Bariatric and metabolic surgery – position statement of Brazilian Society of Parenteral and Enteral Nutrition (SBNPE/BRASPEN)

Cirurgia bariátrica e metabólica – posicionamento da Sociedade Brasileira de Nutrição Parenteral e Enteral (SBNPE/BRASPEN)

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ABSTRACT

Introduction: Obesity is a chronic, multifactorial, and recurrent disease with significant social and clinical impact. It requires treatment led by healthcare professionals focused on the individual living with the condition. There is a global increase in the prevalence of obesity, and clinical and surgical treatments have advanced in the last decade. Bariatric and metabolic surgery is an effective treatment for sustained weight loss and metabolic improvement, currently performed using minimally invasive techniques. Therefore, the objective of this study was to standardize and support technical procedures in bariatric surgeries, including surgical indications, nutritional care, and decisions in special situations. **Methods:** This document was produced in conjunction with the Brazilian Society of Parenteral and Enteral Nutrition (SBNPE/BRASPEN) involving a bariatric surgeon and nutritionists with expertise in the field. The content of this position statement was developed considering the most recent scientific recommendations and expert opinion. **Development:** The topics of the position statement include surgical indications, nutritional monitoring and assessment, pre and postoperative supplementation plan, dietary progress, and management of potential complications. **Conclusion:** The treatment of obesity requires the involvement of an interdisciplinary team and the patient to establish effective treatment. Support is necessary to promote patient autonomy and achieve the expected results.

RESUMO

Introdução: A obesidade é uma doença crônica, multifatorial e recorrente, de grande impacto social e clínico. Ela exige tratamento conduzido por profissionais de saúde centrados na pessoa vivendo nessa condição. Há um aumento global da prevalência da obesidade e os tratamentos clínicos e cirúrgicos tem avançado na última década. A cirurgia bariátrica e metabólica é uma forma de tratamento eficaz para perda de peso sustentada e melhora metabólica, sendo atualmente realizada por técnicas minimamente invasivas. Assim, o objetivo desse trabalho foi uniformizar e auxiliar condutas técnicas nas cirurgias bariátricas incluindo indicações da cirurgia, cuidados nutricionais e decisões frente a situações especiais. **Método:** Este documento foi produzido junto a Sociedade Brasileira de Nutrição Parenteral e Enteral (SBNPE/BRASPEN), envolvendo um cirurgião bariátrico e nutricionistas com expertise na área. O conteúdo deste posicionamento foi conduzido considerando as recomendações cientificas mais recentes e opinião de especialistas. **Desenvolvimento:** Os tópicos do posicionamento incluem indicações da cirurgia, acompanhamento e avaliação nutricional, plano de suplementação pré e pós operatório, evolução da dieta e condutas frente a eventuais complicações. **Conclusão:** O posicionamento da SBNPE reforça que o sucesso da cirurgia bariátrica no tratamento da obesidade depende do acompanhamento multidisciplinar, contínuo e individualizado, com ênfase na nutrição como eixo central para prevenir complicações, manter resultados positivos e garantir qualidade de vida a longo prazo.

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INTRODUCTION

Obesity is a chronic and progressive disease, with a complex and multivariate etiology, associated with profound clinical, social, psychological and professional consequences. Its prevalence has increased exponentially throughout the world. Obesity levels in the United States are alarming and future prospects are even more worrying. A recent published study in the renowned Lancet journal predicts that in 2050, one in every 3 teenagers and two thirds of adults will be obese[1].

Obesity can affect all age groups, both sexes and represents a huge health expense mainly due to the treatment of associated comorbidities, such as diabetes mellitus, high blood pressure and cardiovascular disease, dyslipidemia, hepatic steatosis (which can lead to fibrosis and cirrhosis), and osteoarticular alterations. Excess body fat contributes substantially to the risk of cancer and it is considered a risk factor in 10.9% of non-female and 4.8% non-male tumors[2]. About 12 tumors are much more prevalent in obese patients when compared to eutrophic patients[2]. The clinical and nutritional treatment of obesity is complex and unfortunately associated with frustrating results, insufficient weight loss, and high recurrence rates.

Until recently, the drug treatment for obesity was quite ineffective. This panorama began to change substantially with the introduction of two known analogues of GLP-1, isolated or associated with other gastrointestinal peptides. They have quite promising results, inducing significant and lasting weight loss[3]. However, they also are expensive medications with frequent adverse gastrointestinal effects that require continuous use, as discontinuation is associated with high recurrence rates.

Bariatric surgery emerged more than 50 years ago as an extremely effective alternative, which induces significant and long-lasting weight loss. Its technique has been evolving over the past two years, and is now available in a minimally invasive manner both laparoscopically and robotically, with fairly low rates of surgical morbidity and mortality. There are several techniques available, which must be carefully evaluated to indicate the best option for the patient, based on the severity of obesity, eating habits that lead to obesity and the experience of surgery. Among the techniques available, some have greater restrictive potential, while others are associated with greater disabsorption. The important thing is that bariatric surgery must be understood as a modality that has two very important responses: the incretinic and satiating processes. The surgery allows for higher incretin production, which regulates gastrointestinal activity, and insulin release, inducing satiety.

Dozens of surgical procedures have only been described in the literature, usually with small variations on classic procedures. These procedures have recently been critically reviewed by 3 Brazilian medical societies dedicated to bariatric surgery: the Brazilian Society for Bariatric and Metabolic Surgery (SBCBM), the Brazilian College of Surgeons and the Brazilian College of Digestive Surgery[4]. This publication served as a basis for the modification of Brazilian Federal Council of Medicine (CFM) recommendations related to bariatric and metabolic surgery (BMS), published on May 20, 2025 in the Official Journal of the Union. This is the resolution of the CFM No. 2.429/25, which establishes new rules and parameters for BMS. In addition to reviewing the techniques allowed for surgical treatment (some of the procedures were removed from the resolution, while others were introduced), the document also reduces the minimum age for surgical indication, including teenagers, while also reducing the minimum body mass index (BMI) for surgical indication from 35 kg/m^2 to 30 kg/m^2, as long as patients had other serious comorbidities[5].

