

# Perioperative Nutrition Support for Elective Surgical Cancer Patients: A Narrative Review

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**Objective:** This review of the literature's current types of suggestions regarding perioperative nutrition support for surgical cancer patients was its primary goal.

**Methods:** Appropriate kinds of literature were searched from the databases and other sources based on the process applied in a narrative review. The following databases like SCOPUS, PubMed, science direct, Google scholar, Cochrane library, MEDLINE, and Embase with Boolean operators including OR, AND, with medical heading subjects (MeSH) (preoperative AND nutrition AND cancer, malnutrition OR under-nutrition AND prevention AND management, cancer AND surgery AND analgesia, nutrition AND perioperative AND oncologic surgery, optimization AND perioperative AND nutrition AND cancer, oncological surgery AND frailty, sarcopenia AND perioperative malnutrition AND optimization, prehabilitation AND nutritional support AND cancer AND cachexia) were used. Endnote reference manager was used to remove duplications of extracted kinds of literature from different sources.

**Results:** The total number of articles identified through database and website searches was 34,292. Of these references, 1030 duplicates were removed. Nine hundred literatures were excluded in the screening phase with the human and published periods. Eighty-nine (89) references were included in the final version of this review.

**Conclusion:** Cancer-related malnutrition can be diagnosed using the criteria of the Global Leadership Initiative on Malnutrition (GLIM). A daily caloric consumption of 20–35 kcal/kg, with glucose and lipids, as well as electrolytes, trace elements, and vitamins, is advised for malnutrition in cancer patients.

**Keywords:** cancer, frailty, nutrition support, optimization, perioperative, sarcopenia

## Introduction

Malnutrition is defined as a significant loss in body weight and other body weight components that affects quality of life and the prognosis of a particular illness.<sup>1</sup> Early screening of cancer patients for malnutrition enables early detection and treatment.<sup>2</sup>

Internationally recognised and validated screening tools such as the Malnutrition Universal Screening Tool (MUST), the Nutritional Risk Screening (NRS) and the Patient-Generated Subjective Global Assessment (PG-SGA) can be used to assess the risk of malnutrition.<sup>3–5</sup>

The following criteria (at least one criterion met): severe weight loss (> 10–15% in 6 months), low body mass index (BMI < 18.5 kg/m<sup>2</sup>), or serum albumin < 30 g/L (in the absence of liver or kidney failure) are the standards used to identify cancer patients at a high risk of malnutrition and suggest preoperative nutrition therapy.<sup>3,4,6–8</sup>

The Global Leadership Initiative on Malnutrition (GLIM) ranked the top five criteria, with three phenotypic criteria—non-voluntary weight loss, a low body mass index, and decreased muscle mass—as well as two aetiological criteria—reduced food intake or assimilation and inflammation or disease burden. To determine malnutrition, at least one phenotypic and one aetiological indicator must be present. We suggest two levels of malnutrition severity: level 1 (moderate) and level 2 (severe). It is suggested that the aetiological parameters be used to direct intervention and anticipated outcomes. Malnutrition associated with chronic diseases with inflammation, malnutrition associated with chronic diseases with little to no apparent inflammation, malnutrition

associated with acute diseases or injuries with severe inflammation, and malnutrition associated with starvation are the four aetiological diagnostic groups.<sup>9,10</sup>

The clinical features of malnutrition can be measured by inadequate energy intake, loss of fat, weight and muscle, fluid accumulation and reduced grip strength, which should allow prediction of outcomes such as morbidity and mortality, physical function, quality of life, readmissions and hospitalisations, and health care costs.<sup>11–13</sup>

Cachexia is a multifactorial syndrome prevalent in chronic diseases and is now thought to be a comorbidity of cancer. Cancer-related malnutrition can cause it. It is characterized by a significant, involuntary loss of skeletal muscle mass, along with or without a loss of fat mass, and a heightened inflammatory reaction throughout the body.<sup>14</sup>

The global incidence of malnutrition in the course of cancer ranges from 30 to 90%, depending on the type, location, grade and stage of the tumour, tumour spread and cancer treatment, but also individual susceptibility.<sup>15</sup> In 20–50% of cancer patients having surgery, malnutrition is one of the independent causes of post-operative complications.<sup>16</sup>

Nearly two-thirds of patients with colorectal cancer who were scheduled for surgical resection required other nutritional therapy, and about 1 in 5 required critical nutritional intervention. Every component of measured health-related quality of life (HRQoL) was worse in patients whose diet was compromised than in those who did not need a dietary intervention, including depression, anxiety, pain, social function, overall physical health, overall mental health and overall quality of life.<sup>17</sup>

