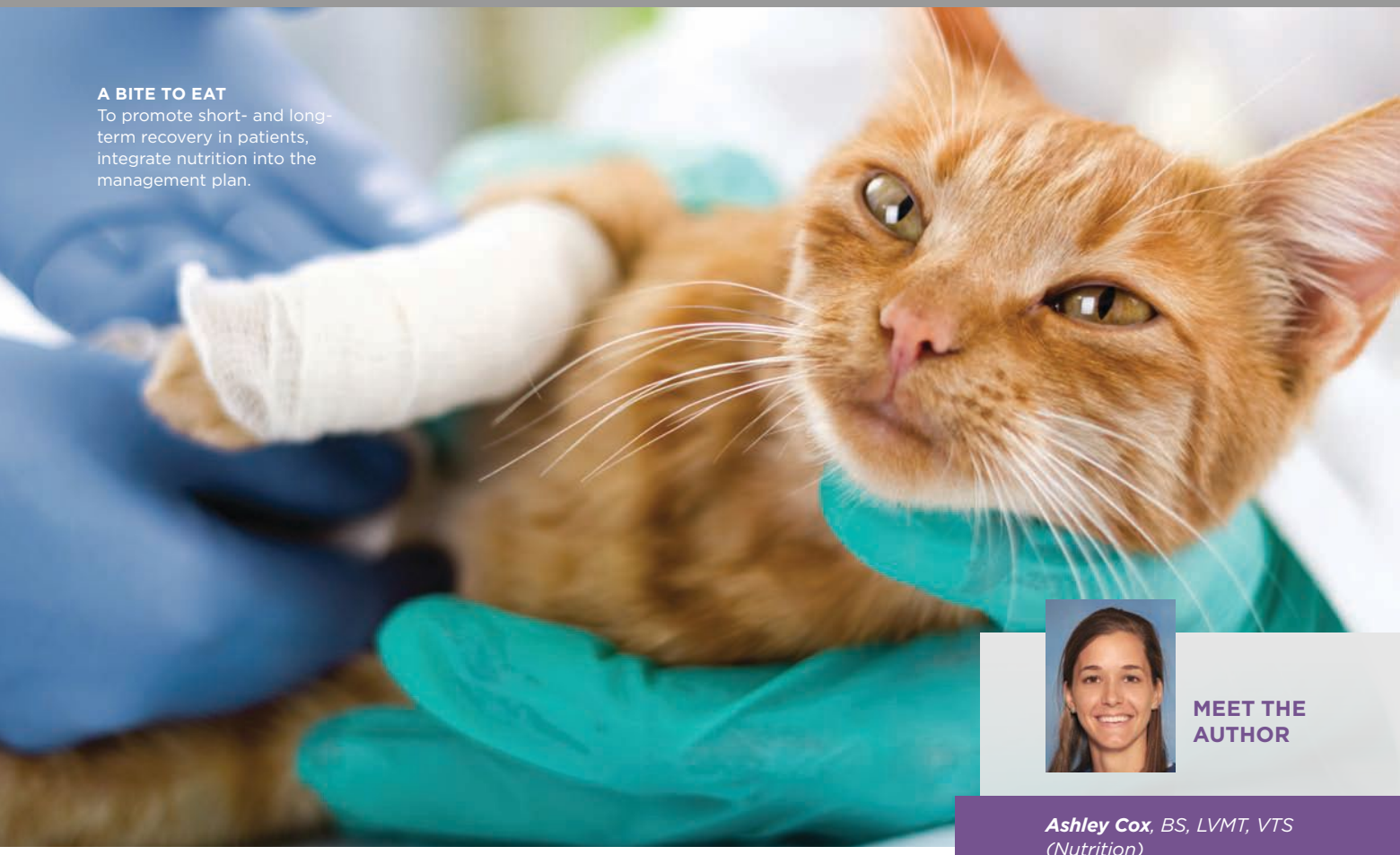

A BITE TO EAT
To promote short- and long-term recovery in patients, integrate nutrition into the management plan.

MEET THE AUTHOR

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Nutritional Support of Dogs and Cats After Surgery

When considering how to best manage and support postoperative surgical cases as it relates to nutritional intervention and gastrointestinal (GI) health, implementing perioperative care strategies can provide a more favorable recovery.