One of the two most serious problems after bariatric surgery is the low post-operative follow-up. Despite its importance in ensuring compliance with dietary recommendations, vitamin supplementation, regular physical exercise, and psychological support, alcohol consumption, and early detection of complications, the majority of patients abandon early or follow-up care. In a recent publication from the University of Chicago, the title of which was precisely the difficulty of post-operative support, called the "Achilles heel" of bariatric surgery, rates for post-operative follow-up were of only 61.9% in 3 months, 29.6% in 12 months and 6.5% in two years[6].

It is within this panorama of constant modifications that the Brazilian Society of Parenteral and Enteral Nutrition (BRASPEN/SBNPE) took the initiative to promote this corporate position on the topic. The issue is extremely pertinent and appropriate, given that these patients are often candidates for nutritional care, both before and after surgery. Ideally, the care should be followed throughout life, ensuring early detection and treatment of eventual nutritional deficiencies, intervention in weight gain, and detection of psychological or psychiatric alterations, including alcohol abuse. This position was divided into chapters that address each of these aspects properly, starting with surgical indication, adequate technical guidance, immediate post-operative dietary care, assessment, and conduct in the face of glycemic disorders and conduct in the face of challenging situations, such as pregnancy, vegetarianism, and if there are indications for enteral or parenteral nutrition, generally being suggested in the event of undesired complications.

I take this opportunity to congratulate the SBNPE board of directors and the Nutrition Committee for this initiative,

greet the authors of the chapters, and thank the opportunity to write this brief introduction.

1. Indications for bariatric and metabolic surgery

Thirty years ago, the NIH (National Institutes of Health) proposed a consensus for surgical treatment for severe obesity. It also established selection criteria, including the efficacy and risks of surgical treatment, the need for research, epidemiological evolution of therapies, and specific recommendations for the procedure. This consensus has previously been used for patients with a BMI equal to or greater than 40 kg/m^2 (with or without disease), or greater than or equal to 35 kg/m^2 (with comorbidities), being applied universally.

Today, obesity is recognized as a chronic disease, impacting inflammatory status and immune dysfunction[7,8]. This inflammatory alteration can lead to alterations in homeostatic mechanisms and, thus, to metabolic disorders associated with obesity and other unidentified pathways for the production of interleukins, adipokines, hormones, and other fast-phase mediators[8,9]. Several studies in the literature demonstrate improvements in comorbidities and a decrease in complications during surgery, which has motivated increased research in this field.

Bariatric surgery has been shown in controlled studies to be effective and safe for weight loss[9]. Mortality rates range from 0.03% to 0.2%[10]. For decades, and until recently, Roux-en-Y gastric bypass (RYGB) and sleeve gastrectomy dominated the Brazilian and global scenarios[9]. These procedures have been, and continue to be, extensively studied, having robust data.

The CFM, no different from the forefront of these studies, issued Resolution No. 2,429 of April 25th, 2025[5], with pertinent changes. Some of these changes are immutable, such as the general aspects of a well-prepared team with adequate professionals, adequately structured and equipped hospital centers, and the designation of absolute and relative indications and contraindications for procedures[5]. Other changes, however, led to shifts in clinical practice. The CFM aligned itself with internationally recognized studies, focusing on treating the patient, not just a number (BMI). Numerous studies demonstrate the concern for treating obesity as a chronic disease and, therefore, with a broad treatment including both medical and surgical procedures (Table 1). Similarly, the resolution reviewed the types of recommended surgical procedures and those not recommended, primarily due to complex and severe complications, and emphasizing that alternative surgeries can be performed within revision surgeries. These alternative procedures can be performed as primary surgeries, provided the patient consents and is aware that they may not offer the best results[5].

Board 1: – Prerequisites for adult bariatric surgery patients according to the Brazilian Federal Medicine Council Resolution No. 2,429 of April 25th, 2025.

Preoperative **Indication: adults**
BMI greater than 40 kg/m^2, regardless of disease
BMI equal to or greater than 35 kg/m^2, associated with at least one disease aggravated by obesity that improves with weight loss
BMI equal to or greater than 30 kg/m^2 and less than 35 kg/m^2, if associated with: Type 2 diabetes mellitus Severe cardiovascular disease with target organ damage Early chronic kidney disease in type 2 diabetes Severe sleep apnea Fatty liver disease with fibrosis Disease indicating transplant Reflux disease indicating surgery Severe osteoporosis
- BMI greater than 60 kg/m2, with assessment of the hospital's structural/physical capacity and staff preparedness

BMI = body mass index.

In terms of age, the extreme age groups present good results already described, as long as the patient is in good mental and physical health, aware of the risks and benefits (Table 2)[5].

Board 2 – Prerequisites for teenage bariatric surgery patients according to the Brazilian Federal Medicine Council Resolution No. 2,429 of April 25th, 2025.

Preoperative **Indication: teenagers (16 years and older), alongside criteria for adults**
Patient and family understand the risks and need for lifestyle changes inherent to the type of surgery
Psychological/physiological development and maturity
Ability to understand the risks/benefits and make decisions
Family support
Surgery in adolescents over 14 and under 16 years of age may be considered in exceptional cases of severe obesity (BMI greater than 40 kg/m^2) associated with life-threatening clinical complications

BMI = body mass index.

The resolution addresses with greater clarity the indication for bridging surgeries for other morbidities, which were previously considered contraindications for bariatric surgery, such as target organ transplants[11,12]. The resolution also addresses endoscopic procedures, recognizing them as part of the treatment[5].

Below, Tables 3 to 7 summarize the guidelines and indications from the new CFM resolution No. 2,429/2025.

Board 3 – Team composition that needs to be available for bariatric surgeries according to the Brazilian Federal Medicine Council Resolution No. 2,429 of April 25th, 2025.

