

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 2022 survey from the Association for Pet Obesity Prevention, 59% of dogs and 61% 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>
Activity level	Owner compliance	Meal frequency
Genetics/ breed	Overfeeding	Single dog household
Age	Not understanding seriousness	Begging
Reproductive status	Socioeconomic status	
Underlying disease (e.g. hypothyroidism)	Owner age	

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

Weight Loss Improves Health

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.¹⁷ 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.¹⁸

Another notable benefit of weight loss is 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.¹⁹

Obesity Identification and Prevention

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. After an overweight patient has been identified, further workup can aid in ruling out complicating health conditions; this may include a thorough history (don't forget medications), physical exam, CBC, chemistry panel, UA, and T4.

Body condition score allows one to easily calculate an estimated ideal body weight. Each unit that the pet is over the ideal body condition score is equivalent to 10% extra body weight, as shown in Table 4.

Table 4: BCS as it correlated to % overweight

Body condition score	% overweight
4	-
5	-
6	10%
7	20%
8	30%
9	40%

Example:

*4yo MN Labrador who weighs 95 pounds has a BCS of 8/9 → 30% overweight
95lbs x 0.7 = 66.5 pounds ideal weight*

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. Furthermore, educating an owner on their pet's body condition score can help client's accept their pet's weight status when an overweight patient is identified, or it can aid in obesity prevention by discussing weight and BCS at healthy pet appointments as well. Veterinarians or trained staff members would be wise to teach owners to perform a BCS at home during the first pet visit, puppy/kitten wellness appointments, or spay/neuter visits. Afterall, prevention is the BEST available treatment for obesity.

Nutritional Approach to Weight Loss

In humans, the nutritional approach to weight loss focuses on the amount of food intake, the type of food eaten, and the timing of meal consumption.²⁰ In veterinary medicine, the discussion around weight loss has long emphasized caloric restriction. But the issue is more complex; there is no single best approach to weight loss, and having multiple nutritional options allows for individualized care.

The goals in healthy weight loss and maintenance are the same, whether utilizing an over-the-counter or prescription weight loss diet. They include maximizing fat loss, minimizing the loss of lean body mass, reducing oxidative stress and risk of secondary healthy problems, and finally keeping the weight off in the weight maintenance phase. 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. A therapeutic weight loss diet may be indicated for pets whose energy requirements for weight loss or maintenance are below RER, for pets who are always hungry, and/or for pets who are very overweight, for example. Cost of a prescription weight loss diet may be a challenge point for some owners, but a 2015 study found that the cost of feeding a prescription weight loss diet to obese dogs was, on average, about the same as feeding a regular diet before and during weight loss.²¹

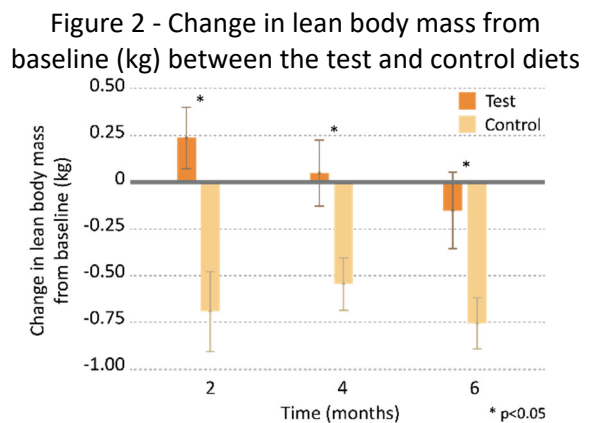
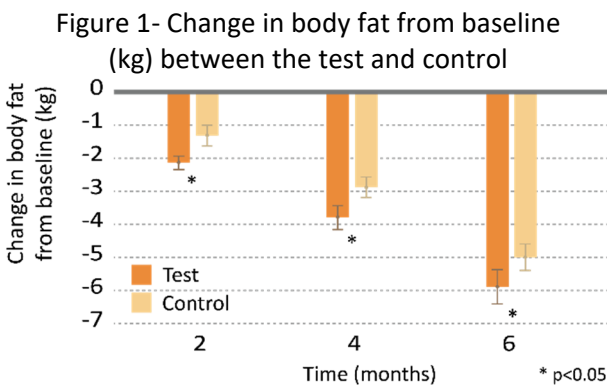
Diets formulated for weight loss should have the following attributes: lower caloric density, higher nutrient to calorie ratio, palatable, and appealing to the pet owner. Modification of certain nutrients can help pets achieve an ideal body weight and condition. For example, fat is a more energy-dense 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.²² 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.²³ 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).²⁴⁻²⁶

