

# Perioperative Nutritional Optimization in Inflammatory Bowel Diseases: When and How?

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## Abstract

Inflammatory bowel diseases (IBDs), including ulcerative colitis (UC) and Crohn's disease (CD), are commonly associated with important changes in nutritional status (NS). Both malnutrition and obesity have a negative impact on the course of both diseases, with greater risks of postoperative complications, such as anastomotic dehiscences, reoperations, prolonged hospitalizations, and increased mortality. The diagnostic criteria for identifying individuals at nutritional risk, with clear indication for preoperative nutritional therapy, involves several factors. Oral nutrition should be the first choice of nutritional support. If the patient has difficulty in consuming food, the enteral route is the second option, through elementary (amino acids), semi-elementary (oligopeptides), or polymeric (whole proteins) formulas. When oral or enteral routes are not indicated (in the presence of intestinal obstruction or ischemia, fistula, or bleeding), total parenteral nutrition can meet the daily nutritional needs of the critically ill patient. Nutritional support can be performed exclusively or in an associated way, which will depend on the nutritional severity of the patient with IBD. Nutritional screening should be performed at all stages of the disease, always individually and with professionals with experience in IBD. The reduction of complications in the perioperative period is not only associated with adequate surgical technique, but also with adequate nutritional support and clinical preparation before surgery. Therefore, the dietitian with a focus in IBD has an important role in the multidisciplinary team, collaborating with all stages of treatment and with the optimization of the nutritional status of the surgical patient.

## Keywords

- ▶ inflammatory bowel diseases
- ▶ nutritional optimization
- ▶ perioperative nutrition

## Introduction

Inflammatory bowel diseases (IBDs), including ulcerative colitis (UC) and Crohn's disease (CD), are commonly associ-

ated with important changes in nutritional status (NS). Preoperative nutritional therapy aims to control symptoms, as well as to prevent and correct malnutrition.<sup>1,2</sup> Patients with CD and UC can have nutritional deficiencies, due to

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impaired nutrient absorption, mainly iron, calcium, zinc, selenium, magnesium, vitamin B12, B9, vitamins A, C, D and E, fatty acids, amino acids, and carbohydrates.<sup>3,4</sup> The British Society of Gastroenterology Consensus (2019) emphasizes that changes in body composition, with increased visceral fat and decreased lean mass, are frequent in patients with IBD, increasing the risk of cardiovascular diseases, surgical complications, and the length of hospitalizations.<sup>4</sup>

Both malnutrition and obesity have a negative impact on the course of both diseases, with greater risks of postoperative complications, such as anastomotic dehiscences, reoperations, prolonged hospitalizations, and increased mortality.<sup>5</sup>

Although the main treatment for IBDs is based on medications, with corticosteroids, aminosalicylates, immunosuppressants, and biologics, surgery remains an important therapeutic option. Approximately 47% of patients with CD and 16% of patients with UC undergo one or more abdominal surgical procedures during the course of the disease.<sup>6</sup> Yamamoto et al. (2019), in a case-control study, observed that postoperative infectious complications were more prevalent in patients who received biological agents with associated malnutrition when compared with those with preserved nutritional status.<sup>7</sup>

Malnutrition is often identified preoperatively, and its causes are related to decreased food intake, malabsorption, and increased energy expenditure, especially during the phases of active disease.<sup>6</sup>

Patients with sarcopenia (a process of muscle mass loss that is characteristic of aging) generally have a greater need for blood transfusions, higher rates of sepsis, thromboembolic events, and worsening of the clinical status with admission to intensive care units (ICUs).<sup>6</sup> Thus, sarcopenia is associated with worsening postoperative outcomes in patients with IBD.

Preoperative malnutrition increases the risk of complications, even more when associated with the use of biological agents. A case-control study compared 70 IBD patients using biologics up to 8 weeks preoperatively with 70 patients without previous exposure to biological therapy. The authors identified that 43% of patients using biologics were malnourished, and, of those, 16% had postoperative complications, such as intra-abdominal abscesses, anastomotic and enterocutaneous fistulas, and wound infection. In the control group, 14% of the patients had some kind of complication.<sup>7</sup> Patients who use biological therapy usually have a more severe disease course; however, biologics are not considered the single cause related to higher postoperative morbidity, it is rather their association with risk factors such as malnutrition or previous steroids that causes these complications.