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By definition, perioperative care involves the periods immediately before, during, and following a surgical operation. In human medicine, a protocol known as Enhanced Recovery After Surgery (ERAS) was developed in Europe as an evidence-based multidisciplinary approach. ERAS improves clinical outcomes for patients undergoing major surgeries by adopting multimodal care.[1] Veterinary nurses can play an integral role in perioperative care as it relates to nutrition by obtaining an accurate diet history, understanding the metabolic effects of anesthesia, and appropriately implementing assisted feeding or diet recommendations. Veterinary nurses trained and confident in identifying pets at risk for malnutrition prior to or following a surgical procedure and becoming proficient in implementing appropriate feeding protocols can significantly influence recovery and mortality for their hospitalized patients.

PREOPERATIVE GUIDELINES

In people, it has been documented that 1 in 3 hospitalized patients are malnourished.[2] Because hospitalized dogs are predisposed to undernutrition, nutritional screening should be a part of the routine physical and history on every animal admitted for an elected surgery. Collecting information such as body condition score, muscle condition score, body weight, diet, treats, medications/supplements, and any recent changes in appetite or GI function will help provide appropriate feeding recommendations in preparation for surgery as well as following surgery.

In addition, the veterinary nurse should confirm the time of the last meal fed to confirm appropriate fasting prior to surgery to help decrease anesthetic risks. Anesthetic and sedative medications reduce or eliminate airway protective reflexes that normally prevent regurgitation of gastric contents into the lungs. Consequently, complications of anesthesia may be intraoperative aspiration or gastroesophageal reflux (GER), which could potentially cause esophagitis or, when severe enough, esophageal strictures. In attempts to reduce the risk of GER or aspiration associated with anesthetic protocols, fasting guidelines have been developed by anesthesia societies around the world. In recent years, fasting guidelines in healthy people with elective surgeries have evolved from the NPO (*nil per os* or nothing by mouth) after midnight to the following preoperative fasting schedule: no clear fluids 2 hours prior to surgery, no solids 6 hours before, and no large or fatty meals 8 hours before.[3]

One study compared dogs given half of their daily estimated energy requirement (EER) in canned food 10 hours prior to an elective surgery to those given their EER 3 hours before the surgery. The 10-hour fasting group had significantly increased incidence of GER when compared to the 3-hour fasting group.[4] While veterinary medicine may not have developed fasting guidelines, considering the fasting timeframe prior to surgery may influence additional monitoring intra- and postoperatively.

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INTRAOPERATIVE GUIDELINES

In healthy and diseased patients, anesthesia impairs the body's response to insulin, which may contribute to hyperglycemia during and following surgery.[5] In addition to anesthesia's effect on insulin, the normal mechanisms for maintaining glucose homeostasis become ineffective during the perioperative period due to catabolic hormones increasing glucose and minimizing effects of insulin. Blood glucose concentrations increase from hepatic glycogenolysis and gluconeogenesis as a response to metabolic stress caused by surgery. The magnitude of this response is usually in proportion to the severity of the surgical trauma.

POSTOPERATIVE GUIDELINES

The nutritional and metabolic imbalances that patients undergo postoperatively encourage a catabolic state and appetite derangements commonly leading to food refusal, predisposing them to a negative energy balance. A possible complication following surgery influencing the nutritional status of a patient is postoperative ileus. Postoperative ileus is a delay in GI motility following abdominal surgery. Symptoms often associated with postoperative ileus include vomiting, abdominal tenderness/distention, nausea, and delayed bowel movements/flatulence.[6] Early enteral nutrition may

