



Surgical Nutrition

Diet Plan After Surgery and Food to Avoid?

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Objectives :

- Introduction to surgical nutrition
- Preoperative nutritional assessment and management
- Intraoperative nutritional considerations
- Postoperative nutritional support
- Special nutritional needs
- Case studies and evidence-based practices



Introduction to surgical nutrition



Definitions:

Nutrition:



Taking in and metabolism of nutrients (food and other nourishing materials) by an organism so that life is maintained, and growth can take place.

Malnutrition:

Malnutrition refers to deficiencies, excesses, or imbalances in a person's intake of energy and/or nutrients. (WHO, June 2021).



The term malnutrition addresses 3 broad groups of conditions:

- ***Undernutrition***, which includes wasting (low weight-for-height), stunting (low height-for-age) and underweight (low weight-for-age).
- ***Micronutrient-related malnutrition***, which includes micronutrient deficiencies or micronutrient excess. Micronutrients are the vitamins and minerals needed by the body. The 5 most common micronutrient deficiencies include: Vitamin A, iodine, iron, zinc and folate.
- ***Overweight obesity and diet-related noncommunicable diseases*** (such as heart disease, stroke, diabetes and some cancers).



Importance of nutrition in surgical patients:

Surgical procedures (and subsequent fasting) after admission can cause these patient to go into severe malnutrition quickly ,often before the treating team realizes it.

Adequate nutrition is essential for surgical patients to ensure proper wound healing, reduce complications, enhance immune function, and promote faster recover.

There is evidence that patient with severe protein depletion have greater incidence of postoperative complications such as : pneumonia, wound infection and prolonged hospital stay.



overview of the metabolic changes that occur during and after surgery:

1. Stress Response

Surgery triggers a stress response that is mediated by the release of stress hormones such as cortisol, catecholamines (e.g., adrenaline), glucagon, and growth hormone.

2. Hypermetabolism

The body enters a hypermetabolic state, where the metabolic rate increases to meet the higher energy demands caused by the surgery.

3. Increased Catabolism

The body shifts toward catabolism, breaking down muscle tissue (proteins) and fat stores to supply energy and nutrients to vital organs and tissues.

4. Insulin Resistance:

Surgery often causes insulin resistance and hyperglycemia, increasing the risk of infections and poor wound healing.



5. Fluid and Electrolyte Shifts:

Surgery leads to fluid imbalances and electrolyte shifts, which need careful management.

6. Inflammatory Response:

Inflammation promotes healing but, if excessive, can cause complications like infections.

7. Nitrogen Loss:

Increased muscle breakdown results in nitrogen loss, indicating a need for more protein to aid recovery.

8. Anabolic Phase:

After the initial breakdown, the body enters a rebuilding phase where proper nutrition is essential for tissue repair and recovery.



The Role of Preoperative Parenteral Nutrition

A Comprehensive Review





Introduction



- Malnutrition is associated with poor surgical outcomes, and therefore optimizing nutritional status preoperatively is very important. I used a review of the literature related to preoperative parenteral nutrition (PN) as a reference of my seminar
- Lakananurak, N.; Gramlich, L. The Role of Preoperative Parenteral Nutrition. *Nutrients* **2020**, *12*, 1320. <https://doi.org/10.3390/nu12051320>

Enhanced Recovery



- Preoperative PN can dramatically reduce postoperative complications, including infections and wound healing issues. For instance, patients with severe malnutrition saw a significant drop in non-infectious complications from 43% to just 5%.



Shorter Hospital Stays

- While the total length of stay might increase due to the need for preoperative PN, the postoperative stay is often shorter, thanks to fewer complications and faster recovery.



Targeted Nutrition

- The goal is not weight gain but the replenishment of vital nutrients. Patients receive tailored nutrition plans, ensuring they get the right balance of macronutrients and micronutrients.



Safety First

- Complications from PN are rare but manageable with proper monitoring. The benefits far outweigh the risks, making it a safe option for those who need it most.

