

Nutritional Management of Canine and Feline Obesity

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Prevalence and Cost of Obesity

Obesity is an excess of body fat that frequently results in significant impairment of health. Using the nine-point Purina Body Condition Scoring System,^{1,2} dogs and cats with a body condition score (BCS) of 6-7 out of 9 are generally considered overweight while 8-9 out of 9 are considered obese.³ Each BCS unit above 5/9 is equal to approximately 10% excess body weight.⁴

Obesity is one of the most common diseases encountered by veterinarians and yet, unlike many conditions, can often be prevented altogether. According to a 2018 survey from the Association for Pet Obesity Prevention, 55.8% of dogs and 59.5% of cats are overweight or obese.⁵ This translates into an estimated 50 million dogs and 56 million cats in the United States in 2018, which reflects a 169% increase in overweight cats and a 158% increase in overweight dogs over ten years.^{5,6} While the shocking nature of these numbers alone should motivate us to address this issue, we also cannot forget that obesity is costly for owners and can negatively impact our patients' quality of life.

Obese pets are also expensive! In addition to increased food costs, owners of overweight pets are also spending more on veterinary bills. According to pet insurance claim statistics released by Nationwide, \$69 million was paid out in claims for diseases related to obesity in 2017. The most common comorbidity in obese dogs is osteoarthritis, while the most common comorbidity in obese cats is bladder or urinary tract disease.⁷ The 2017 Banfield State of Pet Health Report found that over a 4-year period, owners of overweight dogs spent 17% more in healthcare costs and 25% more on medications compared to owners of healthy-weight dogs. Owners of overweight cats also spent 36% more on diagnostic procedures versus owners of healthy weight cats.⁶

Factors Contributing to Obesity

While many factors contribute to obesity, most can be divided into either pet-related or owner-related factors. Table 1 summarizes these factors. Pet-related factors such as genetics, breed, age, or reproductive status may predispose them to obesity. Neutering is frequently mentioned as a cause of increased body weight and condition in dogs and cats. While the exact mechanisms contributing to weight gain after neutering have yet to be conclusively determined, both an increase in food intake and decrease in energy expenditure have been suggested. In one study, a group of adult male cats were neutered in order to examine the effects of neutering on energy expenditure and weight gain. Their results supported the conclusion that there is a period of increased food intake following neutering.⁸ Another study paired 11-week-old female kitten littermates and randomly assigned them to either a neutered group (neutered at 19 weeks old) or an intact group. All kittens were offered a dry diet free-choice until they were one year of age. This study observed that post-neutering, the body weight, BCS, and body fat percentage of the neutered kittens continued to increase despite consuming similar amounts of energy to their intact littermates. The authors concluded neutered kittens have a reduced metabolizable energy requirement.⁹ While these studies observed differing mechanisms, they both concluded that it is essential to feed to maintain an ideal BCS rather than free-choice to prevent post-neutering weight gain.^{8,9} Common owner-related factors include poor compliance to a feeding program, not understanding the seriousness of obesity, overfeeding of food/treats, and not recognizing that a problem exists.

Table 1: Factors Relating to Obesity in Pets¹⁰⁻¹³

<i>Pet-Related</i>	<i>Owner-Related</i>	<i>Additional Factors</i>
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Activity level Genetics/ breed Age Reproductive status Underlying disease (e.g. hypothyroidism)	Owner compliance Overfeeding Not understanding seriousness Socioeconomic status Owner age	Meal frequency Single dog household Begging
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The Relationship between Obesity and Disease

Adipose tissue is now understood to be an active endocrine organ that results in chronic inflammation, causing oxidative stress and potential secondary health conditions.¹⁴ Pro-inflammatory cytokines attract macrophages and immune cell populations may shift. The result is secretion of hormones and inflammatory mediators known as adipokines.¹⁴ Table 2 is a brief review of the effects of obesity on select adipokines.

Table 2: Select Adipokines in Obesity¹⁴

↑ <i>TNF-α</i>	↓ <i>Adiponectin</i>	↑ <i>Leptin</i>
Inflammatory mediator	Inversely proportional to adiposity Potentiates insulin signaling Less adiponectin = more insulin resistance	Regulates appetite Obese individuals resistant to effects

While many owners may be familiar with the most commonly known health issues associated with obesity, such as musculoskeletal disease or diabetes mellitus, our understanding of the far-reaching impact of obesity on health continues to deepen. Obesity's contribution to the progression of osteoarthritis (OA) in patients goes beyond weight-bearing stress. Inflammatory mediators that increase with obesity, such as IL-1 or TNF-α, increase matrix metalloproteases (MMPs), which are responsible for breaking down cartilage and result in cartilage degradation.¹⁴ Oxidative stress can further increase the circulating inflammatory cytokines. Common weight related health conditions are reviewed in Table 3.

