

CHAPTER 1

Nutritional assessment in small animals

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Introduction

It is generally believed that hospitalized patients experiencing malnutrition are at greater risk of morbidity and mortality. There is ample evidence in human patients that this is the case, and while this association has not been clearly established in small animal patients, caloric intake has been found to be positively associated with hospital discharge (Mullen et al., 1979, Brunetto et al., 2010). Despite the lack of a proven direct causal relationship between impaired nutritional status and poor clinical outcome, the assumption is that the prevention or correction of nutritional deficiencies should minimize or eliminate the risk of nutritionally associated morbidity and mortality.

Inadequate food intake is a very common presenting complaint in small animal practice and only a minority of dogs and cats achieve adequate voluntary food intake during hospitalization (Remillard et al., 2001). The task of identifying and determining the magnitude of malnutrition in a patient and deciding whether steps need to be taken to address the problem is complicated by several factors. First, the degree of malnutrition and its impact on a patient's body composition, metabolism and functional status varies considerably with the extent of insufficiency of calorie and nutrient intake, the patient's illness and other physiological demands (See Chapter 11). Furthermore, as many of the parameters used to assess the nutritional status of patients are substantially affected by illness and injury, it is therefore difficult, if not impossible, to gauge the extent to which malnutrition, as opposed to the underlying disease, has contributed to changes in any given parameter. Alterations in visceral proteins (e.g., albumin, transferrin), markers of immune function (e.g., total lymphocyte counts, intradermal skin testing), and body composition (e.g., weight loss, skin fold thickness, body condition scoring) have all been explored as markers of nutritional status in both human and small animal patients (Mullen et al., 1979, Otto et al., 1992, Michel 1993). Additionally, functional tests such as grip strength and peak expiratory flow rate and sophisticated body composition analysis using dual X-ray absorptiometry, bioelectrical impedance and other modalities have been investigated in human patients (Hill, 1992). Ultimately,

however, the diagnostic accuracy of these tests remains unknown because there is still no universally accepted “gold standard” of malnutrition with which these tests can be compared.

The recognition that a true “diagnostic test” for malnutrition might not be forthcoming caused a shift in perspective on nutritional assessment. Many of the parameters used to assess malnutrition have been found to be associated with clinical outcome. While they might not be specific markers of nutritional status (many could be deranged for reasons other than malnutrition), they could be used as prognostic indicators. Thus nutritional assessment has evolved into a prognostic, rather than a diagnostic instrument. The techniques that are used to assess nutritional status are those known to be associated with malnutrition, and these have proven to be useful in predicting which patients are more likely to suffer complications. Patients are selected for nutritional support not simply because they are malnourished but rather on the basis of whether nutritional support might have an impact on their clinical outcome. The corollary is that there are malnourished patients for whom providing nutritional support, with its inherent risks and cost, will confer no benefit.

Indications for nutritional assessment

The importance of nutritional assessment is receiving growing recognition in small animal medicine (Freeman et al., 2011). All hospitalized patients should undergo nutritional assessment as part of their initial work up. Given the likelihood that the majority of patients will have inadequate voluntary food intake throughout their hospitalization, the task of nutritional assessment will allow early identification of that subset of patients who are truly at risk, and thus enable prioritization of time and resources for addressing the needs of those patients. The process of nutritional assessment can also facilitate decision-making with regard to selecting an appropriate diet for the patient, deciding whether assisted feeding is indicated and, if it is indicated, determining the best route of assisted feeding for that patient. Furthermore, a properly done nutritional assessment will permit the clinician to anticipate potential complications and develop a feeding plan that will monitor for and minimize the risk of those complications.

Methods of nutritional assessment

There have been only limited investigations of prognostic markers of nutritional status in small animal patients. Admission serum albumin concentration has been shown to correlate with risk of mortality in critically ill dogs (Michel, 1993). In the same population, admission body condition score and lymphocyte count did not correlate with outcome. Intradermal skin testing has been shown to be a feasible means of evaluating cell-mediated immunity in cats but whether this test is associated with nutritional status or is predictive of clinical outcome has not yet been investigated (Otto et al., 1992). Also noted in feline patients is an association

between elevation of serum creatinine kinase activity and anorexia which resolves upon reintroduction of food (Fascetti, Mauldin and Mauldin, 1997).

For human patients a rapid, simple, 'bedside' prognostic tool for nutritional assessment called *subjective global assessment* (SGA) has been in use for approximately 3 decades (Baker et al., 1982). The technique was designed to utilize readily available historical and physical parameters to identify malnourished patients who are at increased risk for complications and who will presumably benefit from nutritional intervention. The assessment involves determining whether nutrient assimilation has been restricted because of decreased food intake, maldigestion or malabsorption, whether any effects of malnutrition on organ function and body composition are evident, and whether the patient's disease process influences its nutrient requirements. The findings of the historical and physical assessment are used to categorize the patient as A: well nourished, B: moderately malnourished or at risk of becoming malnourished, and C: severely malnourished. SGA has been investigated for its ability to identify patients at risk of medical complications in diverse patient populations, and has been shown to have excellent inter-observer agreement and better predictive accuracy than traditional markers of nutritional status (Keith, 2008).