Nutritional Assessment Methods

Common Criteria and Tools:

- Low Serum Albumin
- Low Body Mass Index (BMI)
- Significant Weight Loss
- Subjective Global Assessment (SGA)
- Nutrition Risk Index (NRI), Nutrition Index (NI), Nutrition Risk Screening (NRS)
- Prealbumin, Total Lymphocyte Count, Mid-Arm Circumference, Triceps Skinfold Thickness

ESPEN Guidelines:

- Diagnosis of Malnutrition: BMI < 18.5 kg/m² or combination of weight loss and reduced BMI
- Severe Nutrition Risk: Weight loss >10–15% within 6 months, BMI < 18.5 kg/m², SGA grade C or NRS > 5, Preoperative serum albumin < 30 g/L





Key Takeaways

- - Albumin is not a good indicator of nutritional status due to its insensitivity to nutrient intake changes and its role as a marker for inflammation.
- - Use validated tools like SGA, NRS, and CNST for accurate assessment.
- - Implement a comprehensive nutrition care pathway that includes screening, assessment, treatment, and monitoring.



Thanks for Listening

- Done by KHALID ABUELSAMEN

Peri operative Glucose management





Patients who experience major trauma, illness, or surgery often develop a hyper metabolic stress response, which is characterized by hyperglycaemia and insulin resistance. This response involves an increased level of endogenous hepatic glucose production while insulin-stimulated peripheral glucose uptake is reduced. This hyperglycaemic response has been referred to as “stress hyperglycaemia”. Initially, this response was considered to be a beneficial adaptation to critical illness because an additional glucose supply was available as a source of energy. However, an increasing body of evidence indicates that acute severe hyperglycaemia causes numerous immediate adverse effects and is associated with serious adverse clinical outcomes. The severity of the response to major surgery may be affected by an individual's ability to control blood glucose and the magnitude of the surgery . In other words, patients who have glucose intolerance or diabetes and experience a more invasive surgical procedure would be expected to develop more profound a hyperglycaemia.



Hyperglycaemia adversely affects morbidity and mortality in surgical and critically ill patients. The development of these adverse effects is likely related to the numerous adverse cellular and biochemical events that occur as a result of hyperglycaemia. For example, risk of infection is increased with severe hyperglycaemia, because of abnormalities of monocyte and polymorphonuclear neutrophil function, decreased intracellular bactericidal activity, and glycosylation of immunoglobulins. Blood coagulation is activated by hyperglycaemia, as circulating prothrombin fragments and D-dimers are increased, and platelet aggregation and thrombosis occur. Inflammation and activation of proinflammatory cytokines is also induced by hyperglycaemia. Hyperglycaemia also abolishes intrinsic myocardial protective mechanisms, such as ischemic preconditioning. Thus, hyperglycaemia interacts at the cellular and biochemical level in numerous ways, which may be responsible for the adverse effects associated with hyperglycaemia.



■ THE USE OF INSULIN PERFUSIONS TO IMPROVE OUTCOMES IN CRITICALLY ILL PATIENTS :

- Insulin is the sole therapy currently available to treat acute hyperglycaemia. In addition to its glucose-lowering effects, insulin also has multiple metabolic and cellular actions that could benefit outcomes. For example, insulin plays a crucial role in maintaining normal cell metabolism by increasing glucose uptake and adenosine triphosphate (ATP) production by glycolysis. Of its non-metabolic effects, insulin provides protection from endothelial dysfunction, which may prevent organ failure and death. Insulin also has anti-inflammatory effects, which decrease levels of pro-inflammatory cytokines, adhesion molecules, and acute phase proteins. Insulin has anti-thrombotic, anti-atherogenic properties. Insulin treatment causes arterial vasodilation and capillary recruitment, via activation of the nitric oxide pathway and improves myocardial perfusion. Although it is difficult to distinguish whether these benefits arrive directly from insulin therapy rather than treatment of hyperglycaemia, the inotropic and direct cardio protective effects of insulin, specifically, anti-apoptotic properties, have been found to be independent of glucose concentrations.