Table 3: Common weight related health conditions^{14,15}

<i>Overweight or Obese Cats are</i>	<i>Overweight or obese dogs risk developing</i>
4 times more likely to develop diabetes	Tracheal collapse
Nearly 3 times more likely to experience lameness	Diabetes
More likely to have non-allergic skin problems	Cruciate ligament disease
At risk for urinary tract disease	Osteoarthritis
Prone to liver disease and failure of the organ	Urinary tract disease
Likely to experience OA and ligament damage	Intervertebral disc disease
	Pancreatitis

Maintaining Ideal Body Condition Can Extend Healthy Years

A groundbreaking 14-year study by Purina researchers showed that feeding dogs to an ideal body condition throughout their lives can significantly extend a dog's healthy years. At the Purina Pet Care Center in Missouri, 48 eight-week-old Labrador Retrievers were paired by sex and litter, then randomly assigned to either a control or restricted-fed group. Dogs in the control group were allowed to eat ad-libitum as puppies and then a consistent amount of food beginning at 3.25 years old. Dogs in the restricted-fed group received 25% less than the amount eaten by their paired littermates. All dogs received the same nutritionally completed and balanced foods (first puppy diets, then adult formulations)

throughout the study. Only the amount provided was different. This groundbreaking study demonstrated that feeding dogs to an ideal body condition throughout their lives could significantly extend a dog's healthy years by a median of 1.8 years. And although the restricted-fed dogs in the study generally developed the same chronic conditions as they aged, the need for treatment of those conditions was delayed. Long-term treatment of osteoarthritis was initiated an average of three years later and treatment for chronic conditions was initiated an average of 2.1 years later in the restricted-fed dogs.¹⁶

The Path towards Weight Loss

A five-step approach can be used to help our patients achieve a healthy weight:

- 1) Identify and assess overweight pets
- 2) Create a partnership with our clients
- 3) Make a customized weight loss plan
- 4) Follow-up
- 5) Celebrate success!

1) Identify and assess overweight pets

The easiest time to identify overweight pets is during a clinic visit. The body weight, BCS, and muscle condition score should be recorded each visit. Recording and monitoring BCS is essential because while tracking a patient's body weight can indicate weight loss or gain, it does not determine if a pet is too thin or too heavy for their frame and body type. Full schedules and brief appointments can result in obesity and the diet conversation being overlooked. However, training technical staff on body condition scoring can allow us to leverage their knowledge and help make our time in the exam room as effective and efficient as possible.

2) Create a partnership with our clients

Client commitment is essential to the success of a weight loss program. However, it is often the most difficult component to achieve. Successful weight loss depends on teaching clients how to assess their pet's body condition, modifying client behaviors, and educating clients about the obesity-associated health risks. Purina conducted a study that found that many pet owners may have difficulty accurately assessing body condition in their own dogs. Owners of 201 healthy adult dogs were asked 30 questions about their pets and asked to determine their dogs' body condition scores, using the Purina Body Condition System as a reference. Independently, a professional skilled in body condition scoring evaluated the same dogs, and the scores were then compared. In this study, only 28% of owners characterized their dogs as overweight, while the expert identified 79% of those same pets as overweight.¹⁷ This exercise can be quickly and efficiently reproduced in our exam rooms utilizing BCS charts or posters. It is often more impactful for an owner to reach the realization that their pet is overweight on their own versus quickly being told so during the physical exam.

While conversations about weight may sometimes feel time-consuming or even challenging, our patients depend on us to be their advocates. Some owners may have financial concerns about the cost of therapeutic weight loss diets. A study in Europe found that the cost of feeding a therapeutic weight loss diet is, on average, not significantly different from the cost of feeding a maintenance diet before and during weight loss.¹⁸ Furthermore, if we take a moment to explain the specific benefits of a therapeutic weight loss diet as mentioned below, it can increase our client compliance.

3) Make a customized weight loss plan

Key Components of a Therapeutic Weight Loss Diet

We know that modification of certain nutrients can help pets achieve an ideal body weight and condition. For example, fat is a more energy-dense source of calories compared to protein and carbohydrate. Often, limiting the amount of fat in a diet will also lower the total caloric density of the diet.