The SGA can easily be adapted to veterinary patients. The patient history should be assessed for indications of malnutrition, including evidence of weight loss and the time frame in which it has occurred, sufficiency of dietary intake including the nutritional adequacy of the diet, the presence of persistent gastrointestinal signs, the patient's functional capacity (e.g., evidence of weakness, exercise intolerance) and the metabolic demands of the patient's underlying disease state. The physical exam should focus on changes in body composition, presence of edema or ascites, and appearance of the patient's hair coat. With regard to assessing changes in body composition, it is important to recognize that while metabolically stressed patients experience catabolism of lean tissue, these changes may not be noted using standard body condition scoring systems if the patient has normal or excessive body fat (Figure 1.1). Since catabolism of lean tissue can have deleterious consequences for outcome, it is important that along with evaluation of body fat, patients undergo evaluation of muscle mass to assess lean tissue status (Freeman et al., 2011). A muscle mass scoring system that has been used in dogs and cats is outlined in Table 1.1 (Michel, Sorenmo and Shofer, 2004, Michel et al., 2011).



Figure 1.1 An example of a patient exhibiting significant wasting of the epaxial musculature despite having excessive body fat.

Table 1.1 Description of a muscle mass scoring system for dogs and cats.

Score	Muscle Mass
0	On palpation over the spine, muscle mass is severely wasted
1	On palpation over the spine, mass is moderately wasted
2	On palpation over the spine, muscle mass is mildly wasted
3	On palpation over the spine, muscle mass is normal

**Figure 1.2** A dog with advanced malnutrition in which nutritional support is indicated.

The next step of nutritional assessment is to determine whether or not the patient's voluntary food intake is sufficient. To do this one must have a caloric goal, select an appropriate food and formulate a feeding recommendation for the patient. This will permit an accurate accounting of how much food is offered to the patient and will allow evaluation of the patient's intake based on how much of the food is consumed. A reasonable initial caloric goal for hospitalized dogs and cats is based on an estimate of resting energy requirement (see Chapter 2).

Clearly patients that are already significantly malnourished at the time of presentation (Figure 1.2) should receive nutritional support. However, given the catabolic stress associated with critical illness, patients who have experienced or are anticipated to experience substantially reduced food intake for longer than 3 days also deserve attention (Figure 1.3). Furthermore, as the clinical course of a hospitalized patient may change rapidly, it is important that nutritional assessment is viewed as an ongoing process so that the feeding plan can be adjusted in a timely fashion.

If a patient is deemed a candidate for assisted feeding, the nutritional assessment will encompass several additional steps. If enteral feeding is being contemplated, gastrointestinal tract function must be evaluated (e.g., presence of vomiting, ileus, ischemia) as well as the patient's ability to tolerate the feeding tube and tube placement (e.g., anesthesia required, abnormal hemostasis). A critical step is to assess the patient's level of consciousness and gag reflex. One of the most serious complications of enteral feeding is aspiration pneumonia, which can be a fatal complication in critically ill patients. If parenteral nutrition



Figure 1.3 A dog with severe trauma to oral and nasal cavity that places this dog at high risk of becoming malnourished if a route of nutrition is not identified.

is under consideration, it is necessary to assess the patient's fluid tolerance, determine whether dedicated venous access is possible and whether that access will be central or peripheral. Furthermore, patients receiving parenteral nutrition require close monitoring for technical and metabolic complications and should be cared for in a facility that has 24 h nursing care and the ability to perform point of care serum biochemistry.

Summary

In conclusion, nutritional assessment of veterinary patients is a largely subjective process that should identify those patients at risk of malnutrition-associated complications, rather than just malnourished patients. All hospitalized patients should undergo nutritional assessment with the goal to identify those patients for whom nutritional intervention is likely to improve clinical outcome. Furthermore, a nutritional assessment will facilitate decision-making with regard to selecting appropriate diet, deciding whether assisted feeding is indicated and, when it is indicated, determining the best route of assisted feeding. It will also permit optimization of a feeding plan that will maximize the benefits to the patient while minimizing the risks of complications.

KEY POINTS

- All hospitalized patients should undergo nutritional assessment with the goal to identify those patients for whom nutritional intervention is likely to improve clinical outcome.
- Through subjective evaluation of historical and physical data, a patient's degree of malnutrition and the need for nutritional intervention can be determined.
- Nutritional assessment will also aid in development of the feeding plan including determining a route of assisted feeding, selecting a diet and optimizing the plan to minimize complications.
- Nutritional assessment should be viewed as an ongoing process so that the feeding plan can be adjusted in a timely fashion in the event that the condition of the patient changes.

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