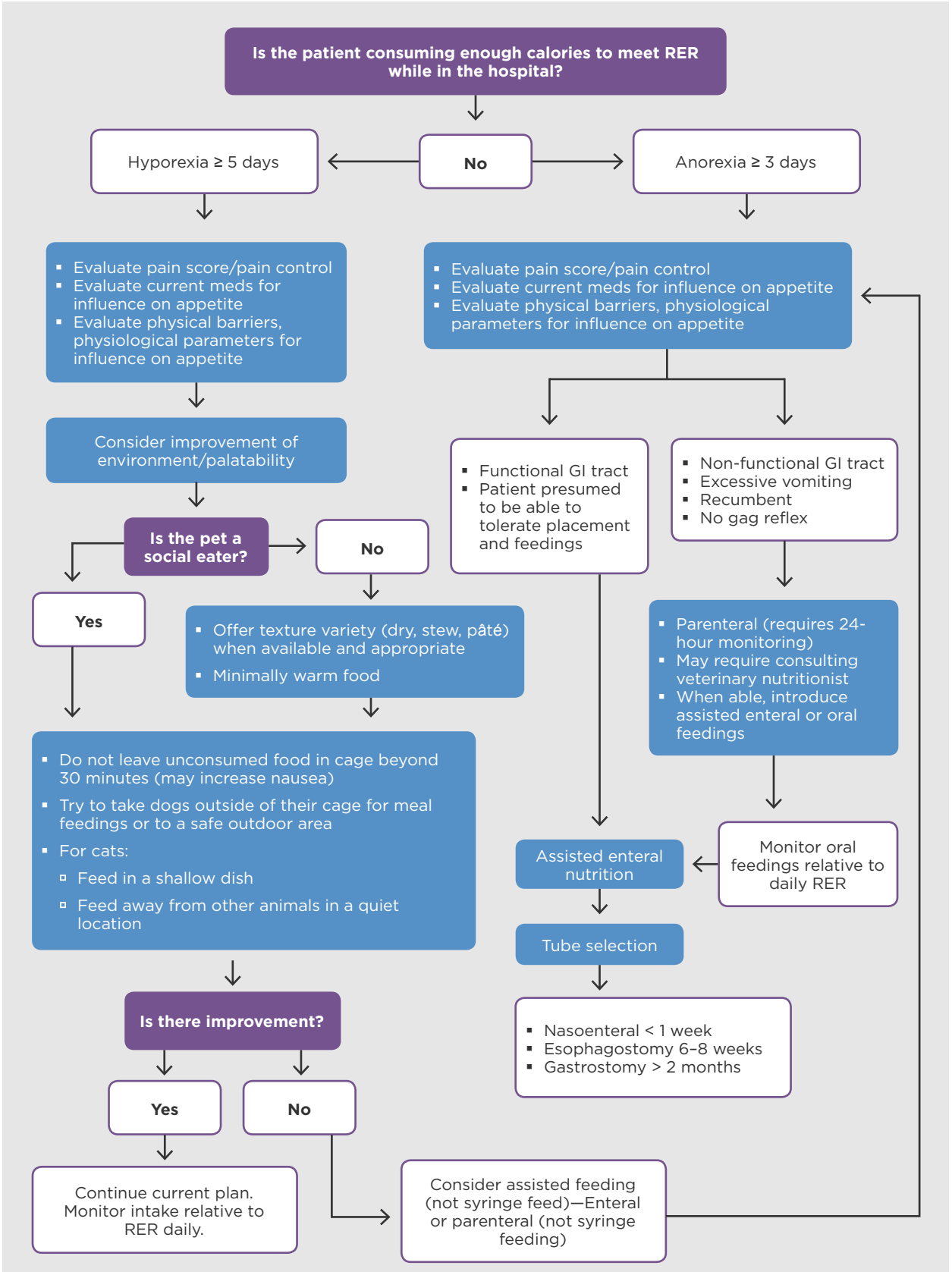

FIGURE 1. Determining appropriate assisted feeding method to meet patients' resting energy requirements (RER) while hospitalized and unwilling or inadequately consuming enough calories to meet energy demands.

assist in limiting the opportunity for decreased GI motility. One study, in healthy dogs, showed that GI contractions within the stomach, duodenum, and jejunum/ileum decreased following a 12- to 24-hour fasting period.[7]

Another study discussed the benefits to enteral versus parenteral nutrition when the GI tract is available. With early enteral nutrition, direct stimulation to the mucosa causes activation of hormonal secretions assisting in recovery of normal GI motility.[8]

Creating a feeding and monitoring plan postoperatively to support early caloric demands decreases the mortality rate and shortens hospital length of stay in dogs and cats.[8] Energy demands should be calculated by using the resting energy requirement (RER) of the animal's current body weight with the equation: RER = (body weight in kilograms)$^{0.75}$ × 70.

Selecting a diet for postoperative patients that is highly palatable, is calorically dense, and upon limited intake can provide a concentrated energy source is ideal. Warming the food and presenting different textures (pâté/stew/kibble) may help boost appetite. The therapeutic veterinary critical care diets are some of the easiest ways to offer calorically dense diets when the patient can tolerate the high protein/high fat composition. It is important to remember that food aversions can quickly develop when the patient is in pain or nauseated. An important aspect of nursing care is attention to analgesia and comfort of the patient to minimize the risk of discomfort and food aversion.

