thresholds, consensus was achieved on surgical nonresponse defined as $<$10% TWL at 12 months (73.0%), recurrent weight gain as $>$25% of lost weight from nadir (70.3%), and a 10% change in %EWL from nadir as normal physiologic response (83.8%). Conservative management items achieved the highest consensus rates (80.9%) while quantitative threshold items require additional research (28.1%). Inter-rater reliability improved across all domains, with conservative management achieving substantial agreement (AC1 = .70).

Conclusion: Expert consensus was achieved on fundamental principles of postbariatric care, including preferred terminology, measurement metrics, and provider roles. These recommendations address important gaps in clinical practice standardization. (Surg Obes Relat Dis 2026;22:753–761.)

Keywords: Bariatric surgery; Weight recurrence; Suboptimal response; Delphi consensus; Obesity management medications; Metabolic surgery; Revisional surgery

Obesity affects approximately 42% of adults in the United States, significantly increasing the risk of type 2 diabetes, hypertension, cardiovascular disease, and premature death [1]. Traditional obesity definitions have relied primarily on body mass index (BMI), though recent work has moved toward more comprehensive diagnostic approaches that incorporate measures of adiposity and organ dysfunction [2]. Metabolic and bariatric surgery (MBS) has emerged as the most effective treatment for severe obesity, achieving superior weight loss and comorbidity remission compared to

medical management, with type 2 diabetes remission occurring in up to 70%-80% of patients within 1-2 years [1,3]. However, clinically significant weight recurrence occurs in approximately 20%-35% of patients, typically beginning in the second or third postoperative year [4,5]. This weight recurrence not only diminishes the initial surgical benefits but often leads to recidivism of obesity-related comorbidities including diabetes, hypertension, and sleep apnea that had initially improved or resolved [4,6]. Current management approaches include a multimodal strategy integrating behavioral interventions, nutritional counseling, pharmacotherapy with GLP-1 receptor agonists, endoscopic procedures, and revisional surgery, though the optimal sequencing and selection of these interventions remains challenging [7].

The management of recurrent weight gain (RWG) is complicated by the lack of standardized definitions for what constitutes clinically meaningful suboptimal surgical response. Multiple definitions exist, including absolute weight recurrence from nadir, percentage of weight regained, or percentage of excess weight regained, leading to reported prevalence rates ranging from less than 10% to over 90% depending on the criteria and timepoint used [8,9]. Different thresholds can classify the same patient as either requiring intervention or being clinically stable, creating confusion about appropriate treatment timing and selection [9,10]. The American Society for Metabolic and Bariatric Surgery (ASMBS) POWER Task Force and the International Federation for the Surgery of Obesity and Metabolic Disorders (IFSO) have recognized this problem and called for consensus terminology, but no universally adopted standard exists [8,11]. Without uniform criteria, research comparisons become difficult to interpret and clinical guidelines remain fragmented [9,12].

Beyond these definitional challenges, the landscape for treating obesity has expanded significantly. Multiple health care specialties now manage postbariatric care, including bariatric surgeons, endocrinologists, gastroenterologists, and metabolic specialists, yet they lack standardized terminology and protocols for defining RWG. Without uniform criteria, each provider may reach different conclusions about the same patient's status and treatment needs, hampering coordinated care [13,14]. The present study is an international Delphi consensus study that sought to address this gap by establishing multidisciplinary expert agreement on terminology, diagnostic approaches, and management strategies for suboptimal response and RWG after MBS.

Methods

Study design

This study employed a two-round modified Delphi methodology to establish expert consensus on definitions, diagnostic approaches, and management guidelines for suboptimal response and weight recurrence after MBS. The study was conducted in compliance with CREDES guidelines and the ACCORD checklist for reporting consensus-based methods.