Thus, due to the clear association between malnutrition and increased postoperative complications in patients with IBD undergoing abdominal surgical treatment, there is a need to optimize the nutritional status whenever possible, aiming at reducing postoperative complications. The aim of this review is to detail the indications for preoperative nutritional therapy in patients with CD and UC as well as to discuss the best access routes and types of nutritional

supplementation used, according to recent evidence from the literature.

## When to Perform Nutritional Optimization?

Patients with IBD require screening for nutritional status in the preoperative period.<sup>4,6</sup> Nutritional assessment based on objective parameters such as weight, percentage of weight loss in the last 6 months, body mass index (BMI = weight (kg) / height (m)<sup>2</sup>), triceps skinfold measurement, and laboratory tests such as albumin and prealbumin are basic tools to provide an accurate nutritional diagnosis.<sup>4,8</sup> The diagnostic criteria for identifying individuals at nutritional risk, with clear indication for preoperative nutritional therapy, involve nutritional risk screening (NRS)  $\geq 3$ , or at least one of the following criteria: serum albumin deficit ( $< 3$  g/dL), insufficient food intake for more than 5 days, BMI  $\leq 18.5$  kg/m<sup>2</sup>, and weight loss of 10 to 15% in 6 months.<sup>2,5,9-11</sup> The perioperative nutrition screen (PONS) is another screening tool used to determine the nutritional risk indicators described above.<sup>12</sup>

According to the European Society for Clinical Nutrition and Metabolism (ESPEN) guidance (2020), the classification of IBD patients at risk of severe malnutrition should include the following criteria: weight loss between 10 and 15% in 6 months, BMI  $\leq 18.5$  Kg/m<sup>2</sup>, subjective global assessment (SGA) grade C or NRS  $\geq 5$  and serum albumin  $< 3$  g/dL (with no evidence of kidney or liver dysfunction).<sup>10,11</sup>

The NRS is a method recommended by the ESPEN, and it aims at the early detection of nutritional risk in hospitalized patients. The NRS variables include unwanted weight loss (quantity and time), BMI for adults and weight percentile for height for children, appetite, chewing and swallowing capacity, gastrointestinal symptoms (vomiting and diarrhea), factors of the underlying disease, stress, and the patient's clinical status. The classification of the NRS is based on low, moderate, or high risk of malnutrition, and, in patients at risk, a more detailed nutritional assessment is performed. The advantage of the NRS is that it can be applied by nurses and not just dietitians, other health professionals can apply this questionnaire, because of that, it covers a larger number of patients.<sup>13,14</sup>

The subjective global assessment (SGA) is a validated instrument for assessing the nutritional status of patients. It includes a history of weight loss in the 6 months prior to assessment, changes in the dietary pattern (degree of change), gastrointestinal symptoms (duration and intensity), metabolic demand for the underlying disease, change in functional capacity (level of muscle strength), and physical examination (assessment of subcutaneous fat loss, edema and/or ascites). The SGA classifies patients as nourished, moderately malnourished, or severely malnourished. It is a simple, cheap, and non-invasive method of evaluation that can be easily applied, so it is an instrument of high reproducibility, sensitivity, and specificity.<sup>13,15</sup>

According to the European Crohn's and Colitis Organization (ECCO) topical review (2020), plasma proteins, such as albumin, should not be used as markers of nutritional status in active IBD, due to impaired plasma concentration for the binding of vitamins to acute phase proteins, and the

reduction of their hepatic production (albumin, transferrin), presence of infection and/or trauma. Therefore, the correction of micronutrient deficiency is the best approach to be performed in patients during the phases of disease activity.<sup>6</sup>

According to the British Society of Gastroenterology (2019), the correction of anemia in the preoperative period should also be performed, as it is associated with a reduction in the risk of intra-abdominal sepsis in the postoperative period, risk of intestinal obstruction, anastomotic dehiscence, pneumonia, and other infections, including those of the surgical site. Anemia treatment can be performed orally or preferably intravenously. Blood transfusions should be avoided whenever possible, as they contribute to increased risks for anastomotic complications, intra-abdominal abscess, and thromboembolic events.<sup>4</sup>

As noted, there are multiple criteria for identifying malnutrition with repercussions in the perioperative period in patients with CD and UC, according to different societies and study groups on the subject. The definitions are the same for both diseases. We emphasize the importance of an adequate nutritional assessment in the preoperative period in a multidisciplinary fashion, and, whenever possible, patients with an indication for elective procedures must be instructed to perform proper preoperative optimization of the nutritional status, as described below.