According to recommendations made by the European Society for Clinical Nutrition and Metabolism (ESPEN) expert group, nutritional care for cancer patients should be based on three key procedures: screening all cancer patients for nutritional risks early in their treatment without taking into account their body mass index or weight history; incorporating measures of anorexia, body composition, inflammatory biomarkers, resting energy expenditure, and physical performance into nutritional assessment methods; Utilizing multimodal dietary interventions with customized treatment plans, such as care aimed at boosting calorie consumption, lowering inflammation and hypermetabolic stress, and boosting physical activity.<sup>18</sup>

In patients with colon cancer, preoperative albumin level was a predictor of prognosis, and low albumin level is linked to a worse outcome in these patients.<sup>19</sup>

Preoperative nutritional interventions to optimise nutritional status with enteral and parenteral nutrition have shown that enteral nutrition was superior to parenteral nutrition in reducing postoperative complications.<sup>20</sup> Although there are well-known, internationally recognised guidelines for the management of perioperative malnutrition, too little attention is paid to it in clinical practise.<sup>21</sup> Since there is no argument in the treatment of malnutrition in cancer patients, inadequate nutritional therapy for these patients should be considered unethical.<sup>22</sup>

In patients with cancer of any type and location, multimodal care, including nutritional therapy, should be consistent with the principle of improved recovery after surgery (ERAS).<sup>23</sup>

According to one study, current data suggests that both types of neoadjuvant therapy (chemoradiation and perioperative chemotherapy) have similar outcomes of interest.<sup>24</sup> Another important component of perioperative care for these patients has just been introduced into prehabilitation practise, which aims to reduce the occurrence of adverse events and improve nutritional and health status during the perioperative period.<sup>25</sup> Considering that malnutrition and underfeeding are risk factors for postoperative complications, early enteral nutrition is important for all surgical patients at risk of malnutrition.<sup>26</sup> The nutritional care process was found to be beneficial by nutrition and dietetics professionals.<sup>27</sup>

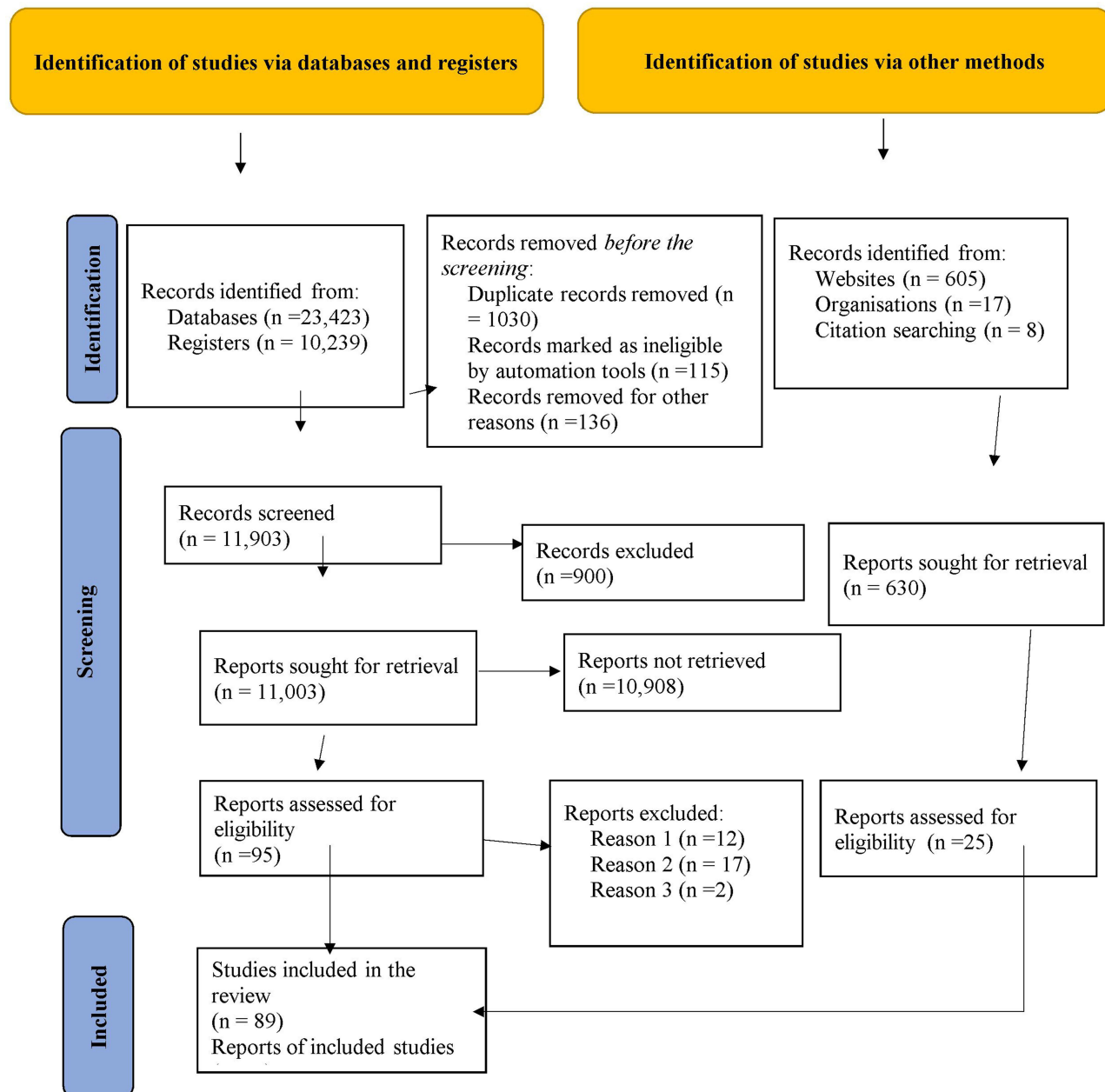
The purpose of this literature review was to thoroughly examine the available literature in order to obtain recommendations for enhancing nutrition in cancer patients undergoing elective surgery.