General aspects **Regarding the team**
Surgeon
Endocrinologist, or in the absence of, general practitioner
Cardiologist
Psychiatrist
Nutritionist
Psychologist

Board 4 – Contraindications for bariatric surgeries according to the Brazilian Federal Medicine Council Resolution No. 2,429 of April 25th, 2025.

Preoperative **Contraindications**
Obesity or metabolic disease amenable to clinical treatment
Untreated or poorly controlled illicit drug abuse
Pregnant patients
Patients unable to adhere to postoperative recommendations, especially the multidisciplinary team

Board 5 – Recognized alternative bariatric surgeries according to the Brazilian Federal Medicine Council Resolution No. 2,429 of April 25th, 2025.

Procedures **Recognized alternative surgeries** **(indications for possible revision surgeries)**
Sleeve gastrectomy with duodenal switch
Gastric bypass with single anastomosis
Sleeve gastrectomy with duodenal-ileal anastomosis
Sleeve gastrectomy with bipartition of the intestinal tract
(provided agreement with the multidisciplinary team, in addition to the patient's informed consent)

Board 6 – Non-recommended bariatric surgeries according to the Brazilian Federal Medicine Council Resolution No. 2,429 of April 25th, 2025.

Procedures **Surgeries not recommended**
Adjustable gastric banding
Scopinaro Surgery
*Not authorized by the CFM **Patients who have already undergone these procedures

Board 7 – Recognized endoscopic procedures according to the Brazilian Federal Medicine Council Resolution No. 2,429 of April 25th, 2025.

Endoscopic procedures recognized by the CFM
Intragastric balloon
Endoscopic gastroplasty (or other designated name)

2. Pre- and postoperative nutritional monitoring and assessment

Monitoring and assessment in BMS requires a qualified multidisciplinary team, including a dietitian, who is essential for providing nutritional monitoring throughout all phases of the pre-, peri-, and post-operative periods[13,14].

In the preoperative period, the patient will require systematic and individualized assessment, including nutritional and metabolic assessment, as well as nutritional diagnosis, monitoring, and nutritional intervention[14,15]. Support group meetings with family members will also contribute to better patient understanding and adherence to the care inherent to BMS[15].

In the period leading up to surgery, the goal is to minimize peri- and postoperative risks, as well as initiate nutritional reeducation to adopt good eating habits, correct nutritional deficiencies, lose body weight (to reduce liver volume and improve surgical access)[16], and shorten the preoperative fasting period, which will help accelerate postoperative recovery. Nutritional and metabolic assessment, including anthropometry, body composition, biochemistry, and dietary intake, aims to identify the etiology and extent of nutritional deficiencies in a thorough and detailed manner. Additionally, the medical history should cover family history, obesity history, previous treatments, comorbidities, and eating disorders.

A relevant point in anthropometry is measuring waist circumference (Table 8), as it is an important parameter in assessing the risk of developing cardiometabolic disease[17].

It is noteworthy that excessive adiposity in the abdominal region can make it difficult to determine the midpoint between the iliac crest and the lowest rib, and for this reason, it is recommended to measure the circumference at the largest protuberance of the abdomen.

Board 8 – Waist circumference (WC) limits stratified by body mass index (BMI) for white individuals.

Classification	BMI (kg/m²)	WC in women	WC in men
Eutrophic	18.5 - 24.9	≤80 cm	≤90 cm
Overweight	25.0 - 29.9	≤90 cm	≤100 cm
Obesity I	30.0 - 34.9	≤105 cm	≤100 cm
Obesity II and III	≥35.0	≤115 cm	≤125 cm

Values above those recommended correlate with a high risk of future coronary events, as well as other diseases[18].

Neck circumference, which is easy to measure and inexpensive, can be included in the anthropometric scope. It is associated with insulin resistance and cardiovascular risk factors, in addition to being a predictor of sleep apnea/hypopnea (>32 cm for women and >38 cm for men), commonly associated with obesity[19].

Body fat distribution is more important than BMI, since body fat volume, and especially its location, directly correlates with metabolic complications, both in adults and adolescents. Computed tomography, magnetic resonance imaging, and dual-energy X-ray absorptiometry (DEXA) are considered the gold standard. However, due to the high cost and limitations of equipment for this population, their daily use is impractical. Therefore, the most commonly used method is the multifrequency, tetrapolar, and segmented bioelectrical impedance, as it is noninvasive and low-cost, even though it has limitations in this population[20].

Biochemical analysis, including fasting blood glucose, glycated hemoglobin, lipid profile, micronutrients (iron, vitamin B12, B9, vitamins A, D, and E, among others), and liver, kidney, and pancreatic function, is also recommended for preoperative evaluation to identify and treat nutritional deficiencies. It should be noted that a more comprehensive analysis should be considered in malabsorptive procedures[14,21].

Assessing dietary intake is essential to understanding dietary patterns and defining behavioral strategies for developing good eating habits, which will be crucial postoperatively[21]. A 3-day food record and a food frequency questionnaire can also be part of the food intake analysis.

The physical and nutritional assessment can complement the nutritional diagnosis, including nutritional semiology, observing the hair, eyes, mouth, and nails, as well as the presence of symptoms such as cramps, edema, memory lapses, and changes in taste and smell[14,15].

For nutritional optimization, reducing protein catabolism, and restoring bowel function, a shortened fast before surgery can be implemented (except in certain conditions, such as gastric stasis) with the administration of a solid meal 6 hours before and 200 ml of liquid 2 hours before the surgical procedure[22].

In the postoperative period, there must be an individualized, continuous and lifelong nutritional monitoring in accordance with the surgical technique performed and the presence of existing comorbidities[13-15]. The purpose of nutritional treatment is to minimize nutritional impacts, continue the nutritional reeducation process, supplement the necessary macro and micronutrients, and promote early introduction of the postoperative diet to reduce complications.