## How to Perform Nutritional Optimization?

Initially, nutritional management is based on increasing caloric intake, which may or not include oral nutritional supplements. The second strategy would be to perform enteral nutrition (EN), if possible, exclusively, for a period of 4 to 6 weeks. If use of the gastrointestinal tract is contraindicated, total parenteral nutrition (TPN) should be used.<sup>5,6,16</sup>

The calorie intake recommended by ESPEN for patients with IBD is 25 to 30 Kcal/Kg/day and 1.5 g/Kg/day for protein requirements.<sup>10,11,17</sup> The International Anesthesia Research Society (2018), on the other hand, recommends a protein supply above 1.2 g/Kg/day with the use of whey protein and casein, as they have a greater effect on muscle synthesis.<sup>12</sup>

Exclusive enteral nutrition (EEN), either with elementary (amino acids), semi-elementary (oligopeptides), or polymeric (whole proteins) formulas, can be used for preoperative optimization in complications such as enterocutaneous fistulas.<sup>3,18-20</sup> According to the British Society of Gastroenterology Consensus, the minimum recommendation for EEN is for a period of 4 to 6 weeks, to reduce symptoms and improve the healing conditions of the intestinal mucosa.<sup>4,21</sup> A case-control study with patients with CD on EEN in the preoperative period showed a reduction in C-reactive protein (CRP), surgical time, and a lower risk of abscesses or anastomotic fistulas in the postoperative period. There are no studies that have evaluated the use of EEN in patients with UC.<sup>6</sup>

Total parenteral nutrition (TPN) is indicated for patients who do not meet daily nutritional needs through oral and/or enteral food, have severe malnutrition, or those with intestinal obstruction, high-output fistulas, severe bleeding, or

when the microbiota is dysfunctional during periods of disease activity.<sup>6,16,17</sup> The use of preoperative TPN is directly related to a decrease in postoperative complications such as anastomotic dehiscences, thromboembolic events, and septic complications in malnourished patients with CD.<sup>22</sup> A meta-analysis study showed that nutritional support by enteral or parenteral nutrition in the preoperative period reduces complications in the postoperative period in IBD patients.<sup>1</sup> The purpose of TPN in the preoperative period is to restore energy and protein storage, reduce and/or correct micronutrient deficiencies, in addition to preventing post-surgical malnutrition in patients at nutritional risk.<sup>17</sup> The duration of TPN in the preoperative period generally varies from 5 to 90 days, and most studies show a period of 7 to 14 days as the ideal.<sup>12,17,23</sup>

The association of EEN and TPN should be considered in patients who need nutritional support of more than 60% for the daily needs that cannot be achieved by EEN alone. Total parenteral nutrition can be used as a support for EEN.<sup>11,16</sup> This combination is generally used in patients with severe and chronic malnutrition associated with CD, with strictures and episodes of partial small bowel obstruction, for example.

A recent systematic review (2019) found that EEN is more favorable than TPN, due to the lower incidence of complications and bacterial translocation, preservation of gastrointestinal function, and lower cost.<sup>8</sup> However, Lakananurak and Gramlich (2020) demonstrated that ICU patients who received EEN had higher rates of complications (hypoglycemia and vomiting) than patients with TPN.<sup>17</sup> A meta-analysis and 16 other randomized controlled trials in critical conditions demonstrated that there are no evident clinical advantages of EEN over TPN related to mortality, pneumonia, and length of hospital stay.<sup>24</sup> Jankowski et al. (2018) demonstrated that when it came to postoperative complications and mortality, there was no significant difference between enteral or parenteral routes.<sup>25</sup> However, EEN optimization can be slower than TPN, which should always be considered when planning the time to perform abdominal surgical procedures, on a case-to-case individual basis.<sup>2,17</sup>