Expert panel selection

An organizing committee of 8 members with expertise in MBS and research methodology identified and invited 66 international experts across five specialties: surgery (n = 34), obesity medicine/endocrinology (n = 17), gastroenterology (n = 7), dietetics and nutrition (n = 6), and psychology (n = 2). Experts were required to have a minimum 5 years of experience in MBS or related fields, active involvement in research with peer-reviewed publications, and current clinical practice involving bariatric surgery patients. Invited experts represented 20 countries across six continents, including the United States, Canada, United Kingdom, Germany, Finland, Spain, Italy, Brazil, Argentina, Chile, Mexico, Guatemala, Egypt, Saudi Arabia, Iran, India, Thailand, South Korea, Singapore, and Australia. Participating experts were offered coauthorship on resulting publications as an incentive for participation.

Questionnaire development

A 164-item questionnaire was developed through a comprehensive literature review and expert input from the organizing committee. Questions were organized into seven dimensions: conservative management (23 items), diagnostic methods and assessment (9 items), endoscopic interventions (8 items), quantitative thresholds (61 items), risk factors and predictors (26 items), surgical interventions (20 items), and terminology and definitions (17 items). A complete list of questions is included in Appendix 1. Respondents were asked to rate each item using a four-point categorical scale: agree, disagree, neutral, or out of my expertise.

Delphi process

The study was conducted using the *Welphi* platform. Round 1 occurred in March 2025 with a 4-week response period and email reminders at days 7 and 12. All 164 items were presented for initial voting. Following inter-round analysis in April 2025, Round 2 was conducted in May 2025 over a 4-week period, in a similar fashion. In Round 2, experts were asked to complete the same questionnaire, with access to their individual Round 1 responses and the percentage of respondents who agreed with each item in Round 1, allowing them to change their answers for Round 2.

Consensus definition and statistical analysis

Consensus was defined a priori as ≥70% agreement among expert respondents, similar to prior consensus studies [15,16]. The primary outcome was the percentage of experts selecting "Agree" for each item. Items marked "Out of my expertise" were excluded from consensus calculations. Inter-rater reliability was assessed using Gwet's AC1 coefficient, with values interpreted as none to slight (.01–.20), fair (.21–.40), moderate (.41–.60), substantial (.61–.80), or almost perfect (.81–1.00) agreement. Between-group differences were assessed using the Kruskal-Wallis H test. Statistical analysis was conducted using R software version 4.5.0.

Ethical considerations

A waiver of informed consent was requested due to the deidentified nature of the study. Experts received detailed information about study's purpose, methodology, and data usage. All expert responses remained anonymous throughout the process, with only aggregate, deidentified data reported.

Results

Participant characteristics and response rates

A total of 66 international experts in MBS were invited to participate in this consensus study. Of these, 36 experts (54.5%) completed Round 1 and 38 experts (57.6%) completed Round 2. In Round 1, participants included surgery (n = 20), obesity medicine/endocrinology (n = 7), gastroenterology (n = 2), dietetics (n = 6), and psychology (n = 1). In Round 2, participants included MBS (n = 23), obesity medicine/endocrinology (n = 9), gastroenterology (n = 2), and dietetics (n = 4). The expert panel included clinicians with extensive experience in bariatric surgery practice, research, and education from multiple countries.

Overall consensus achievement

Consensus (≥70% agreement) was achieved on 43 items (26.2%) in Round 1, improving to 67 items (40.9%) in Round 2, representing a 14.6 percentage point increase. Conservative management achieved the highest consensus rates (72.79% increasing to 80.85%), while quantitative thresholds showed the lowest rates (29.78% to 28.05%). Inter-rater reliability improved across all dimensions from Round 1 to Round 2, with conservative management progressing from moderate (AC1 = .53) to substantial agreement (AC1 = .70, 95% CI: .60-.79) in the final round. Other dimensions achieved moderate agreement by Round 2: risk factors (AC1 = .53), quantitative thresholds (AC1 = .52), surgical interventions (AC1 = .56), and terminology (AC1 = .53). Kruskal-Wallis tests revealed statistically significant differences between specialty groups across all dimensions (all $P < .05$) (Table 1 and Fig. 1).

Consensus by dimension

Dimension: Conservative management

This dimension achieved the strongest consensus, with key agreements including individualized patient management (100%), consideration of obesity management medications when comorbidities recur (100%), and recognition that RWG is difficult to manage with lifestyle alone (91.9% in Round 2). Experts supported endocrinologists (100%) and surgeons (97.3%) prescribing obesity management medications, but not psychiatrists (16.2%) or OBGYNs (18.9%) (Table 2).