Depending on the technique, a restricted liquid diet (clear liquids without added sugar) is generally initiated in the first 24 hours, starting at 50ml/h and progressing to 200ml/h, according to the patient's tolerance. This is followed by a full liquid diet, starting on the 2nd or 3rd day until the 14th day (50 ml/h, progressing to 200 ml/h, according to the patient's tolerance). The patient then starts a pasty consistency diet (days 15 to 30) and, finally, a soft and normal diet (solid foods starting on the 30th postoperative day). Protein, vitamin, and mineral supplementation is recommended. Even though there is no standardized timeframe, the literature presents the progression phases considering individual tolerance and the characteristics of the surgical technique performed[13,22].

In the medium and long term, the diet will lack all the nutrients proposed by My Plate and the DASH diet[13,23] (high in protein, and contain whole grains, vegetables, fruits, and omega-3 fatty acids). Water intake will need to be greater than 1.5 liters per day. The recommended protein intake is 60 to 120 g/day, or 1.5 g/kg/day of ideal body weight (10 to 35% of total energetic value - TEV). Carbohydrate intake should start at 50 g/day and progress to 130 g/day. Fats should provide 20 to 35% of TEV, with a predominance of unsaturated fats. Fiber should be stimulated through a daily consumption of at least five servings of fruits and vegetables[13].

Additionally, mindful eating and proper chewing should be recommended, as well as discouraging the consumption of liquids with meals, limiting the consumption of simple sugars, carbonated beverages, and alcoholic beverages[13].

3. Evolution of the post-operative diet of bariatric and metabolic surgery

Nutritional care after BMS must be performed by a dietitian continuously, in all phases, and always in accordance with the surgical technique. The objective of accompanying the evolution of the phases of the diet is to avoid nutritional, mechanical, metabolic, and physiological complications in the short and long term.

The evolution of the non-post-operative diet of bariatric and metabolic and adaptive surgery must be started early within 24 hours after the procedure[22]. The evolution of the texture of the diet is gradual, including 5 phases: restricted liquid, complete liquid, pasty, brandy and solid consistency. It is important to highlight that progress is only in accordance with surgical technique and individual patient tolerance. There is still no definitive and uniform consensus regarding periods for each consistency, particularly in the two initial months. However, the literature proposes for adapted textures, so that there are no nutritional prejudices or side effects such as nausea and vomiting[14,22,24-26,28].

The initial volume of the diet should be 50 ml every 15 minutes or 20 ml every 10 minutes. All liquids should be without added sugar or caffeine. The intake of liquids is recommended, and in the pasty and solid phases, it is best to eat slowly. Protein supplementation or use of nutritional supplements should also be initiated after surgery[24,27].

The minimum protein intake should be 60 to 120 g/day, distributed throughout the body at least 3 to 5 times/day or 1.5 g/kg of ideal weight/day. The needs to be a limit for the consumption of carbonated, sugary, industrialized and alcoholic beverages. Patients should be encouraged to eat with full attention and efficient chewing.

Below (Table 9), we summarize the guidelines according to the post-operative phase[14,22,26-28].

Board 9 – Recommendations for diets in the restricted liquid, complete liquid, doughy, brand and normal consistency phases.

Phase 1: restricted liquid diet
Time: start in the first 24 hours after surgery.
Duration: up to 48 hours post-operative.
Objective: test tolerance of gastrointestinal treatment.
Foods: water, coconut water, fruit drinks or caffeine-free drinks.
Temperature: ambient, avoiding extremes of temperature (hots or colds)
Volume: 20 ml every 10 minutes.
Phase 2: complete liquid diet
Time: Start 48 hours after surgery.
Duration: 2nd year or 14th day.
Objective: adaptation phase to avoid distension of the gastric pouch and gastrojejunal anastomose (in intestinal bypass surgeries) while promoting adaptation and hydration.
Volume: between 50-150 ml per meal ingested in small volumes reaching 1800 ml to 2000 ml/day.
Foods and Preparations: sieved and sugar-free foods, such as water, coconut water, mixed fruit juices (50%/50%), natural yogurts or with a minimum of ingredients without fruit pulp and without sugar. Defatted ground beef broths, fish broths, chicken broth added with vegetables prepared with natural temperatures, which should be liquidized and sieved. Patients should avoid sugary drinks, caffeine and carbonated drinks.
Supplementation: protein supplementation should be started if the patient does not reach 60 to 80 g/day. There should also be vitamin and mineral supplementation.
Phase 3: doughy diet
Tempo: start on the 15th day.
Duration: 10 to 14 days or more.
Objective: facilitate the transition to a semi-solid diet, guaranteeing better digestive tolerance and adaptation and training to chewing.
Volume: from 100-120 g or ml, divided every 2 hours.
Foods and preparations: ripe fruits, solids, unpeeled or scraped and/or kneaded seeds, milk shaken with fruits, porridge of cereals without sugar, liquidized soups, chicken or fish cooked and defied, pureed vegetables, “baby food consistency” rice.

Continuation Board 9 – Recommendations for diets in the restricted liquid, complete liquid, doughy, brand and normal consistency phases.

Phase 4: brand diet
Tempo: Start on the 30th day.
Duration: 14 days.
Objective: facilitate the transition to a solid diet, facilitate digestion and train chewing. Increase the intake of protein foods and liquids in the intervals between meals.
Volume: 120-150 g or ml divided every 2 hours.
Foods and preparations: cooked and unpeeled vegetables, unpeeled ripe fruits, cooked or mixed eggs, thick and defatted cheeses, meats and poultry in cooked or thin preparations.
Phase 5: normal consistency diet
Time: Start 45 days after surgery.
Objective: to evolve a general and individualized diet, with emphasis and attention to the quality of the diet, start meals by ingesting proteins while observing the meal time, which should be slowly observing digestive tolerance.
Volume: 200-250 g or ml, being able to progress to 300-350 g in the long term.
Foods and preparations: in this phase, foods of all textures are allowed, excluding the concentration of fats and fried foods with emphasis on initial protein intake. Introduce cooked and leafy vegetables, fruits, meats of all types, cereals and legumes.