Hydration control during surgery:



☐ Hydration before surgery:

One of the most common rules before any kind of surgery is to fast 12 hours before surgery. This is done as a precautionary measure. If there is excess water in your system during a surgery, it can lead to pulmonary aspiration. This means if your stomach consists of any water, it will enter your lungs and potentially block the airways and cause major infections such as pneumonia. This situation can lead to death. Scary!

This of course is not the case with all patients and most likely a small amount of water hours before surgery will be OK. Now if the patient has had a glass of water right before surgery and is weak or elderly or both can increase the chance of being a lethal mistake. Healthy patients who are about to have minor surgery can consume a glass of water 4 hours before surgery. Of course, if your doctor has advised you too fast for 12 hours it is highly recommended that you adhere to his or her instructions. It definitely reduces the chances of causing any complication.

It is now advisable to drink clear liquids 2 hours before the surgery, breast milk 4 hours before, non-human milk and solid light food 6 hours before, and anything else 8 hours before the surgery. These are more relaxed guidelines to be followed but only under the advice of a doctor. But it is always important to follow the advice of your doctor.



☐ Hydration after surgery:

It is absolutely essential to stay fully hydrated post-surgery. This is done to avoid potential surgical complications, including vein thrombosis, which is a clot that is built up in the major veins of the thighs and legs. The patient can also suffer from pulmonary embolism. After the surgery your immune system is extremely weak, thus increasing the chances of an infection. Water helps keep these infections away and acts as a catalyst to your recovery. Furthermore, water helps your body get rid of toxins from the anaesthesia. So drinking water post-surgery can be very helpful in all aspects of recovery.

Although these rules have been followed for years, doctors today are becoming increasingly more lenient about the rules of fasting pre surgery.

Certain studies have suggested that it is better to drink water before surgery. It may be easier for the patient to recover from the surgery itself. Either way, your doctor is the best person to advise you about the consumption of water before and after your surgery.



- The outcome after any surgery is dependent on multiple factors among which fluid regulation is an important consideration. The type, amount and rate of fluid administration are primarily determined by the nature of surgery, requirements and losses and coexisting morbidities, if present. Any fluid either too much too little can be of unfavourable consequence. Therefore, knowledge about the physiology of body fluids and the composition of the parenteral fluids is of paramount importance for the preoperative physician. The fluid management in surgical patients is handled jointly by the anaesthetist during surgery and the team monitoring patients' postoperative care.



□ Types Fluid

Based upon the patient's requirements, fluids can be of either *replacement* or *maintenance* type. *Replacement* fluids are necessary to treat existing deficits or compensate for ongoing losses during the perioperative period. The common replacement fluids used in the perioperative period include 0.9% sodium chloride (NaCl), Ringer's lactate, balanced salt solution and synthetic colloids. *Maintenance* fluids are those required for optimization of the ongoing losses due to physiological processes in order to maintain homeostasis. The common maintenance fluids are dextrose, dextrose–saline (5%D 0.9% NaCl%), dextrose–hypotonic saline (5%D 0.45%NaCl) and Isolyte solutions.

❑ Choosing Between Crystalloids and Colloids

Extracellular fluid (ECF) replacement is better replenished by crystalloids. The distribution of crystalloids in the extracellular (interstitial) space is theoretically three times that of the intravascular space. Hence, after administration of 1 L of crystalloid and after checking the volumes after 1 h, about 250 mL will be present in the intravascular compartment and about 750 mL in the extravascular compartment (interstitial space). Only a negligible amount of isotonic fluid fills up the intracellular compartment. However, excessive crystalloids can dilute the plasma proteins thereby reducing plasma oncotic pressure causing fluid filtration from the intravascular to the interstitial compartment. This can lead to complications like interstitial pulmonary oedema.