## Methods

Appropriate types of literature were searched in databases and other sources based on the procedure used in a systematic review. The following databases such as SCOPUS, PubMed, science direct, Google scholar, Cochrane library, MEDLINE and Embase were searched using Boolean operators such as OR, AND and medical keywords (MeSH) (preoperative AND nutrition AND cancer, malnutrition OR malnutrition AND prevention AND management, cancer AND surgery

AND analgesia, nutrition AND perioperative AND oncological surgery, optimisation AND perioperative AND nutrition AND cancer, oncological surgery AND frailty, sarcopenia AND perioperative malnutrition AND optimisation, prehabilitation AND nutritional support AND cancer) were used. A critical appraisal of the literature was conducted to screen papers. Endnote Reference Manager was used to remove duplicates of extracted literature types from different sources. The review process was conducted following the Preferred Reporting Elements for Systematic Reviews and Meta-Analyses (PRISMA) 2020<sup>28,29</sup> (Figure 1).

Conclusions and recommendations were drawn by directing the assessment towards perioperative optimisation of cancer patients with malnutrition. The studies were summarised by weighing the advantages and disadvantages of the alternative management strategies based on the currently available literature.



**Figure 1** Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) 2020. Adapted from Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ (Clinical research ed)*. 2021;372:n71.<sup>29</sup>

## Inclusion and Exclusion Criteria

In this literature review, we considered randomised controlled trials, systematic reviews, meta-analyses and observational studies of perioperative (preoperative, intraoperative and postoperative) nutritional support or therapy in elective surgical cancer patients worldwide published in English at any time point, in any age group and in both men and women. Duplicate studies, reports, commentaries, articles without full text, short communications irrelevant to our topic, and letters to the editor were excluded from this literature review.

## Results

### Identification of Studies and Characteristics of Included Studies

We identified a total of 34,292 studies from databases, registries, websites, organisations and citations. After removing duplicates and reviewing titles and abstracts, 88 studies were considered for full text review.

The total number of literature identified through database and website searches was 23,423 and 10,239 respectively. Of these scraps of literature, 1030 duplicates were removed. Nine hundred (900) pieces of literature were excluded during the screening phase with humans. Eighty-nine (89) pieces of literature were included in the final version of this literature review.

Out of the total 89 studies, twelve (12) different studies were selected as the sample for the summary of the literature review based on the grading of recommendations, assessment, development and evaluations (GRADE) of each type of literature for the conclusions (Table 1).

## Discussion

Perioperative nutritional support can improve positive patient outcomes by reducing hospital stay, morbidity and postoperative mortality.<sup>37</sup> It is well known that the preoperative nutritional status of the patient is a decisive factor for the postoperative outcome in surgical oncology cases.<sup>38</sup> A systematic review and meta-analysis concluded that preoperative body composition assessment helps to identify patients who need nutritional support.<sup>39</sup>

The aim of this literature review was to discuss the currently available literature on perioperative nutrition therapy in surgical cancer patients by dividing it into different subcategories.