4. Pre- and post-operative supplementation plan for Bariatric and metabolic surgery

Although the clinical benefits of BMS are widely recognized, the procedure is also linked to a high risk of nutritional deficiencies due to dietary restriction, reduced absorption, and hormonal alterations[13].

The adoption of integrated perioperative supplementation and recovery protocols (Enhanced Recovery After Surgery - ERAS) has showed clear benefits in reducing complications, improving recovery and maintaining nutritional status[29].

As such, nutritional care is an essential pillar of pre- and post-operative management in BMS. The implementation of nutritional supplementation protocols is decisive in preventing complications, preserving lean mass and optimizing clinical recovery.

Pre-operative supplementation

Pre-operative nutritional management, including micronutrient assessment, low-calorie diets with adequate protein and targeted supplementation, promotes significant reductions in liver volume, better metabolic profile, and reduces intra- and post-operative risks[30,31].

Correcting nutritional deficiencies before surgery reduces morbidity, improves body reserves, and facilitates post-operative recovery. Studies[26,32] show that pre-operative supplementation with specialized multivitamins significantly reduces deficiencies of iron, folic acid, and vitamin D. As such, an individualized nutrient replacement protocol in the presence of any deficiencies, while in the pre-operative period, is essential for good recovery post-operative.

Regarding the need for non-preoperative weight loss, there are no clear definitions in the literature, but it is indicated for individuals with a BMI greater than 40 kg/m^2. Very low-calorie diets (VLCD) protocols promote reduction of liver volume from 12 to 19%, facilitating laparoscopic access and reducing surgical time[30,31], which can be used in patients with more severe signs of obesity.

Postoperative supplementation

In the postoperative period, continuous nutritional monitoring, with an emphasis on multivitamin supplementation, calcium, iron, zinc, vitamin D, vitamin B12, and adequate protein intake, is associated with maintaining weight loss, preventing deficiencies, and reducing complications in the medium and long term. A systematic review confirmed that individualized nutritional interventions and periodic monitoring reduce vitamin deficiencies by up to 25% in the first year after surgery[13].

After surgery, the dietary regimen progresses in phases, evolving from a liquid diet to a solid diet. During this period, significant weight loss occurs, associated with a high risk of

nutritional deficiencies. Sander et al.[32] report an incidence of vitamin D (60%), iron (45%), B12 (30–40%), and calcium (25–30%) deficiency after RYGB if adequate supplementation is not provided. They emphasize the importance of continuous nutritional monitoring and individualized postoperative supplementation, considering the patient's profile and surgical technique[33,34].

According to Frias-Toral et al.[26], patients undergoing RYGB and biliary-pancreatic diversion (BPD) require more intensive supplementation of fat-soluble vitamins and protein compared to sleeve gastrectomy. Table 10 presents the main nutritional risks and recommended supplementation for each bariatric surgery.

Board 10 – Recommended postoperative supplementation, according to the type of bariatric surgery.

Type of surgery	Main nutritional risks	Recommended supplementation
Roux-en-Y gastric bypass	Iron, vitamin B12, calcium and vitamin D deficiency	Multivitamin: 200% DRI Iron: 45–60 mg Calcium: 1200–1500 mg B12: 350–500 mcg Protein: 1.2–1.5 g/kg IBW
Vertical gastrectomy	Vitamin B12 and iron deficiency	Multivitamin: 100% DRI Iron: 18–36 mg B12: 350–500 mcg Protein: 1–1.5 g/kg IBW
Biliopancreatic diversion	Severe deficiencies of fat-soluble vitamins and proteins, as well as iron, calcium, vitamin B12 and D	Multivitamin: 200% DRI Iron: 45–60 mg Calcium: 1200–1500 mg B12: 350–500 mcg Intensive supplementation of vitamins A, D, E, and K Protein: up to 2 g/kg of IBW

Adapted from Mechanick et al. (2020)[13] and Osland et al. (2020)[35].

DRI = dietary reference intakes; IBW = ideal body weight.

The role of the nutritionist, together with the interdisciplinary team, is central to the selection, prescription, and monitoring of these strategies, which must be maintained long-term.

5. How and how often to perform follow-up in bariatric and metabolic surgery

Bariatric surgery is a safe and effective treatment option for individuals with obesity who have failed clinical treatments. It induces significant weight loss and has been associated with improvement or resolution of associated comorbidities. However, it is not a stand-alone treatment but rather a component of an approach that includes lifestyle changes and ongoing support to ensure long-term success[36].

Postoperative monitoring and follow-up are essential to assess patient progress, identify complications or side effects, and provide ongoing support and education. Regular follow-up helps reinforce nutritional and lifestyle recommendations, monitoring the weight loss process, and identifying nutritional deficiencies or other health problems[10,36].

Nutritional monitoring begins preoperatively, when a clinical nutritionist develops a dietary and nutritional plan for the patient and their family. Postoperative monitoring should be individualized and systematic, according to a protocol that includes assessment of weight loss, body composition, physical activity levels, nutritional status, supplementation plan, and adherence to dietary and lifestyle changes to adequately support expected weight loss. Adherence to nutritional guidelines is essential to ensure adequate macro- and micronutrient intake, hydration, and control the consumption of high-calorie and nutritionally poor foods and beverages. It is essential that the multidisciplinary bariatric surgery team has a follow-up protocol that includes nutritional, metabolic, and body composition assessments at each patient visit[14,36-39].

The frequency of nutritional monitoring should be individualized, considering the needs of each patient, their bariatric procedure, and the severity of other associated comorbidities. It is important to highlight that the recommended surgical techniques in Brazil are RYGB, sleeve gastrectomy, duodenal switch, and adjustable gastric banding. The first two are the most commonly performed procedures. Expected nutritional deficiencies include protein, iron, vitamin B12, vitamin D, zinc, and thiamine. In patients undergoing procedures with a higher degree of malabsorption, such as the duodenal switch, a more extensive micronutrient assessment should be considered based on symptoms and risks[36,37]. All multidisciplinary bariatric surgery teams must follow patients at regular intervals after surgery for a minimum of two years, but adherence to follow-up remains a major challenge[37,40,41].