Colloids on the contrary, being larger in size have difficulty crossing the capillary membrane and are returned easily via the lymphatics. They stay much longer in the intravascular compartment, exert colloid oncotic pressure (COP) and are needed in much smaller volumes. But if the vascular permeability is increased due to any cause, they can reach the interstitial space and produce interstitial COP. This can exacerbate pulmonary oedema. They can also cause allergic reactions and are costlier than crystalloids. Therefore, a good option in perioperative patients is to administer the maximum amount of fluid as crystalloids until there is any risk of overload. However, the choice is best decided by the physician on an individual basis .



postoperative nutritional support





Postoperative Nutritional Support: Early Enteral Nutrition vs. Parenteral Nutrition

Early Enteral Nutrition (EN): involves delivering nutrients directly into the gastrointestinal (GI) tract. It is the preferred method of feeding in postoperative patients because it helps maintain the integrity of the gut, supports immune function, and reduces the risk of bacterial translocation, which can lead to infections like sepsis. EN should be initiated early, often within the first 24–48 hours post-surgery, even in patients unable to consume food orally. Early EN is associated with fewer postoperative complications such as infections, reduced mortality, and faster recovery compared to delayed nutrition .

- EN promotes gut motility, prevents gut atrophy, and stimulates the production of gut hormones that play key roles in the immune system. Moreover, it reduces the hypercatabolic state induced by surgery, helping preserve lean body mass .
- Not all patients can tolerate EN immediately after surgery, especially those with gastrointestinal dysfunction (e.g., bowel obstruction or severe ileus). For such patients, EN can be started cautiously with lower volumes or via nasojejunal tubes that bypass the stomach .

Parenteral Nutrition (PN)

- Definition and Indications: Parenteral nutrition (PN) provides nutrients directly into the bloodstream through a central or peripheral venous line. PN is indicated when the GI tract is non-functional or inaccessible, such as in cases of severe bowel obstruction, short bowel syndrome, or when patients cannot tolerate EN. Although PN bypasses the GI system, it can adequately meet the body's nutritional needs .
- Risks and Complications: PN carries a higher risk of complications compared to EN. These include infections related to central venous catheter use, liver dysfunction, hyperglycemia, and electrolyte imbalances. Additionally, PN does not stimulate gut function, potentially leading to gut atrophy and increased infection risk .
- PN should be reserved for patients who cannot receive enteral feeding. Current guidelines suggest initiating PN after 5–7 days postoperatively in patients who cannot be fed enterally and are at low nutritional risk. In high-risk, malnourished patients, PN may be started earlier, within 3–5 days .



Guidelines for Postoperative Feeding and Monitoring

1. European Society for Clinical Nutrition and Metabolism (ESPEN) Guidelines:

- Early enteral feeding should be initiated within 24–48 hours after surgery for most patients, particularly those who are critically ill or malnourished .
- EN preferred over PN: EN is preferred due to fewer complications, but if EN is contraindicated or poorly tolerated, PN can be started. PN should be delayed until after 5–7 days in well-nourished patients unless they cannot tolerate enteral feeds .
- Monitoring and Adjustments: Nutritional support should be closely monitored for tolerance, metabolic disturbances, and signs of infection. Refeeding syndrome, which involves shifts in fluids and electrolytes, can occur in malnourished patients, requiring slow initiation and careful monitoring of electrolyte levels .

2. American Society for Parenteral and Enteral Nutrition (ASPEN) Guidelines:

- Early EN: Supports early EN within 24–48 hours unless contraindicated, with gradual progression as tolerated .
- PN when needed: If EN cannot be established in critically ill patients, PN should be initiated within 3–7 days, especially if they are malnourished .
- Energy and Protein Requirements: Energy needs are typically 25–30 kcal/kg/day, while protein requirements are higher in surgical patients, ranging from 1.2–2.0 g/kg/day, depending on their condition .

Monitoring:

- Nutritional Status: Routine assessment of nutritional status should include weight, muscle mass, and serum proteins (e.g., albumin, prealbumin). Close monitoring of blood glucose levels, liver function tests, and electrolytes (especially in PN) is essential .

Tolerance:

Patients on EN should be monitored for GI symptoms like bloating, diarrhea, and vomiting, while those on PN require monitoring for catheter-related infections and metabolic complications .