Dimension: Terminology and definitions

Strong consensus emerged that "suboptimal" is the preferred term for poor surgical response (89.5% in Round 2), compared to "inadequate" (8.1%) or "poor response" (10.8%). Experts agreed that no uniformly recognized definition exists for RWG (94.6%) and that uniform definitions would help guide treatment selection (97.3%).

Dimension: Quantitative thresholds

Despite containing 61 items, this dimension showed limited consensus. However, experts strongly favored %TWL as the preferred response measurement (94.6% in Round 2). A 10% increase in excess weight loss (%EWL) from nadir was considered a normal physiologic response (83.8%). The most supported threshold for surgical nonresponse was <10% total weight loss (TWL) at 12 months (73.0%). Four specific quantitative thresholds achieved consensus: % TWL as the optimal measurement approach (94.6%), a 10% change in %EWL from nadir considered normal physiologic response (83.8%), surgical nonresponse defined as <10% TWL at 12 months (73.0%), and RWG defined as an increase of more than 25% of lost weight from nadir (70.3%).

Dimension: Risk factors and predictors

Key consensus items included genetic factors and family history of obesity (86.5%), maladaptive eating behaviors (94.6%), poor follow-up (89.2%), and inadequate physical activity (89.2%) as contributors to suboptimal outcomes. Assessment of stress and mood over 6-12 months was deemed important (94.6%).

Dimension: Surgical interventions

Experts agreed that certain anatomical causes require revisional surgery (91.9%) but that medical treatments should be considered first due to higher revision morbidity (94.6%). For patients with suboptimal response or RWG

Table 1
Consensus achievement and inter-rater reliability by domain across Delphi rounds

Dimension	Round 1 consensus (%)	Round 2 consensus (%)	Round 1 AC1 (95% CI)	Round 2 AC2 (95% CI)
Conservative management	72.8	80.9	.53 (.42, .65)	.7 (.6, .79)
Diagnostic methods and assessment	56.6	63.7	.34 (.1, .58)	.47 (.26, .79)
Endoscopic interventions	42.7	42.9	.21 (.12, .3)	.37 (.24, .5)
Quantitative thresholds	29.8	28.1	.32 (.28, .35)	.52 (.46, .57)
Risk factors and predictors	62.4	68.8	.41 (.31, .51)	.53 (.42, .63)
Surgical interventions	56.9	64.5	.37 (.27, .47)	.56 (.46, .66)
Terminology and definitions	53.0	60	.32 (.22, .43)	.53 (.42, .64)

after sleeve gastrectomy, experts reached consensus that conversion to RYGB (86.5%), SADI-S (86.5%), and duodenal switch (86.5%) are all acceptable treatment options. Minimum time to revision was set at 12 months (86.5%).

Dimension: Diagnostic methods and assessment

Multidisciplinary team evaluation (97.3%) and comprehensive nutritional assessment (97.3%) achieved a strong consensus. However, routine diagnostic procedures like upper GI studies (67.6%) and endoscopy (67.6%) received only moderate support.

Dimension: Endoscopy interventions

This dimension achieved the lowest consensus. Endoscopic stoma reduction for dilated anastomoses received the strongest support (78.4%), while routine gastroenterology consultation at 6- or 12-months postsurgery had minimal support (<20%).

Items not achieving consensus

Ninety-seven items (59.1%) did not reach consensus, predominantly in quantitative thresholds. Nonconsensus items typically involved specific technical parameters, timing intervals, or emerging treatments.

Discussion

This international Delphi consensus study established multidisciplinary expert agreement across several dimensions of RWG after MBS, offering a framework for clearer communication among providers and improved outcomes for patients. This study established expert consensus across fundamental aspects of postbariatric care, spanning management approaches, terminology, diagnostic strategies, risk assessment, provider roles, and treatment selection criteria. These findings can be implemented to standardize care coordination among the multiple specialties treating patients with RWG after MBS.