According to the Health Minister Office (GM/MS) Ordinance No. 425 of March 2013 and the Brazilian Guide to Nutrition in Bariatric and Metabolic Surgery, nutritional monitoring after bariatric surgery must follow an individualized and systematic protocol tailored to the patient's needs and the specific needs of each service[14,37,40,41]. Table 11 presents the protocol establishing follow-up frequency for different exam types following the bariatric surgery.

Board 11 – Protocol establishing follow-up frequency for anthropometric, biochemical, food consumption and body composition exams after bariatric surgery.

Anthropometric exam	Biochemical exams	Food consumption	Body composition exam
• Monthly: until the 6th month	• Quarterly until the end of the 1st year	• Monthly: until the 6th month	• Semiannual: until the end of the 2nd year
• Quarterly: until the end of the 1st year	• Annually: starting in the 2nd year	• Quarterly: until the end of the 1st year	• Annual: from the 3rd year onwards
• Semiannual: until the end of the 2nd year		• Semiannual: until the end of the 2nd	
• Annual: from the 3rd year onwards		• Annual: from the 3rd year onwards	

6. Hypoglycemia and reactive hyperinsulinemia after bariatric surgery

BMS is arguably the most effective treatment for severe obesity. Besides promoting systemic metabolic improvement, it also demonstrates significant results in glycemic control and remission of type 2 diabetes mellitus in some patients[42]. Although evidence has demonstrated these benefits over the years, BMS is not without complications. Among these, there are early and late dumping syndrome, the latter termed hyperinsulinemic hypoglycemia (HH) or reactive hypoglycemia. These complications are more common after RYGB. They are less common in one anastomosis gastric bypass (OAGB), but can also occur after a sleeve gastrectomy (SG)[14]. Ileal bile acid absorption induces the activation of farnesoid X (FXR) and Takeda G-protein-coupled receptor 5 (TGR5), contributing to a significant improvement in insulin sensitivity and glucose efficiency. Therefore, dumping syndrome and symptomatic hypoglycemia are not observed[43,44].

Early dumping syndrome and late hyperinsulinemic/reactive hypoglycemia have distinct characteristics. However, both impact patient quality of life. In the presence of severe events, these events not only threaten the safety of individuals, but can also lead to incapacitation.

Early dumping syndrome results from anatomical alterations in the gastric and/or intestinal tract, which allow a significant amount of glucose to be absorbed very rapidly by the small intestine. Symptoms may appear between 10 and 30 minutes after a meal, and include gastrointestinal symptoms (pain, abdominal distension, borborygmus, nausea and diarrhea) and vasomotor symptoms (flushing, palpitations, sweating, tachycardia, hypotension, fatigue, drowsiness and syncope, although rarely)[14,45,46].

HH is considered a late complication of MBC, which may appear from the first postoperative year. Postprandial symptoms are characterized by hypoglycemia resulting from an exaggerated insulin response caused by the ingestion of refined carbohydrates[14,45,46]. Symptoms can occur 1 to 3 hours after a meal. These neuroglycopenic symptoms are related to hypoglycemia and are described as sweating, palpitations, tremors, irritability, syncope, feelings of fatigue, weakness, confusion, and hunger.[14]

It is important to note that the precise pathophysiology of HH is unknown. However, it is believed that the triad of this complication after RYGB would be 1) food absorption; 2) incretin production and 3) insulin secretion[14]. The abrupt and abundant entry of nutrients into the jejunum (simple carbohydrates) combined with their accelerated absorption causes spikes in glucose and, consequently, insulin. Furthermore, it is important to consider that the exposure of L cells in the distal jejunum and proximal ileum to nutrients causes an amplification of GLP-1, FGF-19, and other incretins, triggering a hyperglycemia-dependent insulin secretion[47]. Another theory argues that some patients may have an excessive capacity for incretin and insulinotropic production after meals, leading to severe hypoglycemia. Therefore, the use of a GLP-1 antagonist (exendin 9-39) would halt this hypoglycemia, lending credibility to this theory[47]. Other hypotheses point to other mechanisms involved in HH, which include a deficient suppression of basal insulin secretion in response to hypoglycemia, defective glucagon production[48,49], and alterations in bile acid kinetics[50], which could trigger the excessive secretion of FGF-19 and cytokines, such as IL-1 beta[47,51].

The criteria for the medical diagnosis of HH, generally accepted in the field, must meet Whipple's triad: 1) blood glucose levels <50 mg/dL and 2) improvement or 3) reversal of symptoms with increased blood glucose levels after ingesting simple carbohydrates, such as candy or sugars. Nutritional intervention in dumping syndrome is effective. However, in HH, it becomes complex and often ineffective. It should be combined with pharmacological intervention (acarbose, diazoxide, somatostatin Analo SG, and calcium channel blockers alongside GLP-1 agonists). In some situations, endoscopic intervention (transoral outlet reduction – TORe; endoscopic revision of the gastrojejunal anastomosis) should be used. When both fail, surgical intervention (RYGB reversal, RYGB conversion to SG, RYGB conversion to one of the ileal surgical techniques, partial pancreatectomy, band or ring placement, and gastrostomy) is indicated to treat HH[47]. Table 12 presents a summary of nutritional inverventions for hypoglycemia and reactive hypoglycemia and hyperinsulinemia

Board 12 – Nutritional intervention for hypoglycemia, reactive hypoglycemia, and hyperinsulinemia after bariatric surgery.