Special Nutritional Needs

During the last few years, several studies reported that patients with severe obesity often display micronutrient deficiencies (MDs) when compared with normal weight controls.





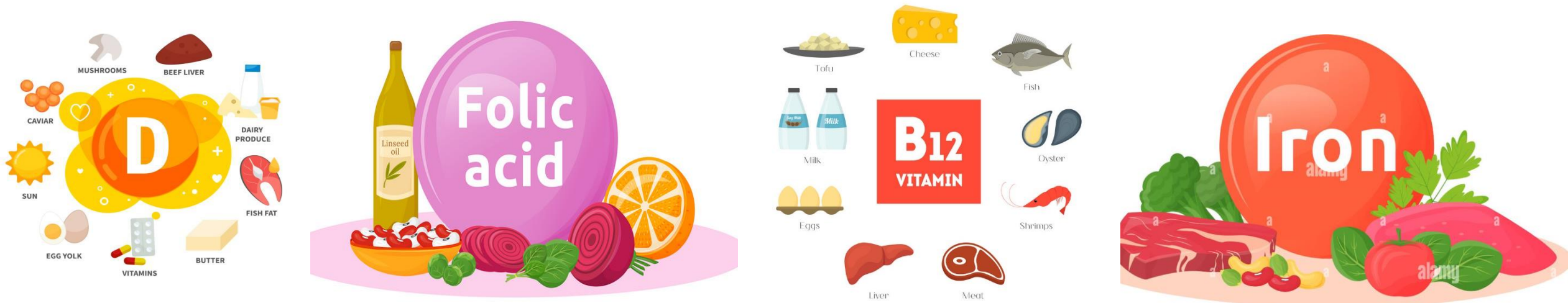
Bariatric Surgery: Mechanisms and Nutritional Implications

Irrespective of the procedure utilized, bariatric surgery alters the anatomy and physiology of the proximal and/or distal parts of the gastrointestinal tract to facilitate weight loss. All procedures involve a reduction in gastric capacity by altering the size of the stomach (restrictive effect), while gastric bypass (GBP) and biliopancreatic diversion with duodenal switch (BPD-DS) involve diverting varying lengths of the proximal small bowel to reduce the absorption of nutrients (malabsorptive effect). Bariatric procedures with malabsorptive components have a greater impact on long-term nutritional outcomes than restrictive procedures, and the long-term nutritional risks increase proportionally with the amount of small bowel bypassed.

Nutritional Deficiencies in Bariatric Surgery

Causes and Risks

Potential nutritional risks may be attributed to a number of causes. First, pre-existing micronutrient deficiencies are not uncommon findings in bariatric surgery candidates. The nutrients most commonly affected are vitamins B12, vitamin D, folate and iron, and to date this has been attributed to poor dietary quality, with low dietary micronutrient sources relative to caloric intake. As preoperative screening does not yet form part of bariatric surgical management guidelines, undetected and uncorrected deficiencies at baseline may exaggerate postoperative findings.





Three approaches to managing malnutrition and specific nutrient deficiencies

Monitoring: Current guidelines unanimously recommend that micronutrient monitoring occur at 1, 3, 6, and 12 months post-operatively, with different micronutrients recommended for testing depending on the type of surgery.

Routine supplementation: Blanket recommendations for daily multivitamin and multimineral supplementation (with specified sources of iron and folate), calcium, vitamin D, and vitamin B12 are specifically recommended for all procedures. The 2013 update of the Clinical Practice Guidelines specifies that these recommendations cover the initial postoperative phase (3 to 6 months) for gastric bypass (GBP), sleeve gastrectomy (SG), and adjustable gastric banding (AGB), and that supplementation should be provided in chewable forms to maximize absorption.

Correction of deficiency: When laboratory findings indicate low serum levels of micronutrients, replacement aimed at repletion of body stores is indicated.