Fiorindi et al. (2020) showed the importance of perioperative nutrition (reduced fasting and increased intake of carbohydrates in the preoperative diet), regardless of nutritional status. These strategies collaborate with the reduction of postoperative complications.<sup>26</sup> The protocol for enhanced recovery after surgery (ERAS) recommends a 6-hour and 2-hour preoperative fasting for liquids, with a carbohydrate-based drink (12% maltodextrin associated or not with proteins) with a volume of 400 mL and 200 mL, respectively, and 8 hours for solid foods, without compromising surgical outcomes. Enhanced recovery after surgery is contraindicated in cases of severe gastroesophageal reflux, intestinal obstruction, gastroparesis, and pyloric stenosis. There is strong evidence that drinks with high carbohydrate concentrations administered 2 to 3 hours before surgery can improve the patient's nutritional status in the postoperative setting, accelerate recovery, and decrease the length of hospital stay.<sup>4,20,24,27</sup>

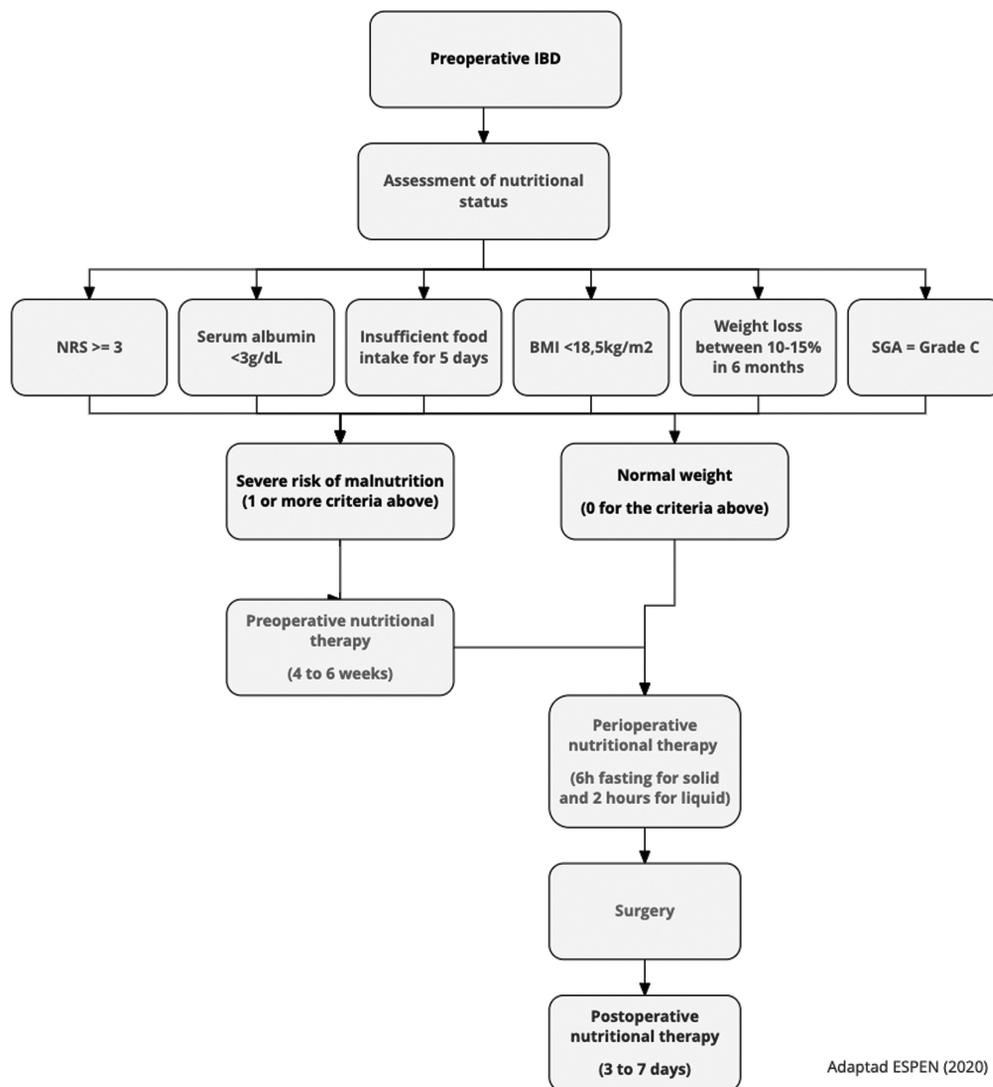
Postoperative enteral nutrition must be restarted in the first 24 hours (whenever possible) for patients with malnutrition and those who do not reach the recommended nutritional goals (minimum 60% of their protein/kcal needs orally), because when performed early, it decreases morbidity and mortality rates.<sup>16,20,26</sup> Clearly, this may not be possible due to the occurrence of postoperative ileus. Nakeeb et al. (2009) demonstrated that nutritional supplements taken orally, with a dose of 200 mL twice a day, until normal feeding is achieved, bring benefits to patients.<sup>28</sup> In the postoperative period, the diet needs to be hyperproteic to achieve the ideal protein goal.<sup>12</sup>

