

# Perioperative Nutritional Intervention: Where Are We?

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The role of nutritional intervention in optimization of surgical outcomes has yet to become fully realized. Benefits are well established, including decreases in surgical complications, hospital length of stay (LOS), use of skilled nursing care after hospitalization, cost of health care delivery and increased patient satisfaction. While the concept is widely agreed upon, practice and implementation are not broadly utilized.

The preoperative period in the elective surgical candidate is ideal to assess and address modifiable risk factors to decrease the risk of complications and poor outcomes. A nutrition assessment can aid in identifying the degree of malnutrition, and the level of preoperative preparation needed.

The most frequent surgical complication is infection. Literature has reported improved outcomes in patients undergoing major elective surgery when immunonutrition formulas (IMF: formulations including arginine and  $\omega$ -3 fatty acids) are provided perioperatively, including lower risk of morbidity, decreased infections, improved wound healing, shorter LOS and overall cost savings.

Arginine is thought to be one of the primary nutrients driving the benefits reported for IMF. Providing supplemental arginine in the form of IMF increases arginine availability, promotes mechanisms of nitric oxide production and the proliferation of T lymphocyte function to optimize the immune response, and enhances wound healing.

The use of fish oils is central to the concept of metabolic manipulation in the perioperative period. The fish oils eicosapentaenoic and docosahexaenoic acid serve to attenuate the metabolic response to the surgical stress and, via the metabolic derivatives resolvins and protectins, serve to actively participate in the resolution of inflammation.

Preoperative supplementation, though not always feasible, with oral IMF for 5–7 days before surgery has been reported to be beneficial in most analyses. Continuing IMF postoperatively strengthens observed benefits in poorly nourished patients. For patients with a decreased ability

to take oral nutrition, enteral (EN) or even parenteral nutrition (PN) may be indicated during the preparation for surgery. For optimal benefit, preoperative PN should be continued postoperatively until the patient can tolerate EN.

It is postulated that preoperative delivery of an isotonic carbohydrate solution serves to *load* the muscle, myocardium and liver with glycogen. In addition to preserving skeletal muscle mass, carbohydrate loading decreases insulin resistance, improves perioperative glycemic response and is reported to promote rapid return of postoperative bowel function and shorten hospital stay.

Appropriate and timely nutrition therapy in the postoperative setting can reduce surgical complications. Due to supportive evidence, early EN has become a mainstay recommendation of fast-track protocols. Despite this, EN is often delayed in the postoperative setting due to surgical dogma or misperceptions regarding contraindications. Though many exist, the greatest benefits of EN thought to promote improved patient outcomes include preservation of gut integrity and enhancement of gut-mediated immunity.

The American Society of Parenteral and Enteral Nutrition and the Society of Critical Care Medicine provide evidence-based recommendations for the appropriate use of PN, including in the postoperative setting for severely malnourished patients until adequate EN can be administered or when EN is not feasible. It is not, however, uniformly associated with the same positive outcomes as EN.

Probiotics may promote positive balance and maintenance of gut microbiota by strengthening intestinal barrier function, increasing numbers of beneficial bacteria and decreasing the number of pathogens. Evidence suggests that the use of prebiotics and probiotics reduces infectious complications, decreases days on antibiotics and improves gastrointestinal motility. Though results are promising, they are not necessarily translatable to other heterogeneous populations. Future studies must be conducted to appropriately evaluate clinical effectiveness.

Currently, the concept of perioperative surgical nutrition is evolving to become routine practice despite the difficulty of creating a uniform formulation beneficial to the heterogeneous surgical population. The components of a successful nutrition regimen include preoperative and early postoperative IMF, carbohydrate loading administered in the immediate preoperative setting and judicious occasional use of perioperative PN.