### Preoperative Counseling and Education

In addition to an examination of general medical conditions, the preoperative medical evaluation of cancer patients should include nutritional status, functional status, and symptom control (especially with reference to cancer-related pain). It's also important to take into account the cancer's natural course as well as the effects of any earlier radiation or chemotherapy. Older people can experience cancer surgery with comparable short- and long-term results as younger ones. Considerations for treatment should be made in light of functional status rather than chronological age.<sup>40</sup>

Detailed formal education and counselling in the preoperative period are invaluable in reducing reducible factors such as smoking, malnutrition, alcohol consumption and anaemia.<sup>41</sup>

Outcomes after colorectal surgery have been measured by various indicators such as length of stay, morbidity, mortality, overall survival, disease-free survival, and time to first bowel movement or time to first oral intake. However, many of these indicators are of limited relevance to frail older people, who may be more concerned about anticipated disability and dependency than a cancer diagnosis or a reduction in life expectancy.<sup>42–44</sup>

A randomised clinical trial (RCT) concluded that integrated palliative care models (PC) for cancer patient caregivers lead to good patient outcomes and improve the caregiver experience.<sup>45</sup>

Another study on the use of complementary and alternative medicine in cancer patients concluded that communication with patients about the use of complementary and alternative medicine (CAM) in cancer treatment plays a crucial role for a positive outcome.<sup>46</sup>

Nutritional counselling, usually carried out by dietitians, is considered the best way to stabilise various chronic diseases.<sup>35</sup>

**Table I** A List of Examples of Literature That Was Used in the Findings

Author (s)	Publishing Year	Study Design	Objectives	Outcomes/Conclusions
Van Bokhorst-de van der Schueren MA, et al <sup>5</sup>	2014	Systematic review	To investigate the construct, criterion, and predictive validity of nutrition screening instruments for the general hospital context.	No screening or assessment tool can accurately screen for nutrition issues or forecast outcomes that are linked to inadequate nutrition.
Cederholm T, et al <sup>9</sup>	2019	A consensus report	This initiative is focused on building a global consensus around core diagnostic criteria for malnutrition in adults in clinical settings.	To diagnose malnutrition at least one phenotypic criterion and one etiologic criterion should be present.
Park HM, et al <sup>30</sup>	2022	Quasi-experimental	Preoperative nutritional support program (PNSP) among malnourished cancer patients.	Preoperative nutritional support for malnourished pancreatic cancer patients enhances clinical outcomes and nutritional state outcomes.
Haskins IN, et al <sup>19</sup>	2017	Comparative study	Association between preoperative hypoalbuminemia and 30-day patient morbidity and mortality in colon cancer patients	Preoperative hypoalbuminemia is associated with an increased risk of early patient morbidity and mortality.
Kwag SJ, et al <sup>16</sup>	2014	Cross-sectional	To evaluate the prevalence of malnutrition and its effect on the postoperative morbidity of patients after surgery for colorectal cancer.	Postoperative complications following colorectal cancer treatment can be predicted by nutritional risk assessment.
Le Roy B, et al <sup>25</sup>	2016	Multicentric, randomized, control trial	To evaluate the effect of prehabilitation, compared to conventional care, on the percentage of patients reaching complete oncological treatment.	Perioperative chemotherapy became the gold standard treatment in advanced gastric adenocarcinoma
Kabata P, et al <sup>31</sup>	2015	A prospective randomized controlled trial	To assess the need to introduce preoperative nutritional support in patients without malnutrition at qualification for surgery.	Preoperative nutritional support should be introduced for nonmalnourished patients to maintain proper nutritional status as well as to decrease postoperative complications.
Chow R, et al <sup>32</sup>	2020	Systematic Review and Meta-analysis	To update the original systematic review and meta-analysis previously published by Chow et al, while also assessing publication quality and the effect of randomized controlled trials (RCTs) on the meta-conclusion over time.	The results support the current European Society of Clinical Nutrition and Metabolism guidelines.
Rajan S, et al <sup>33</sup>	2021	A prospective randomized study	To assess the effect of carbohydrate drinks given 2h before surgery on intraoperative blood glucose levels as compared to those who did not receive it.	Compared to patients who received carbohydrate drinks 2 h before surgery, those who did not receive it had significantly higher blood glucose values intraoperatively with a higher incidence and severity of PONV and comparable ICU stay.

(Continued)

**Table 1** (Continued).

Author (s)	Publishing Year	Study Design	Objectives	Outcomes/Conclusions
Beattie AH, et al <sup>34</sup>	2000	A randomized controlled trial	To investigate changes in nutritional status and the influence of oral supplements on nutritional status, morbidity, and quality of life in postoperative surgical patients.	Nutritional status declined for two months after discharge.
Vasiloglou MF, et al <sup>35</sup>	2019	A Narrative Review	To explore aspects of effective nutritional counselling, including advances in counselling and areas where nursing input in nutritional counselling might enhance overall nutritional care.	Healthcare professionals require training and education to facilitate a patient centred approach to effective counselling.
Yap A, et al <sup>36</sup>	2019	A meta- analysis	To further analyze the effects of propofol (intravenous) and volatile (inhalational gas) anesthesia on cancer recurrence and survival	According to this meta-analysis, patients undergoing cancer surgery may have better recurrence-free survival and overall mortality when they use propofol-total intravenous anesthesia.