A study conducted in 2022 (NPPC Internal Data, St Joseph, MO 2022) evaluated a new and innovative approach to obesity - a diet that aims to help pets lose weight and transform their metabolism. Key features of this test weight loss diet include: 3:1 protein to starch ratio, natural fiber, isoflavones, L-carnitine, high level of omega-3 fatty acids, and glucosamine. Thirty overweight dogs were enrolled into this 6-month weight loss study, and fed a control diet for 8 weeks to determine their maintenance energy requirement. They were then randomized into two groups for the remainder of the 6-month study: the control weight loss diet or the test diet. Both groups were fed at a caloric restriction of 25% MER for months 1-4, and 40% MER for months 5-6. Results show overall weight loss was similar in both groups, but there were significant differences in loss of body fat and maintenance of lean body mass. Dogs fed the test diet lost significantly more body fat compared to dogs fed the control diet (Figure 1), and dogs fed the control diet lost significantly more lean body mass where as the test diet actually minimized loss of lean body mass (Figure 2).



Dogs fed the test diet also showed improvement in select metabolic health indicators. Postprandial interstitial glucose was significantly lower in dogs fed the test diet vs control at the 8-week time point. Fasting serum insulin in dogs fed the test diet was on average 4x lower from baseline after 6 months of

weight loss. Fasting serum cholesterol and triglycerides were significantly decreased in dogs fed the test diet over the 6-month study as well. There was a significant reduction in proinflammatory cytokines TNF-alpha and IL-6 in dogs fed the test diet at 6 months compared to the control group. Finally, fasting serum leptin levels were significantly reduced compared to control as well.

Success in weight loss is not only contingent on feeding an appropriate diet with the right nutrients, but also on feeding the right amount. While many owners feed their pets *ab libitum* or in a time-limited fashion, in order to achieve weight loss it is extremely important to feed a portion-limited amount based on the animal's energy requirements. This can be calculated a few different ways or feeding guide calculators, such as Purina Institute's CentreSquare or Pet Nutrition Alliance, can be used. The first 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. The second 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 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. It is often effective and well tolerated to feed 80% of RER, but note that feeding 70% of RER may be required in some cats. Alternatively, multiply RER by the appropriate life stage factor to determine a starting caloric recommendation for weight loss, as in Table 5. The initial calorie recommendation is variable based on the calculation method used, but it should be noted that no matter the method used (see example below), this initial calorie recommendation is merely a starting place that will likely need to be adjusted.

Table 5: Canine and Feline Life Stage Factors²⁷

Nutritional Assessment Factors	Feline Life Stage Factors	Canine Life Stage Factors
Neutered adults	1.2-1.4	1.4-1.6
Intact adults	1.4-1.6	1.6-1.8
Inactive/obese prone	1.0	1.0-1.2
Weight loss	0.8	1.0
Gestation	1.6-2.0	3.0 (for last 21 days)
Lactation (dependent on # offspring and weeks of lactation)	2.0-6.0	3.0 to ≥ 6.0
Growth	2.5	<4 mo: 3.0 ≥ 4 mo: 2.0
Work	-	Light: 1.6-2.0 Moderate: 2.0-5.0 Heavy: 5.0-11.0

Example:

30 kg MN Labrador, BCS 8/9

BCP 8/9 = 30% over ideal weight

Ideal weight = 30 kg x 0.70 = 21 kg

RER = 70 x (21 kg)^{0.75} = 687 kcal per day

80% of 687 kcal = 550 kcal per day

687 kcal x weight loss life stage factor of 1 = 687 kcal per day

Aspects of feeding management such as size of scoop or inclusion of treats are often overlooked in ensuring the right amount is fed. Multiple studies have documented how widely inaccurate clients can be when using measuring cups to dispense food.^{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 Finally, for some owners including an allotment for treats helps ensure compliance and respects the human-animal bond. In order to keep a diet complete and balanced, treats should be limited to ≤10% of total daily caloric intake.

5 Steps to a Successful Weight Loss Program

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

- 1) Client acceptance
- 2) Comprehensive nutrition history
- 3) Individualized recommendations
- 4) Follow-up and monitoring
- 5) Celebrate success!

The most successful weight loss program is one that utilizes a team-based approach. The best predictors of acceptance and adherence to a weight loss program are the veterinary professional's interviewing skills and the quality of the client interaction.³⁰ Collaboration between trained staff, DVM, and client ensure the best possible outcome for the patient. This presents an opportunity for certified veterinary technician utilization, which can lead to increased job satisfaction and earning potential.^{31,32}

1) Client acceptance

Success of a weight loss plan hinges on a client's dedication and commitment. However, it is often the most difficult component to achieve. Client acceptance starts with honest communication about the problem; don't sugarcoat physical exam findings around weight. Using BCS, and educating our owners on how to perform a BCS themselves, provides an objective measure that can be helpful for owners. However, one study found that owners' perceptions of their pet's BCS may be quite discordant from a veterinary professional's - only 28% of owners characterized their dogs as overweight, while the expert identified 79% of those same pets as overweight.³³ 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, which is why owner alignment is the next key step in client acceptance. Inquiring to an owner, "what are your thoughts about [pet]'s weight?" can help identify the owner's state of change, ranging from precontemplation, contemplation, preparation (decision making), to action.³⁴