1. Controlled carbohydrate portions: 30 g/meal and 15 g/snack.
2. Low glycemic index carbohydrates. According to the Brazilian Diabetes Society (2023)52, "the use of the glycemic index and glycemic load to improve glycemic control in people with T2DM" may be considered when "foods are consumed in isolation (IIB–B)".
3. Lipids: healthy fats/unsaturated fatty acids – 15 g/meal and 5 g/snack.
4. Protein: adequate amounts 1.5–2.1 g/kg of ideal weight or 0.91 g/kg of current weight.
5. Protein supplementation: 100% whey protein isolate powder.
6. Vitamin and mineral supplementation: monitor deficiencies and optimize replacement
7. Meal spacing: 3 to 4 hours.
8. Avoid: alcohol, caffeine, liquids during meals (30 min after), sweets, fruit juices
9. Avoid simple carbohydrates before physical exercise.
10. Avoid physical exercise in the postprandial period.
11. Combine nutritional and physical intervention to prevent sarcopenia.
12. Regular nutritional monitoring.
13. Acarbose.
14. Avoid high-glycemic carbohydrates. The use of dextrose (10 to 15 g) is recommended to prevent recurrence of HH. Monitor after 15 minutes. If resolved, eat a snack/food quality according to the recommendations described above.

HH = hyperinsulinemic hypoglicemia.

7. Weight Recurrence

Although bariatric surgery is, in most cases, effective for treating obesity, a substantial proportion of patients experience suboptimal weight loss or weight recurrence[53]. Weight regain is characterized as a clinical situation in which an initially good response is not sustained over time, resulting in delayed weight regain after achieving an optimal clinical response[53].

Noria et al.[54] reviewed the incidence and causes of weight regain after bariatric surgery and concluded that prevalence rates vary with the surgical technique and time elapsed after surgery. Anatomical defects, such as dilation of the gastric fundus after sleeve gastrectomy and gastrogastric fistula after RYGB are not considered the main causes. The main causes identified by the authors were increased postoperative caloric intake due to lack of adherence to meal planning, inadequate physical activity, and psychosocial stress[54].

Based on the scientific observation that there is a difference in physiological status during weight loss compared to the non-obese state, and that the mechanisms that play a role in weight regain after weight loss are likely different from those that play a role in initial weight gain, Baak et al.[55] published four new physiological scientific findings related to the metabolic processes of obesity that may influence weight regain:

1) The immunological memory of obesity: in addition to persistent immune cells that promote weight recurrence, cells that reduce weight recurrence have been described.
2) The gut microbiome: There is evidence that modulation through a Mediterranean diet and autologous fecal microbiota transplantation can limit weight recurrence.
3) The composition of weight loss: the percentage of fat-free mass lost is the inverse of the amount of weight regained, regardless of the weight loss procedure.
4) Appetite control: When hypothalamic activity remains altered, it stimulates hunger and, consequently, weight recurrence occurs.

Treatment for weight recurrence must, therefore, be individualized and comprehensive. Poor eating habits, including high fat or alcohol consumption, increase the risk of weight recurrence, while high-protein, low-fat diets promote weight maintenance[53]. Although recent research clearly shows that epigenetic alterations modulate physiological mechanisms underlying weight recurrence, most available studies on weight recurrence are associative in nature. Intervention studies that more clearly demonstrate whether interfering with the newly proposed physiological mechanisms, such as incretin-based pharmacotherapy, also leads to weight recurrence are still lacking[55].

Prevention occurs through regular postoperative follow-up, including medical consultations and nutritional counseling, aimed at reducing body weight while preserving fat-free mass and promoting healthy habits[54]. Individualized nutritional therapy emphasizing a sustainable energy deficit and high-quality nutritional foods is essential. Balanced eating patterns, such as the plant-based, Mediterranean, and DASH diets, aid in weight maintenance and provide cardiometabolic benefits[54,56]. A comprehensive review of 114 studies demonstrated the role of plant-based diets and structured physical activity in improving insulin sensitivity, lipid profiles, inflammation, and weight management[56].

Fiber intake can improve gut microbiota diversity, increasing the production of short-chain fatty acids, which reduces chronic inflammation and improves sleep quality and mental well-being. Similarly, diets that control refined-food intake and are high in protein effectively control appetite, improve

metabolic health, and increase insulin sensitivity. These metabolic benefits help offset the reduced energy expenditure observed after bariatric surgery, contributing to weight loss maintenance[54].

Psychological factors, such as cognitive decline, emotional eating, and binge eating significantly hinder results, affecting up to 65% of patients during weight recurrence. This highlights the need for psychological support within a multidisciplinary approach[53].

Additionally, addressing weight regain requires multidimensional strategies that combine nutritional, psychological, and medical support. These strategies optimize surgical outcomes, promote sustainable weight loss, and improve patient health and well-being in the long term[53,54].

8. Nutrition and diet in special situations: pregnancy, vegetarianism, enteral and parenteral nutrition

Pregnancy after bariatric surgery

Fertility often improves after weight loss, increasing the likelihood of conception. Pregnancy should be planned after 12–18 months after BMS, when weight stabilizes, as pregnancy during the first year after BMS can place mothers and newborns at greater risk for other adverse outcomes associated with potential nutritional deficiencies[57]. In this initial period, maternal catabolism increases the risk of malnutrition and fetal complications. Although studies and guidelines show that BMS reduces the risk of gestational diabetes and hypertension, it requires increased surveillance for fetal growth restriction[58,59]. Furthermore, physicians and patients should make a shared decision about the type of BMS among women planning pregnancy after surgery and consider SG instead of RYGB, if appropriate, to minimize potential maternal and neonatal complications after BMS[57].

Main recommendations[58]:

- Quarterly monitoring of iron, ferritin, transferrin, B12, folate, calcium, phosphorus, magnesium, fat-soluble vitamins, and PTH.
- Individualized energy requirements based on pre-pregnancy BMI, weight gain, and physical activity level.
- Protein intake of at least 60 g/day or above 1.5 g of protein/kg of ideal body weight/day.
- Hypoglycemia or hyperglycemia: adjust the quantity and/or quality of carbohydrates. In hyperglycemia: reduce rapidly absorbed carbohydrates and/or replace them with proteins or low-GI alternatives.
- Adapted blood glucose monitoring, as traditional tests can cause symptoms of reactive hypoglycemia.
- Artificial nutritional therapy in cases of severe malnutrition.