## Preoperative Medical Optimization

A study conducted by Grocott MP et al concluded that early perioperative contact between patients and physicians improved patients' surgical and medical conditions, such as hypertension, anaemia and diabetes, as well as physical activity and cessation of smoking and drug or alcohol abuse.<sup>47</sup>

Promoting exercise, correcting malnutrition, psychological support and optimising medical conditions are areas of prehabilitation that improve the postoperative outcome of cancer patients.<sup>48</sup> Preoperative correction of malnutrition and metabolic abnormalities before major surgery has been shown to reduce postoperative complications.<sup>6</sup>

The Society for Perioperative Assessment and Quality Improvement (SPAQI), an interdisciplinary society made up of perioperative medicine professionals, has published recommendations for the preoperative management of frailty. It states that teams should actively screen for frailty before surgery and that pathways, including geriatric comanagement, shared decision-making and multimodal prehabilitation, should be embedded in routine care to improve patient outcomes.<sup>49</sup>

These standards include preoperative screening for common geriatric complexities such as delirium risk and social vulnerabilities, addressing polypharmacy and nutritional needs, improving communication with patients and families, and providing care that is consistent with patients' goals.<sup>50</sup> Significant changes in postoperative functional capacity are more likely to be achieved with a prehabilitation programme than with rehabilitation.<sup>51</sup> Structured and personalised prehabilitation programmes with moderate exercise protocols, combined with optimised nutrition and appropriate psychological support, can improve postoperative outcomes in these individuals. This is an important, targeted and rapidly developing area of clinical research.<sup>52</sup>

## Preoperative Bowel Preparation

Routine preoperative mechanical bowel preparation with antibiotics reduced postoperative anastomotic leakage in patients undergoing elective surgery for colorectal resection of cancer.<sup>53</sup> The other systematic review introduced that the addition of oral antibiotics decreases the development of infection and nutritional obsoleting during the preoperative period is outdated.<sup>54</sup>

The other study, which focused on rectal cancer surgery, concluded that preoperative enemas only led to postoperative complications.<sup>55</sup>

A meta-analysis of randomised controlled clinical trials comparing mechanical bowel preparation with oral and systemic antibiotics with mechanical bowel preparation and systemic antibiotics alone found that surgical wound infections were significantly reduced in patients receiving the former intervention.<sup>56</sup>

## Preoperative Nutritional Support in Cancer Patients and Preoperative Fasting

One of the most important components of surgical care is preoperative nutritional support.<sup>57</sup>

Essential components of perioperative care are the combination of nutritional components with the general management of the patient, reduced preoperative fasting, resumption of oral nutrition as early as possible postoperatively, especially in high-risk patient groups, metabolic control and early mobilisation according to the recommendations for surgical cancer patients.<sup>26</sup> Preoperative nutritional therapy can also be used in non-malnourished patients to maintain an adequate nutritional status and reduce postoperative adverse events.<sup>31</sup> We can improve the nutritional status of elective surgical cancer patients through oral nutritional support and immunostimulatory formulas.<sup>37</sup> A preoperative nutritional support program (PNSP) was formed to improve perioperative nutritional status and clinical outcomes among malnourished patients with cancer.<sup>30</sup> It is well researched that preoperative oral nutritional supplements (ONS) improve the postoperative outcomes of surgical patients.<sup>58</sup>

This meta-analysis showed that the risk of infection, complications and all-cause mortality after gastrointestinal cancer surgery was reduced in patients receiving a preoperative diet in a low-to middle-income country (LMIC).<sup>58</sup> This report shows that some dietary factors have an impact on mortality and on the risk of recurrence or second primary cancer in cancer patients. Therefore, high-risk nutritional states may occur in certain cancers: From diagnosis and throughout the course of treatment, weight loss (lung and oesophageal cancers), malnutrition (lung, oesophageal, colorectal, pancreatic, stomach and liver cancers), weight gain (colorectal, breast and kidney cancers) and alcohol consumption (upper aerodigestive and oesophageal cancers) should be monitored; and after cancer treatments, obesity should be detected (colorectal, breast and kidney cancers).<sup>59</sup> The prudent pattern was characterised by a high intake of fruits and vegetables, poultry and fish, while the western pattern was characterised by a high intake of meat, fat, refined grains and desserts. Patients were followed up for cancer recurrence or death. Higher consumption of Western dietary patterns may be associated with a higher risk of recurrence and mortality in patients with stage III colon cancer treated with surgery and adjuvant chemotherapy.<sup>60</sup>