Other nutritional tips to consider

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- **Protein Requirements:** Increased protein intake is crucial for healing, maintaining muscle mass, and supporting recovery post-surgery.
 - **Hydration:** Patients may struggle with dehydration because of their reduced stomach capacity and potential issues with vomiting or diarrhea. Drinking small sips of water throughout the day is critical.
 - **Small, Frequent Meals:** Due to reduced gastric capacity, patients should eat small, frequent meals to manage portion control and avoid overloading the stomach.
 - **Avoidance of Simple Carbohydrates:** After surgeries like gastric bypass, patients may experience **Dumping syndrome** (nausea, diarrhea, palpitations) if they consume simple sugars. Complex carbohydrates should be prioritized instead of sugary foods or drinks.
 - **Fiber Management:** Low-fiber diets may be recommended initially to avoid gastrointestinal distress, but fiber intake should gradually increase to prevent constipation, which is common post-surgery.



Case Studies and Evidence-Based Practices



Case Study 1: Preoperative Nutritional Intervention

Background: A 70-year-old male with colorectal cancer presented for resection. He was malnourished, with a BMI of 18.

Intervention: The clinical team implemented a preoperative nutritional assessment, using the SGA. They prescribed an oral nutritional supplement (ONS) high in protein and calories for four weeks prior to surgery.

Outcome: The patient gained weight, improved his nutritional status, and experienced fewer complications post-surgery. This aligns with evidence supporting preoperative nutritional support to enhance recovery.



Case Study 2: Carbohydrate Loading

Background: A 55-year-old woman scheduled for elective knee surgery was at risk for insulin resistance.

Intervention: She was given a carbohydrate-rich drink two hours before surgery to optimize glycogen stores and reduce postoperative insulin resistance.

Outcome: Post-surgery, she experienced less nausea and pain and had a shorter hospital stay. Research shows that carbohydrate loading can improve surgical outcomes by promoting metabolic stability.



Case Study 3: Early Enteral Feeding

Background: A patient underwent major abdominal surgery and was previously malnourished.

Intervention: The surgical team initiated enteral feeding within 24 hours postoperatively, using a standard polymeric formula.

Outcome: The patient tolerated the feeds well, experienced faster recovery of bowel function, and had a reduced length of hospital stay. Evidence supports that early enteral nutrition decreases complications and promotes healing.



Case Study 4: Post-Bariatric Surgery Nutrition

Background: A 30-year-old female patient post-Roux-en-Y gastric bypass surgery experienced significant weight loss but showed signs of vitamin B12 deficiency.

Intervention: A registered dietitian recommended regular B12 injections and a high-protein, nutrient-dense diet, along with multivitamin supplementation.

Outcome: The patient's B12 levels normalized, and she reported improved energy and well-being. This case highlights the need for ongoing nutritional monitoring and supplementation in bariatric surgery patients, as indicated by clinical guidelines.



These case studies demonstrate the critical role of nutrition in surgical outcomes. Adopting evidence-based practices not only enhances recovery and reduces complications but also improves the overall patient experience.

Regular updates to clinical guidelines and ongoing education for healthcare professionals are vital to implement these practices effectively.



Review of current research and guidelines.

1.ASPEN Guidelines:

- The American Society for Parenteral and Enteral Nutrition (ASPEN) provides comprehensive guidelines on perioperative nutrition, emphasizing the importance of preoperative screening, nutritional support, and the role of ONS.

2.ESPEN Guidelines:

- The European Society for Clinical Nutrition and Metabolism (ESPEN) recommends individualized nutrition plans, highlighting the importance of early enteral feeding and monitoring for nutritional deficiencies, especially in high-risk surgical patients.



3. Surgical Care Improvement Project (SCIP):

- This initiative emphasizes the reduction of surgical complications through enhanced recovery pathways, including nutritional optimization as a key component.

4. National Institute for Health and Care Excellence (NICE):

- NICE guidelines recommend identifying and managing malnutrition in surgical patients, advocating for the use of ONS and enteral feeding when necessary.



Current research and guidelines strongly support the integration of nutrition into surgical care. By focusing on preoperative assessment, carbohydrate loading, early enteral nutrition, and individualized postoperative plans, healthcare providers can significantly improve surgical outcomes. Continuous updates and education on these guidelines are essential for optimal patient care.