Therapeutic weight loss diets are often high in protein and have a high protein-to-calorie ratio. High protein intake can lead to increased fat loss while preserving lean body mass (LBM) during weight loss. A study of overweight adult dogs conducted at the Nestlé Purina Pet Care Center found that feeding a diet with 39% of calories from protein resulted in increased fat loss and reduced loss of LBM during weight loss compared to diets with a lower percentage of calories from protein.¹⁹ Results were similar in a study conducted in cats; increased dietary protein in a therapeutic weight management diet results in a greater loss of body fat and greater retention of lean body mass compared to a control diet.²⁰ LBM is metabolically active and increases energy requirements, stimulates resting energy metabolism, and reduces oxidative stress.

In addition to reduced fat and increased protein, research has demonstrated that isoflavones are beneficial in healthy weight management and are an important addition to an effective weight loss diet. Isoflavones are natural bioactive compounds found in soybeans and other legumes. Weight management benefits include: increased daily energy expenditure, reduced oxidative stress, reduced weight gain, and reduced fat accumulation (rebound).²¹⁻²³

The Weight Loss Plan

Creating a customized weight loss plan does not have to be difficult or time-consuming. Essential components include a thorough dietary history including the type, amount, frequency of food AND treats, and the pets and people in their household. The World Small Animal Veterinary Association (WSAVA) and the American College of Veterinary Nutrition have each created free diet history forms that can be filled out by owners in the waiting room or at home prior to their appointment.^{24,25} When reviewing the diet history, it is essential to be specific. A 2010 study found that 59% of owners give table scraps that constitute 21% of the total daily calories of the dogs in the study.²⁶ Additionally, a recent study found that 83% of the owners surveyed indicated that they regularly give 1 to 5 treats per day.²⁷ There can be a wide range of caloric content in popular treats or diet formulations and asking open-ended questions can encourage our clients to share details they may otherwise neglect to mention. Once we have a more informed idea of what our patient is currently consuming, we can begin to determine a diet recommendation that includes a specific diet and a specific amount, including any treats.

When creating a customized weight loss plan, we must consider that there is a range of acceptable intake for each nutrient. When attempting weight loss in a patient, simply reducing the amount fed of an over-the-counter (OTC) diet can cause a nutrient deficiency. OTC diets are formulated with the correct balance of nutrients for pets that are expected to consume a specific amount of food based on their body weight. Therapeutic weight loss diets are formulated with appropriate levels of macronutrients and micronutrients to allow for caloric restriction without creating nutrient deficiencies. Typically, weight loss should be limited to 1-2% of body weight per week in dogs and 0.5-2% in cats.

Feeding guide software or calculators, such as the free Nestlé Purina Veterinary Feeding Guide (www.purinafeedingguide.com), can help determine how much to feed of a specific therapeutic diet. Such programs can also incorporate treats as part of a healthy weight loss plan. Another option is to feed 80% of a patient's current caloric intake using a therapeutic weight loss diet. This method assumes the patient is weight stable at their current caloric intake and that an accurate diet history has been obtained. A third option, if an accurate diet history cannot be obtained, is to calculate resting energy requirement (RER)

using the pet's estimated ideal weight and then feed some percentage of that amount.¹³ While feeding 80% of RER is often effective and well tolerated, feeding 70% of RER may be required in some cats. RER can be estimated through the linear equation $RER = 30 \times (BW \text{ in kg}) + 70$. However, this equation is only accurate for pets 2-25 kg. Therefore, we recommend use of the exponential equation $70(\text{kg BW})^{0.75}$ which is accurate for all sizes. Most calculator apps on smartphones will display the x^y exponent function needed to perform this calculation if the phone is turned sideways. As an example, the estimated RER for a 30 kg dog is: $RER = 70 \times (30 \text{ kg})^{0.75} = 897 \text{ kcal}$.

Feeding the right amount of food during weight loss is extremely important. There are three common methods of feeding: 1) Free-choice, also called *ad libitum* 2) Time-limited, which is the amount of food a pet will eat in a given period of time and 3) Portion-limited, which is a measured amount of pet food based on the animal's daily energy requirements. While portion-limited feeding is best, studies have demonstrated that volumetric measurement is often inaccurate.^{28,29} The best solution to combat this inaccuracy is to use a gram scale, which many clients already have at home. Meals for the day or week can be premeasured and packaged in individual portions to save time later. In addition to feeding the right amount, how often we feed also matters. Dogs that are fed once per day are more likely to be obese than dogs that are fed more than once a day.¹¹ Feeding small, frequent meals can lead to increased energy expenditure due to thermogenesis.¹¹ Modifying how owners are measuring their pet's food and increasing meal frequency are small changes that may represent an important step towards achieving and maintaining a healthy weight.