Monitoring intake daily may prevent extended hyporexia and anorexia, as nutritional status can change daily. If an animal has not consumed adequate calories within the last 3 to 5 days (including pre-hospitalization period) due to poor appetite or medical conditions preventing intake, assisted feedings (parenteral or enteral) should be initiated. Enteral nutrition is preferred to parenteral, when possible, to prevent atrophy of intestinal villi and promote mucosa structure and function (**FIGURE 1**).[9]

With use of assisted enteral feeding, it may be suggested that checking gastric residual volumes (GRV) helps distinguish normal versus abnormal gastric emptying and that elevated GRV occurs in delayed gastric emptying indicating retention of the enteral formula. Unfortunately, elevated GRV has very little scientific support for these presumptions and often leads to inappropriate withholding of enteral nutrition.[10] If high GRV is suspected, assess the patient for bloating/fullness, abdominal distention/discomfort, and/or nausea or vomiting as markers for enteral feeding tolerance. If symptoms are present, and the patient can tolerate switching diets, consider a more calorically dense product to decrease the total volume infused or a low fat/low fiber diet to encourage faster gastric emptying. Additionally, if bolus feeding, consider switching to continuous infusion and discuss with the veterinarian proton pump inhibitors or prokinetic therapy to decrease the volume of endogenous gastric secretions and enhance GI motility.

When preparing feeding orders, be sure to include diet, route, amount, and frequency. Consider implementing pre- and post-weight measurements of the diet to consistently and accurately record food versus consumed food. One study revealed the imprecision of using measuring cups with an 18% underestimate to an 80% overestimate in the portion size.[11]

In recent years, additional nutrition consideration for immune modulation (glutamine, arginine, omega-3 fatty acids, and nucleotides) in people and animals undergoing GI surgical recovery has demonstrated positive effects on reducing postoperative complications and shortening hospital stay, but strong evidence for consistent use is lacking.[12] Glutamine is a conditionally essential amino acid, meaning it is not essential except during stress, when the body's requirements for glutamine exceeds the ability to produce sufficient amounts. Rapidly proliferating cells like enterocytes and lymphocytes preferentially use glutamine as an energy substrate and may enhance nutritional status and recovery.[13] Arginine is also a conditionally essential amino acid that can accelerate wound healing by enhancing collagen production and influencing host immunity. Caution should be used with supplementing arginine because it may worsen inflammatory responses in critical patients.[13] Omega-3 fatty acids include eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) which are found in fish oil and are generally dosed through fish oil supplements. The general role of omega-3 fatty acids is inhibiting inflammation through several molecular pathways. An appropriate dose of combined EPA and DHA for inflammatory conditions of (125 mg/kg body weight$^{0.75}$) has been suggested.[14]

Special consideration should be given to dogs and cats undergoing surgical procedures that would remove a large part of their small intestine, known as short bowel syndrome (SBS). The jejunum is responsible for the

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absorption of protein, fat, carbohydrate, trace elements, vitamins, and water. The ileum absorbs bile acids and vitamin B12 (cobalamin). Multiple factors contribute to the malabsorptive state that coincides with SBS. Insufficient absorption of nutrients and impaired digestion with increased intestinal transit speed manifest as diarrhea and, with lack of nutritional intervention, malnutrition negatively impacts the animal. Treatment for SBS includes nutritional support that accelerates intestinal adaptation and control of diarrhea. Enteral feeding provides luminal nutrition that stimulates the enterocytes to initiate hypertrophy and hyperplasia. Dietary recommendations should account for client lifestyle and any underlying disease(s). Modifications to consider and adjust based upon the amount of resection and the animal's tolerance to feedings include offering multiple meals and highly digestible diets with moderate fat to improve digestion and limit diarrhea or vomiting. Fiber can help stimulate intestinal adaptation by maximizing colonic absorption but may decrease diet digestibility and worsen diarrhea.[15] If a portion of the ileum has been resected, cobalamin should be measured and, if low, supplemented. If all the ileum has been removed, cobalamin supplementation is required.

CONCLUSION

While postoperative nutritional support impacts the recovery of the patient, understanding the additional benefits of perioperative nutritional support can help transition into a faster and cost-effective recovery. When considering perioperative nutritional support, remember:

- **Obtain a complete diet history**, including pre-surgical fasting period, to help determine the best nutritional plan following surgery.
- **Initiate early enteral feeding** as soon as possible postoperatively, especially for those patients already at risk for malnutrition, to help promote GI healing and function.
- **Monitor the patient's tolerance** to feeding recommendations daily. Are you noticing bloating/fullness, abdominal distention/discomfort, and/or nausea or vomiting around meal feedings or continuous infusions?
- **Record body weight**, muscle condition, and body condition scores daily.
- **Monitor the patient's pain score** to minimize discomfort that can negatively affect diet intake.
- **Integrate nutrition** into the patient's overall management plan to positively influence short- and long-term recovery.
- **Be aware of additional nutrition concerns** and necessary supportive care if the patient is diagnosed with SBS. TVN

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