Micronutrient recommendations[59]:

- Supplements should contain at least: copper (2 mg), zinc (15 mg), selenium (50 μg), folic acid (0.4–1 mg), iron (45–60 mg), thiamine (>12 mg), vitamin E (15 mg), and beta-carotene (vitamin A; 5000 IU).
- The retinol form of vitamin A should be avoided during pregnancy due to the risk of teratogenicity.
- If the patient remains obese or diabetic, folic acid should be supplemented at a dose of 4–5 mg/day.
- Regarding vitamin B12, a dose of 1 mg by intramuscular injection every 3 months is suggested during the preconception period and monthly during pregnancy.
- Iron infusion should be considered if oral supplementation is insufficient.
- Vitamin D should be supplemented to maintain a serum parathyroid hormone concentration of 50 nmol/L or higher, with serum parathyroid hormone levels within normal limits. If necessary, calcium should be added to maintain parathyroid hormone levels within normal limits.

Vegetarianism in Bariatric Surgery

Vegetarianism is generally defined as the absence of animal meat consumption and can be divided into several subcategories, depending on the consumption of eggs, fish, or dairy products. This diet is known to be associated with deficiencies of vitamin B12, vitamin D, iron, zinc, and calcium. A vegetarian diet is viable after BMS, provided it is carefully planned. However, data evaluating the number of individuals who adhere to a vegetarian diet after bariatric surgery are scarce or very heterogeneous.[60]

One of the main concerns for patients on vegetarian or vegan diets is maintaining adequate protein intake. The daily protein requirement ranges from 60 to 120 g per day, no different from that of omnivores. Furthermore, serum albumin and micronutrient levels (vitamin D, ferritin, transferrin, folic acid, vitamin B12, and zinc) should be monitored at 3 months, 6 months, and 1 year after surgery, and then annually thereafter[61]. This monitoring should be conducted by a multidisciplinary team. During each follow-up appointment, all patients should undergo at least one medical consultation, dietary and physical activity assessment, anthropometric measurements, and blood tests. In postoperative care, standard multivitamin supplementation specific for bariatric surgery should be daily part of nutritional therapy and supplementation may be adjusted after each appointment based on blood test results[60].

The few studies in the literature show that the rate of postoperative nutritional deficiencies during the follow-up of these patients is acceptable[61]. Patients following a vegetarian diet undergoing bariatric surgery present the same pattern of vitamin, protein, and micronutrient deficiencies as omnivorous patients. In practice, a well-defined and documented vegetarian diet should not be a barrier to bariatric surgery[60].

Nutritional strategies[62]:

- Omega-3: use of eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) supplements from microalgae.
- Proteins and amino acids: use eggs, dairy products, legumes, tofu/tempeh, and vegetable protein supplements (soy, pea, rice).
- Vitamin B-12: consumption of eggs, milk and dairy products, shiitake mushrooms, and tempeh. Treatment for B-12 deficiency is primarily via injection (intramuscular), although oral doses of 1,000–2,000 mcg/day have been shown to be equivalent or superior to injectable B-12.
- Vitamin D: Natural food sources are scarce, so plant-based foods enriched with vitamin D are safe options. Vitamin D deficiency should be managed in the same way as for omnivores.
- Calcium: Milk and dairy products, calcium-enriched plant-based beverages, tofu, legumes, arugula, kale, broccoli, and others. Supplementation is recommended according to deficiencies, as is the case for omnivores.
- Iron: Consume legumes, nuts, cereals such as rolled oats, whole-wheat bread, corn cereal, and greens such as watercress and red lettuce. Menstruating women should be cautious, as they are at higher risk of iron deficiency. Supplementation is recommended for deficiencies, as is the case for omnivores. Vitamin C (food or supplement) should be consumed alongside iron (food or supplement) to improve iron absorption.
- Zinc: Zinc intake and serum levels are typically lower in vegetarians. Foods such as rye flour, rolled oats, legumes, and nuts are excellent sources. Routine zinc supplementation is not recommended without prior nutritional assessment.

Enteral nutrition

Enteral nutrition (EN) is indicated when oral intake does not meet needs or there are surgical complications. Early initiation (≤24 hours) should be prioritized when feasible, according to ESPEN guidelines[63]. Table 13 shows a summary on monitoring patients on EN.

Board 13 – Monitoring patients on enteral nutrition post-CBM.

Phase	Assessment
Start	Weight, biochemical tests, electrolytes, B1
Maintenance	Monthly review of nutritional status, functional strength and laboratory tests

Recommendations:

- Use high-protein formulas, adjusting micronutrients according to malabsorption.
- Assess the risk of refeeding syndrome (correct phosphorus, magnesium, potassium, and administer thiamine).
- Consider altered anatomy when choosing an access route.
- Patient/caregiver education on preparation and hygiene.

Parenteral nutrition

Parenteral nutrition (PN) is indicated when the oral/enteral route is unfeasible or insufficient. Typical situations include obstructions, high-output fistulas, and refractory vomiting. Table 14 presents indications for parenteral nutrition.

Board 14 – Classic indications for post-CB parenteral nutrition.

Situation	Justification
Bowel obstruction	Impossibility of enteral nutrition
High-output fistulas	Significant loss of nutrients
Intractable vomiting	Inability to maintain oral intake

Recommendations:

- Early initiation when EN is not possible.
- Individualized formulas containing amino acids, titrated glucose, balanced lipids, and micronutrients.
- Prevent refeeding syndrome with hypocaloric initiation and prior electrolyte correction.
- Weekly reassessments to transition to the enteral/oral route as soon as possible.

Nutrition in special situations after BMS requires multidisciplinary support and rigorous monitoring. Pregnancy, vegetarianism, EN, and PN present distinct challenges, but all share the need for individualized supplementation and continuous monitoring. Integration between surgery, nutrition, clinical

medicine, and obstetrics is essential to minimize complications and optimize long-term outcomes.

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