In order to better align with our clients, it can be very helpful to educate them about the health concerns associated with obesity and the health benefits of weight loss. A relationship-centered approach in communication with clients emphasizes that the goal of a weight loss program is to work together to improve quality of life rather than the number on the scale. Now that the DVM has communicated the problem, sought to investigate the owner's alignment on the issue, and educated about the health benefits and concerns, it would be wise to gauge the owner's receptivity so as to be efficient with the veterinary team's time and resources by implementing a weight loss plan when the client is ready to act. One way to approach this is to ask, "I'd like to spend some time discussing [pet]'s weight and diet. Would you be open to that?" Finally, client acceptance hinges on the same important tools of communication

used to discuss any other medical findings, like expressing empathy. While conversations about weight may sometimes feel time-consuming or even challenging, our patients depend on us to be their advocates.

2) Comprehensive nutrition history

A comprehensive nutrition history is comprised of so much more than just what the pet eats; an animal's nutritional status is impacted by the animal, the diet, the environment, and human-related factors.²⁷ Starting with a board, open-ended question is an effective way to draw out more detail. For example, "describe a typical day's feeding and treats in the Smith household." It is then appropriate to follow up with specific questions to be sure table food, treats, or other special circumstances (size measuring cup, eating the other pet's good, etc.) aren't missed. 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.³⁵ Additionally, a recent study found that 83% of the owners surveyed indicated that they regularly give 1 to 5 treats per day.³⁶

The World Small Animal Veterinary Association (WSAVA), the American College of Veterinary Nutrition, and the Purina Institute 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.³⁷⁻³⁹ These screening evaluations should be updated each visit, and an extended evaluation done when abnormal physical exam findings or nutritional risk factors are identified, such as abnormal BCS or MCS, unexplained weight change, poor skin or haircoat, life stage consideration, history of systemic disease of GI upset, an unconventional diet, etc.⁴⁰

3) Individualized recommendations

An individualized weight loss plan takes into account the client's lifestyle, goals and expectations, and the human-animal bond. The veterinarian or team member can then work together with the client in the decision making process by exploring nutrition options together, and finally make a clear nutrition-related recommendation and elicit client feedback, modifying the recommendations as necessary.

An individualized recommendation will advise the client on diet, amount, frequency, exercise, and address special circumstances (like begging or multi-cat households). The previous section covering the nutritional approach to weight loss details when to choose a prescription vs OTC diet for weight loss, how to determine a starting caloric recommendation, and advocates for smaller, more frequent meals.

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 lean body mass, 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 (without changing energy intake or dietary macronutrient composition) appears to promote physical activity in cats.⁴¹ In addition, OSU'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 and monitoring

Lastly, it is critical that we follow up. The owner should be called within one week after the diet is started to troubleshoot any issues. First weight check-ins should be scheduled regularly, initially 1-2 weeks after the diet is started to adjust recommendations as necessary until desired rate of weight loss is achieved. It

is generally more productive to focus on a BCS goal and rate of loss (1-2% per week) rather than final weight. Then monthly rechecks can be conducted until an ideal body weight is achieved. Many weight loss attempts will fail due to a lack of follow up. Research has shown that compliance tends to be higher in the early stages of weight loss when pets are losing more weight, but that as the rate of loss declines so does the compliance.⁴² Weight loss programs for cats also tend to have a lower completion rate, however those cats that lose weight more rapidly tend to be more successful in a weight loss program.⁴³ 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.⁴⁴ 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.⁴⁵ Weight management is a lifelong process and body weight needs to be monitored even after ideal weight has been achieved.

5) Celebrate success

Be sure to recognize each time the patient loses weight, even a small amount, as clients will see the difference in a more energetic pet. 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.

A Team-Based Approach

A practice that makes a concerted effort to enable and empower the support staff can effectively delegate tasks to truly make the weight loss program a team-based approach.⁴⁶ For example, which tasks in a weight loss plan need to be completed by a DVM? Certainly the physical exam, nutritional assessment, and specific nutrition recommendations. What can be championed by a technician or client services representative? In a well trained staff, this could include everything from facilitating completion of the nutrition history/update form and initiating the nutrition history discussion, to answering client questions and reinforcing the recommendation with informational packets, and follow up weight checks.

Summary

Obesity is an excess of body fat that frequently results in significant impairment of health, and is a widespread problem. 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 There is no single best approach to weight loss for our veterinary patients, so the variety of therapeutic weight management diets available provide effective options in our toolbox in the fight against obesity. While the battle against obesity may be challenging, a well-designed and executed weight management plan that leverages the veterinary team can help our clients significantly extend their pet's healthy and happy years.

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