Compared to usual hospital nutrition without nutritional support, individual nutritional support reduced the risk of death and improved functional outcomes and quality of life in cancer patients at increased nutritional risk.<sup>61</sup> Safe management of anastomotic leaks after gastric cancer surgery with enteral feeding via a naso-intestinal tube.<sup>62</sup>

Preoperative nutritional support reduces the incidence of surgical wound complications in oncology patients.<sup>63</sup> Post-discharge ONS nutritional counselling in patients at nutritional risk after gastric cancer surgery improved nutritional outcomes, skeletal muscle preservation, chemotherapy tolerance and some quality of life variables.<sup>64</sup> Preoperative nutrition care is often overlooked because of the urgency of operating on a cancer patient.<sup>65</sup> The negative consequences are a longer hospital stay, higher levels of treatment-related toxicity, lower response to cancer treatment, lower activity levels, lower quality of life and a poorer overall prognosis.<sup>66</sup>

A systematic review and meta-analysis by Ronald Chow et al concluded that neither parenteral (PN) nor enteral (EN) nutrition is superior in terms of nutritional support and postoperative complication rates.<sup>67</sup> A daily intake of 20–35 kcal/kg, with a balanced contribution of glucose and lipids, and of 0.2–0.35 g nitrogen/kg is recommended both for EN and PN, with an adequate provision of electrolytes, trace elements and vitamins. A balanced contribution of glucose and lipids, or slightly more glucose than fat (60% glucose, 40% fat) is generally recommended. Needless to say, the nutrition must be supplemented, especially in the case of parenteral nutrition, with electrolytes, trace elements and vitamins.<sup>68,69</sup>

Preoperative nutritional assistance is crucial for patients with gastrointestinal and abdominal cancer, even if there is no risk of malnutrition. This method lessens postoperative issues, especially anastomotic dehiscence and leaking.<sup>31</sup>

Patients undergoing oncologic surgery should receive oral preoperative carbohydrate therapy to lessen perioperative discomfort, including worry. There was no increase in the risk of aspiration after preoperative delivery of an 800 mL carbohydrate drink the night before surgery and 400 mL right before surgery on the day of surgery.<sup>70</sup> A study that evaluated preoperative oral carbohydrate loading and its impact on “intraoperative blood glucose levels, postoperative

nausea and vomiting, and intensive care unit stay” found that patients who consumed carbohydrates two hours prior to surgery had lower blood sugar levels than those who did not, and that preoperative carbohydrate loading also reduced the frequency and severity of postoperative nausea and vomiting (PONV).<sup>33</sup>

If the patient is thought to have been unable to consume for longer than five days, preoperative nutritional therapy should be initiated. It is also advised for patients who are anticipated to have low oral intake and who are unable to sustain intake levels above 50% for longer than seven days. It is advised to immediately begin nutritional treatment in such cases.<sup>71</sup>

Preoperative fasting from midnight is not required, according to the European Society for Clinical Nutrition and Metabolism’s (ESPEN) practical recommendation. As a result, patients who are thought to have no particular risk of aspiration can consume clear liquids up to two hours before induction and foods up to six hours before induction.<sup>26</sup>

Several studies have lately questioned the advantages of 6 to 8 hours of preoperative fasting to reduce the risk for pulmonary aspiration of gastric content.<sup>72,73</sup> Traditional fasting is frequently extended when operation takes longer than expected. Due to the heightened systemic response to surgical tissue damage, the recommended prior fasting period can be prolonged by 10 to 16 hours. This has a negative impact on the recovery process.<sup>73</sup>

## Anesthesia Considerations

Anesthesia and/or analgesia are used for diagnostic, therapeutic, or palliative measures in up to 80% of oncological patients.<sup>74</sup> Total intravenous anesthetic may enhance sufferers’ survival without recurrence and lower overall mortality, according to current systematic reviews and meta-analyses.<sup>36,75</sup> Clinical practitioners have begun using local anesthetics in the treatment of a variety of inflammation-related conditions and diseases due to their potent anti-inflammatory properties, which are superior in several ways to traditional anti-inflammatory agents of the non-steroidal anti-inflammatory drugs (NSAIDs) and steroid groups and have fewer side effects.<sup>76</sup> Regional anesthesia may be advantageous because it protects cell-mediated immunity and lowers the surgical neuroendocrine stress response by blocking afferent neural transmission that stimulates the hypothalamic-pituitary-adrenal axis and sympathetic nervous system. This could reduce the need for opioids and volatile anesthetics, which would reduce the risk of cancer recurrence.<sup>77,78</sup>