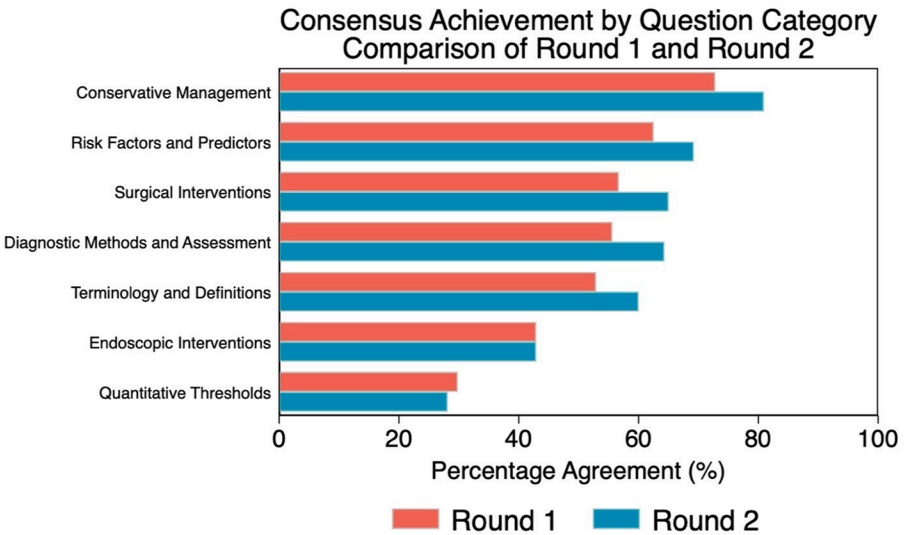

Fig. 1. Consensus achievement across question categories in Round 1 and Round 2. Percentage of expert agreement by question category, showing improvement from Round 1 (coral) to Round 2 (teal). Conservative management achieved the highest consensus (80.9% in Round 2), while quantitative thresholds showed the lowest (28.1% in Round 2).

Table 2
Items achieving highest consensus (≥90% agreement) in Round 2

Item	Dimension	Round 2 consensus (%)
Decisions about management of surgical nonresponse/recurrent weight gain should be individualized for every patient	Conservative management	100
If comorbidities recur OMMs should be considered	Conservative management	100
The presence of co-morbidities (metabolic COMs e.g. T2DM, OSA, MASLD, dyslipidemia, HTN) should be considered when deciding whether an OMM should be initiated	Conservative management	100
Is it appropriate for endocrinologists to prescribe OMMs in patients with recurrent weight gain after surgery?	Conservative management	100
The management starts with a comprehensive assessment that includes dietary patterns, physical activity level, and psychological disorders	Conservative management	97.3
Is it appropriate for surgeons to prescribe OMMs in patients with recurrent weight gain after surgery?	Conservative management	97.3
The presence of co-morbidities (non-metabolic COM e.g. OSA, GERD, Hiatal hernia, Gallstones) should be considered when deciding whether an OMM should be initiated	Conservative management	94.6
Recurrent weight gain after surgery is difficult to manage with lifestyle alone	Conservative management	91.9
The amount of body weight gained should be considered when deciding whether an OMM should be initiated	Conservative management	91.9
The rate of body weight gained should be considered when deciding whether an OMM should be initiated	Conservative management	91.9
An OMM should be continued if the patient loses more than 5% of weight in 3 mo	Conservative management	91.9
Evaluating surgical nonresponse/recurrent weight gain requires a multidisciplinary team evaluation	Diagnostic methods and assessment	97.3
A comprehensive nutritional evaluation is essential for the evaluation of surgical nonresponse/recurrent weight gain	Diagnostic methods and assessment	97.3
Is %TWL a good measurement of response?	Quantitative thresholds	94.6
Careful inspection of prescribed medications taken is necessary for the evaluation of surgical nonresponse/recurrent weight gain	Risk factors and predictors	100
The level of perceived stress and mood over the past 6 mo to 1 yr should be assessed in relation to surgical nonresponse/recurrent weight gain	Risk factors and predictors	94.6
Problematic alcohol use is a contributor to surgical nonresponse/recurrent weight gain	Risk factors and predictors	94.6
Maladaptive eating behavior (grazing, loss-of-control eating, binge eating) are contributors to surgical nonresponse/recurrent weight gain	Risk factors and predictors	94.6
Poor follow-up is a contributor to surgical nonresponse/recurrent weight gain	Risk factors and predictors	94.6
Revision/conversion has a higher morbidity compared to primary bariatric surgery so medical obesity treatment options should be considered before surgical therapies in patients with recurrent weight gain after surgery	Surgical interventions	94.6
Certain anatomical causes of recurrent weight gain after primary bariatric surgery should be corrected with revisional surgery	Surgical interventions	91.9
A uniform definition of recurrent weight gain is helpful to select appropriate treatment modalities	Terminology and definitions	97.3
There is no uniformly recognized definition of "recurrent weight gain" after MBS	Terminology and definitions	94.6