While appropriate calorie restriction is still the most critical component of a weight loss plan; exercise can also be important. Not only does exercise increase energy expenditure, maintain RER, and promote maintenance of LBM, it also enhances the human-animal bond. A general recommendation of walking dogs 30 minutes per day is a good place to start, barring any significant physical impairments that may be exacerbated with exercise. In those cases, lower-impact exercises such as swimming are indicated. The idea of increasing activity in cats often feels daunting or even laughable to some owners. However, a 2014 study investigated the effects of feeding frequency and dietary water content on voluntary physical activity and found that increased feeding frequency and dietary water content (without changing energy intake or dietary macronutrient composition) appears to promote physical activity in cats.³⁰ In addition, Dr. Tony Buffington's Indoor Cat Initiative website (indoorpet.osu.edu/cats) provides additional ideas to promote physical activity, such as moving the food bowl, leash training cats, or playing with a variety of different toys.

4) Follow-up (Overcoming the Obstacles of Weight Loss)

Lastly, it is critical that we follow up. The owner should be called one week after the diet starts to troubleshoot any issues that may arise. A recheck should be scheduled for two weeks after initiating the diet plan, then monthly rechecks conducted thereafter until an ideal body weight is achieved. Many weight loss attempts will fail due to a lack of follow up. By tracking the progress of your patients and making adjustments, you increase the chance of success.

Many dogs and cats will regain weight after weight loss. Researchers found that weight gain occurs more rapidly and at a lower calorie intake than what was originally required to induce obesity.³¹ However, the likelihood of regaining weight has been shown to be significantly less if the therapeutic weight management diet is continued during weight maintenance, rather than switching back onto a standard maintenance diet.³² Weight management is a lifelong process and body weight needs to be monitored even after ideal weight has been achieved.

5) Celebrate Success

Weight loss alone can often be a potent and effective treatment for some medical conditions. A study of fourteen obese client-owned dogs with clinical and radiographic signs of OA evaluated the effect of weight loss on lameness in obese dogs. The dogs were fed a restricted-calorie diet over a period of 16 weeks that incorporated six follow-up visits. At each visit, body weight was measured and severity of lameness was assessed using a numeric rating scale (NRS), a visual analogue scale (VAS), and kinetic gait analysis by a single veterinary evaluator. The results indicate that as little as 6.10% reduction in body weight can cause a significant decrease in lameness. The authors concluded that weight loss should be presented as an important treatment modality to owners of obese dogs with OA and that noticeable improvement may be seen after even modest weight loss.³³ In addition, weight loss may decrease chronic inflammation. A study that evaluated the effects of weight loss on adipokines and markers of inflammation in 25 dogs before and after a weight loss program found that C-reactive protein, monocyte chemoattractant protein-1, resistin, and leptin decreased after weight loss.³⁴

The most notable benefit of weight loss may be an improvement in quality of life. Owners of fifty obese dogs were asked to complete a validated, standardized quality of life questionnaire prior to and following weight loss. Of the 50 dogs that were enrolled in the study, 30 dogs successfully achieved their weight loss goal. As scored by their owners, dogs that failed to complete their weight loss program had lower vitality and higher emotional disturbance scores than those which successfully lost weight. The 30 dogs that achieved their weight loss goals had increased vitality scores ($P < 0.001$), and decreased scores for both emotional disturbance ($P < 0.001$) and pain ($P < 0.001$). The change in vitality score was positively associated with percentage weight loss and percentage of body fat loss. These results indicate that obese dogs that successfully lose weight can achieve a significant improvement in quality of life.³⁵

Be sure to recognize each time the patient loses weight (even a small amount). Adhering to a weight loss plan is not easy and clients will appreciate the praise. Some of the most effective clinic weight loss programs share the successes of their clients and patients. If clients see the successes of others, it will give them encouragement to start a weight loss program for their own pet. Before and after photos can provide a great deal of encouragement.

Summary

Obesity is an excess of body fat that frequently results in significant impairment of health. As many as 80% of veterinarians have tried to help their own pet lose weight, as have over 68% of pet owners. However, 70% of pet owners have NEVER tried a therapeutic diet.⁵ While the battle against obesity may be challenging, a well-designed weight management plan and a therapeutic weight management diet are effective tools in helping our clients significantly extend their pet's healthy years.

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