## Postoperative Nutritional Care

Prescriptions for postoperative oral nutritional supplements for 8 weeks are clearly advantageous for malnourished patients in terms of nutritional healing, protein economy, and quality of life.<sup>34</sup> Long-term bed rest reduces muscular strength, pulmonary function, and tissue oxygenation in addition to increasing insulin resistance and muscle loss.<sup>79</sup>

Immuno-enhanced nutrition (IEN) can be the chosen management, but using parenteral nutrition support should be given to indicated patients like patients with intolerance to it. Preoperative enteral nutrition significantly reduces the postoperative adverse events in patients with digestive system cancer.<sup>80</sup> Perioperative nutritional support has been shown to decrease morbidity, death, and length of hospital stay.<sup>37</sup>

There are many restrictions with this literature review. This literature review’s absence of a meta-analysis of the types of literature with particular issue bases was one of its limitations. The statistics were not quantitatively analyzed, which was another drawback. The current review’s limitations included all kinds of papers with various publication dates, research designs, and the size of the global population.

## Recommendations

### Perioperative Management

Prior to surgery, anesthetists and surgeons should conduct a physical examination, thorough medical history, and laboratory tests to assess the patient’s overall health. They should also pay particular attention to the patient’s nutritional status, type of surgery, and anesthesia, as well as the patient’s stage of cancer, the severity of their malnutrition, and any opportunistic infections they may have. The group should take malnourished patients with any kinds of cancer into account when predicting the perioperative risk category.



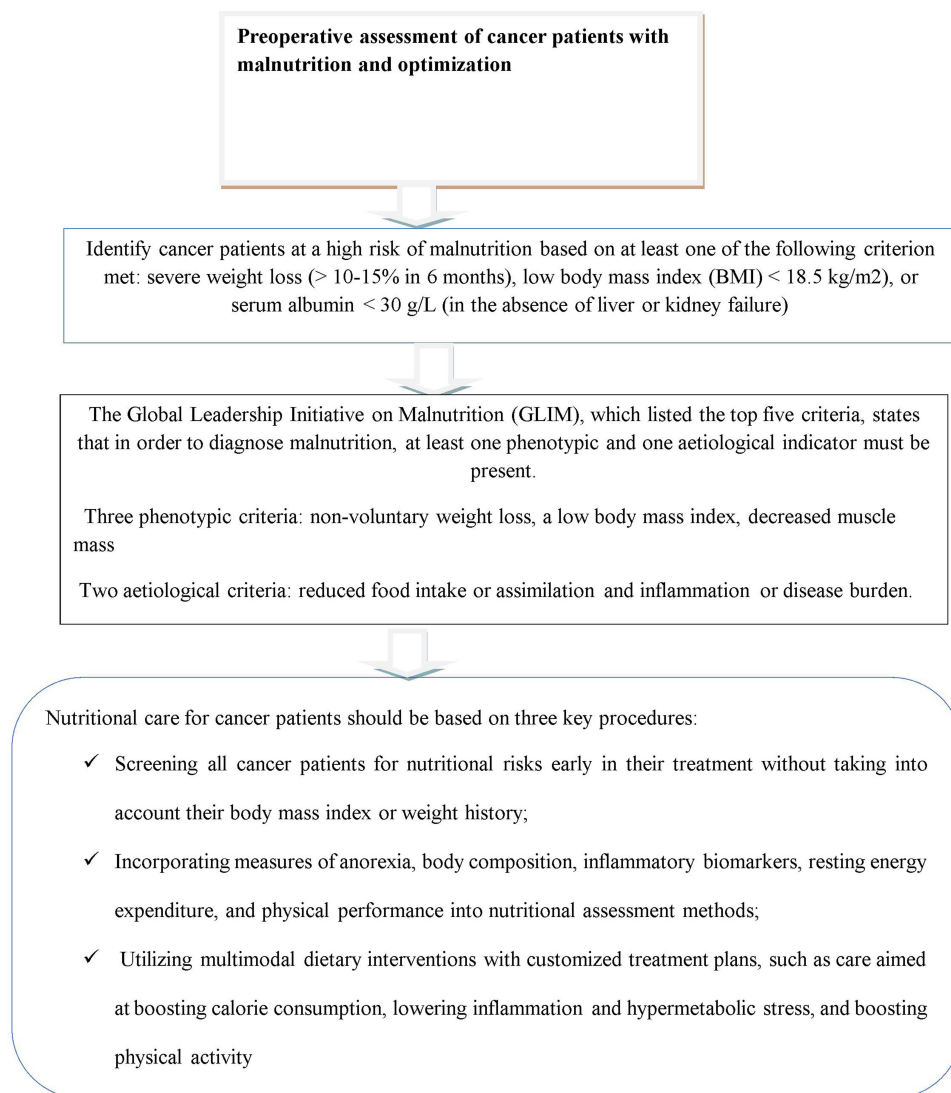
Regional anesthesia is frequently the preferred technique when it is not prohibited, such as in thrombocytopenic patients. The chance of neuropathies, local infections, or abnormalities in blood clotting must nevertheless be considered. All preventive and supportive management is still in effect during the intraoperative period. Malnourished patients who also have cancer should receive extra care, counseling, and multimodal treatments. Regional techniques for postoperative pain control are reliant on the patient's hemodynamic condition, coagulation profile, and resource availability as part of multimodal therapies. Additionally, early nutritional support and antibiotics should be included in postoperative concerns for those patients.