OMM = obesity management medication; T2DM = type 2 diabetes mellitus; OSA = obstructive sleep apnea; MASLD = metabolic dysfunction-associated steatotic liver disease; HTN = hypertension; GERD = gastroesophageal reflux disease; OBGYN = obstetrician-gynecologist; OM = obesity medicine specialist; PCP = primary care physician; GJA = gastrojejunal anastomosis.

Our consensus findings provide solutions to inconsistencies in characterizing RWG after MBS. The challenge in defining RWG has created barriers to evidence-based treatment decisions, as clinicians cannot effectively manage what cannot be reliably identified or measured. Mann et al. found that 61% of studies provided no definition of failure, with <50% excess weight loss at 18 months being the most common threshold among those that did [17]. Prior studies have suggested that several definitions exist for RWG, resulting in inconsistencies in reported prevalence [12]. Studies employ definitions ranging from any increase from nadir weight to regaining ≥25% of maximum weight lost, yielding prevalence rates from 2.5% to 94% at 5 years [9,18]. Metabolic medicine studies show similar variability, with Look AHEAD and Diabetes Prevention Program trials using different thresholds that yield poor interdefinition agreement [19]. Our strong consensus favoring %TWL as the optimal measurement (94.6%) validates recent Dutch Society recommendations to abandon %EWL due to BMI-dependent bias [20]. Experts achieved consensus on four specific

quantitative thresholds: %TWL as the optimal measurement approach (94.6%), a 10% change in %EWL from nadir considered normal physiologic response (83.8%), surgical nonresponse defined as <10% TWL at 12 months (73.0%), and RWG defined as an increase of more than 25% of lost weight from nadir (70.3%). These represent the first internationally agreed-upon quantitative criteria for these critical clinical scenarios, addressing a major gap identified by the ASMBS POWER Task Force [8]. However, these uniform thresholds may not adequately reflect individual patient variation, and future work should explore whether personalized benchmarks based on patient age, sex, and comorbidity profile improve assessment of surgical outcomes.

With new obesity medications, endoscopic procedures, and an increasing number of medical specialties now treating obesity and postbariatric surgery patients, establishing a clear consensus on collaborative care has become essential for the best outcomes. Our findings support this need for coordination, with experts unanimously agreeing on individualized patient management (100%) and nearly completely supporting multidisciplinary team evaluation (97.3%), consistent with current guidelines that favor comprehensive, patient-specific approaches over standardized protocols [6,7]. Our consensus on comprehensive assessment including dietary, physical activity, and psychological factors (97.3%), validates evidence showing that individualized approaches allow identification of contributors to suboptimal outcomes [6,21]. The strong agreement on poor follow-up compliance as a contributor to failure (94.6%) is supported by prior studies demonstrating better outcomes among patients who attend scheduled appointments [22]. Regarding evolving provider roles, our consensus supports both endocrinologists (100%) and surgeons (97.3%) prescribing antiobesity medications, reflecting the need for specialists with dual expertise in obesity medications and postsurgical care [7,23]. This consensus provides a framework for standardizing care, recognizing that bariatric surgery success increasingly depends on comprehensive long-term medical management alongside surgical intervention.