To date, there is no consensus on the ideal duration of continued nutritional support in the postoperative period. However, Cerantola et al. (2011) and the International Anesthesia Research Society (2018) suggest that nutritional therapy between 3 and 10 days (with 7 days being the most common) is associated with great benefit in the recovery of nutritional status and quality of life of patients with malnu-

trition. In eutrophic patients, the evidence is not so relevant.<sup>12,20</sup>

Immunonutrition with glutamine, arginine, omega 3 fatty acid, and RNA, used in combination, reduces overall complications in patients with IBD (lower rates of infection, length of hospital stay, and mortality) when used pre, peri and postoperatively. However, when these nutrients are used separately, the results are not promising. According to the International Anesthesia Research Society (2018), both nourished and malnourished patients should use immunonutrition, mainly in the pre and perioperative period. The recommended duration of immunonutrition for patients with adequate weight is of at least 7 days. In regard to malnourished patients, they should be evaluated weekly using serum albumin (> 3g/dL) as a marker for a better decision regarding the duration of use.<sup>12,20</sup>

In elective surgeries, nutritional supplementation should be recommended. In cases of emergency surgery (severe acute colitis and severe CD with septic or obstructive complications),



IBD: Inflammatory Bowel Diseases; NRS: Nutritional Risk Screening; ERAS: Enhanced Recovery After Surgery; BMI: Body Mass Index; SGA: Subjective Global Assessment.

**Fig. 1** Nutritional optimization for patients with inflammatory bowel disease. Adapted from European Society for Clinical Nutrition and Metabolism guidelines.<sup>11</sup>

nutritional optimization should be postponed, due to increased mortality with delayed surgery.<sup>6</sup>

► **Figure 1** shows an adaptation of an algorithm suggested by ESPEN (2020) in the nutritional management of IBD patients undergoing abdominal surgical procedures.<sup>11</sup> Nutritional assessment according to the criteria for defining malnutrition serves as a screening tool for preoperative nutritional optimization. Nutritional care must also be defined as important in the perioperative period, and after surgery, for better postoperative outcomes.

## Final Considerations

It is important to provide healthcare professionals involved in the management of IBD knowledge on nutritional tools which identify patients at risk of preoperative malnutrition, both from an objective as well as from a subjective point of view. The screening of nutritional status, performed properly in the preoperative period, is of significant importance to identify patients who need preoperative nutritional optimization, and, consequently, avoid different complications in the postoperative period. Malnourished and active IBD patients present metabolic stress, with a deficit in macro and micronutrients, muscle catabolism and increased basal metabolic rate.

Oral nutrition should be the first choice of nutritional support. If the patient has difficulty in consuming food, the enteral route is the second option, through elementary (amino acids), semi-elementary (oligopeptides), or polymeric (whole proteins) formulas. When oral or enteral routes are not indicated (in the presence of intestinal obstruction or ischemia, fistula, or bleeding), TPN can meet the daily nutritional needs of the critically ill patient. Nutritional support can be performed exclusively or in an associated way, which will depend on the nutritional severity of the patient with IBD.

Nutritional screening should be performed at all stages of the disease, always individually and with professionals with experience in IBD. The reduction of complications in the perioperative period is not only associated with adequate surgical technique, but also with adequate nutritional support and clinical preparation before surgery. Therefore, the dietitian with a focus in IBD has an important role in the multidisciplinary team, collaborating with all stages of treatment and with the optimization of the nutritional status of the surgical patient.

### Conflict of Interests

The authors have no conflict of interests to declare.

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