## Conclusions

Cancer-related malnutrition can be diagnosed using the criteria of the Global Leadership Initiative on Malnutrition (GLIM). A daily caloric consumption of 20–35 kcal/kg, with glucose and lipids, as well as electrolytes, trace elements, and vitamins, is advised for malnutrition in cancer patients (Figures 2–4).

## Acknowledgment

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**Figure 2** Preoperative assessment of cancer patients with malnutrition and optimization.

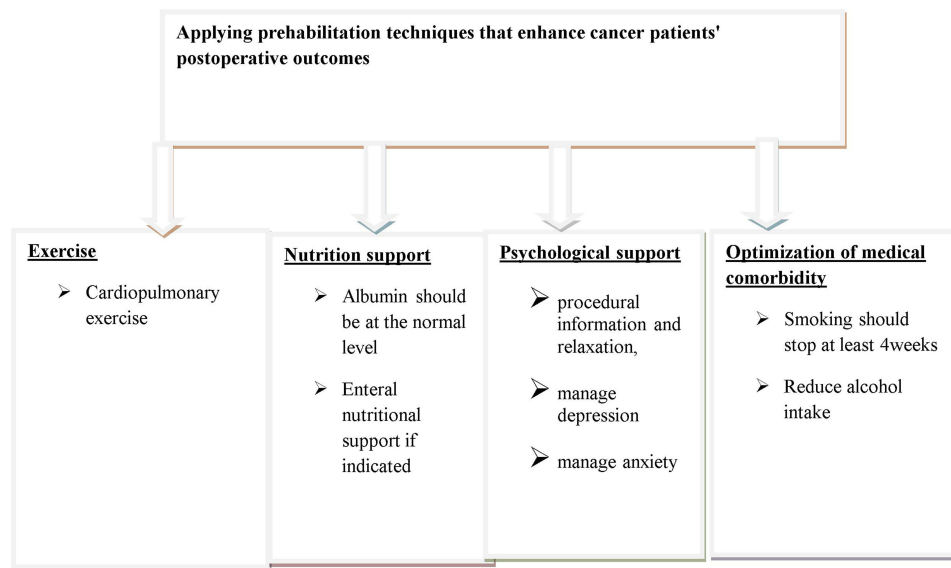


Figure 3 Components of perioperative prehabilitation of surgical cancer patients.

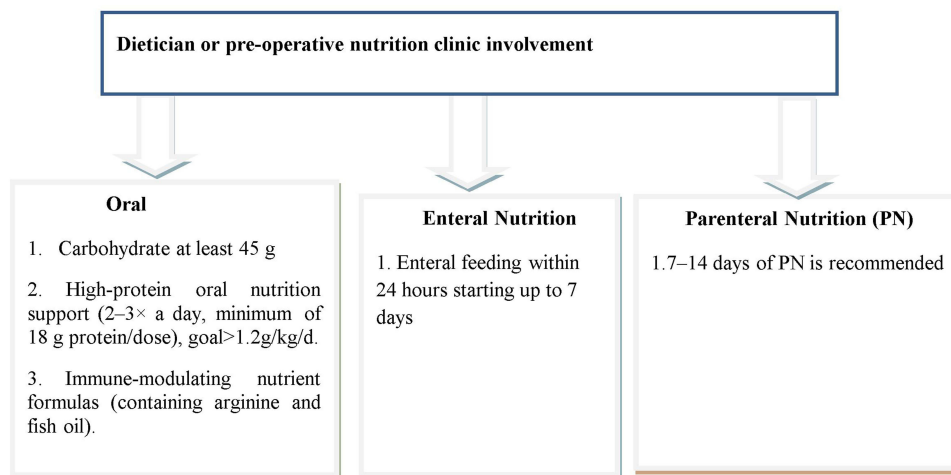


Figure 4 Preoperative nutrition support recommendations.

## Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

## Disclosure

The authors declares no conflict of interest in this work.

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