The present study did not find consensus on endoscopic interventions and timing protocols for weight regain assessment after bariatric surgery, likely reflecting existing evidence gaps rather than expert disagreement. Timing controversies centered on when to assess surgical nonresponse (3 vs 6 vs 12 months postsurgery) and when to refer patients for endoscopic consultation, with experts showing minimal agreement on early referral timeframes (8.1% consensus at 6 months, 16.2% at 12 months). The literature contains sparse evidence-based guidelines for these timing decisions, with most studies instead recommending individualized assessment [6,24]. Early endoscopic referral remains contentious because while some studies support early evaluation to prevent further RWG, others recommend exhausting behavioral and medical therapies first [25,26]. Endoscopic interventions achieved the lowest consensus, reflecting existing literature that demonstrates conflicting results and methodological limitations including small samples, retrospective designs, short follow-up, and lack of standardized measures [27,28]. While procedures like transoral outlet reduction demonstrate short-term efficacy, systematic reviews reveal inconsistent durability beyond 12-18 months and variable success rates attributed to differences in patient selection, technique, and follow-up protocols [25,27]. Furthermore, patient selection criteria for endoscopic interventions remain poorly defined, with few standardized protocols [6,29]. Given the limited evidence base for these procedures and the diverse backgrounds of experts in this study, achieving consensus on their application proves challenging in the evolving field of metabolic surgery. Future endeavors should seek to refine the timeline of postoperative RWG assessment and evaluate the applications of endoscopic intervention.

Weight-based definitions of surgical nonresponse have important limitations when evaluating metabolic surgery outcomes. A patient losing minimal weight but achieving diabetes remission represents metabolic success that weight-based thresholds cannot identify. Recent evidence demonstrates that metabolic improvements occur largely independent of weight loss magnitude. In the STAMPEDE trial, patients with BMI <35 achieved similar HbA1c reductions as those with BMI ≥35, with diabetes remission occurring despite variable weight outcomes [30]. Metabolic benefits appear within days of surgery, before substantial weight loss, through mechanisms including gut hormone changes and bile acid metabolism, rather than caloric restriction alone [2]. BMI also cannot distinguish visceral from subcutaneous fat, which have markedly different physiologic effects. Hepatic and visceral fat decrease by 68% and 36%, respectively after surgery, representing the tissue changes that drive metabolic recovery, while total body mass decreases more modestly [31]. This disconnect has prompted major societies to shift toward metabolic outcome measures, with ASMBS and IFSO guidelines now recognizing that BMI alone is insufficient to assess surgical response [32]. Our consensus on weight thresholds addresses standardization needs but does not fully capture the metabolic improvements that represent certain primary goals of bariatric surgery.

This study has important limitations. The 54%-58% response rate may introduce selection bias, as participating experts may differ systematically from nonrespondents, potentially influencing consensus patterns. The specialty distribution was imbalanced, with surgery comprising the majority while psychology and gastroenterology were under-represented, potentially affecting consensus across certain domains. The 70% consensus threshold, while standard for Delphi studies, remains arbitrary, and items achieving 70%-89% agreement have less robust support than those reaching >90%. Additionally, the weight-based thresholds we identified apply uniform cutoffs across all patients, without accounting for differences in age, sex,

comorbidity profile, or other baseline characteristics that likely influence surgical outcome. Future work using large international databases could establish individualized outcome benchmarks tailored to patient-specific factors rather than single thresholds applied to all. Finally, this consensus reflects expert opinion at a single timepoint and may evolve as new evidence emerges.

Conclusion

This international Delphi consensus study establishes standardized approaches across multiple domains of post-bariatric care, including management strategies, risk assessment, diagnostic evaluation, and treatment selection. The study successfully addressed longstanding inconsistencies in terminology, with %TWL emerging as the preferred response metric, and achieved agreement on core management principles and appropriate provider roles. While quantitative thresholds and endoscopic timing protocols require additional research, these consensus recommendations provide guidance for standardizing care coordination among the expanding specialties treating postbariatric patients.

Disclosures

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