How much should a pet weigh?

Petra Viziova

- How to determine ideal weight of pet?

- Hills diagnostic tools

- Research behind – BCS, BFI, MM

- How to perform measurements for dog

- How to perform measurements for cat

What is ideal weight of Sorkie ?

Nutritional Assessment Screening Evaluation

Nutritional History   Body Weight   Body/Muscle Condition score

Overweight
BCS > 3/5 or > 5 /9

Traditional **BCS only Validated** for pets with **< 50%** **Body Fat**

5 Point BCS	% Body Fat	9 Point BCS	% Body Fat
3	16-25	5	23-27
4	25-35	6	28-32
5	36-**45**	7	33-37
		8	38-43
		9	**44-47**

THE UNIVERSITY of TENNESSEE

The **Domino** Effect of Starting with the **Wrong Ideal Weight**

Inaccurate Starting Point

↓ Success

↑ Frustration

↓ Recommendation

↑ Unhealthy Pets Unhappy HCT
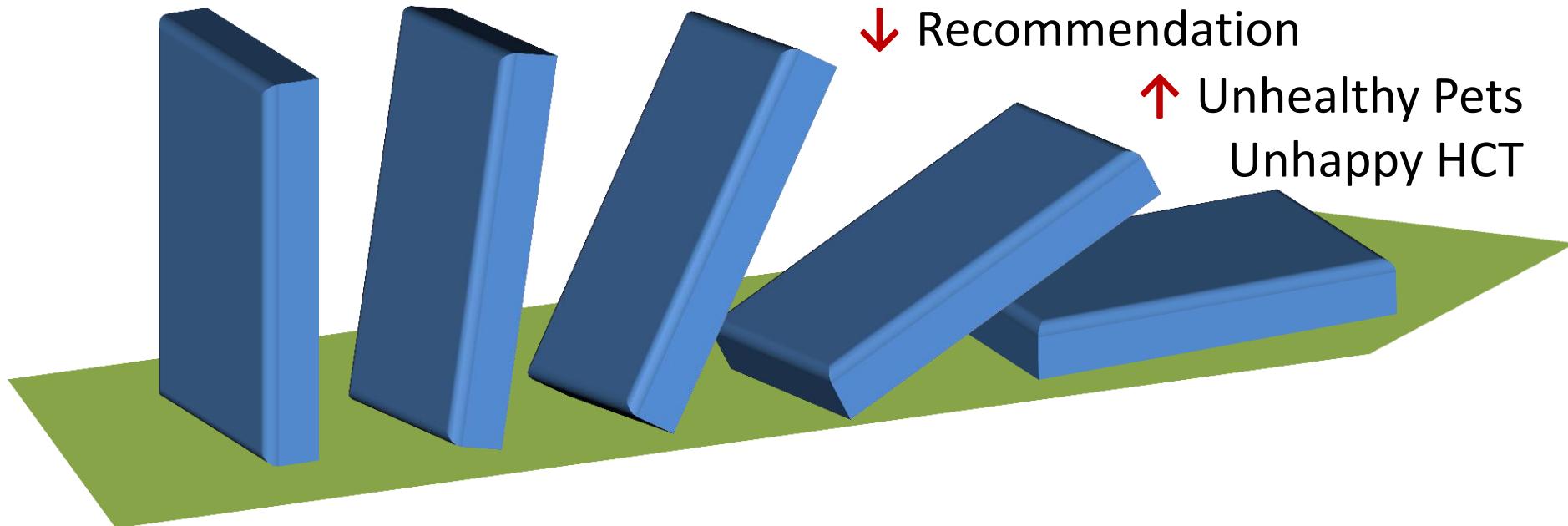
Hill's is giving the Profession Better Tools

Diagnostic Tools

Morphometric Measurements

BFI Risk Chart

Research behind the tools

1. step - to evaluate **current BCS compare to DEXA**

2. step - to validate **BFI** compare to **DEXA**

3. step – to validate a new clinical method of measuring body composition in dogs and cats = **Morphometric measurement** compare to **DEXA**

Study Designed to **Evaluate Accuracy** of **Diagnostic Tests** to assess **Body Composition**

DEXA = Gold Standard

- Morphometric Measurements

- BFI Risk Chart

- Traditional BCS

ACVIM Abstracts 2010

THE UNIVERSITY *of* TENNESSEE

Study Population
Variety of Breeds and Sizes

83 Client-owned Dogs

Eighty three client owned dogs

Age: Range: 1 to 12 years, Average 6 years

Gender: 47 females (5 intact), 36 males (3 intact)

Weight: Range 11 to 162 lbs, Average: 58 lbs

Body Fat: Range: 20% to 65%, Average: 44%

Breed: 64 (77%) were identified as a specific breed,
19 (23%) were classified as mutt or other

Number in each breed classification: 1 BASSET HOUND, 1 BOSTON TERRIER, 1 BOXER, 1 BULLMASTIFF, 1 CORGI, 1 DOBERMAN PINSCHER, 1 FLAT-COATED RETRIEVER, 1 FRENCH BULLDOG, 1 GERMAN SHEPHERD DOG, 1 POODLE, 1 RAT TERRIER, 2 BORDER COLLIE, 2 CHIHUAHUA, 2 JACK RUSSELL TERRIER, 2 MINIATURE PINSCHER, 2, PIT BULL TERRIER, 2 PUG, 2 ROTTWEILER, 2 SHETLAND SHEEPDOG, 2 SHIH TZU, 3 COCKER SPANIEL, 4 AUSTRALIAN SHEPHERD, 5 BEAGLE, 6 GOLDEN RETRIEVER, 6 OTHER, 7 DACHSHUND, 10 LABRADOR RETRIEVER, 13 MUTT

76 Client-owned Cats

Seventy six client owned cats:

Age: Range: 1 to 15 years, Average 6 years

Gender: 38 females (0 intact), 38 males (1 intact)

Body Fat: Range: 25% to 62%, Average: 46%

Weight: Range 6.2 to 25.3 lbs, Average: 13.5 lbs

Breed:

54 DOMESTIC SHORT HAIR, 14 DOMESTIC LONG HAIR, 2 BURMESE, 1 ABYSSINIAN/SOMALI, 1 AMERICAN SHORTHAIR, 1 DEVON REX, 1 SHOWSHOE, 1 SINGAPURA, 1 OTHER.

Distribution of Pets based on DEXA determined Percent Body Fat
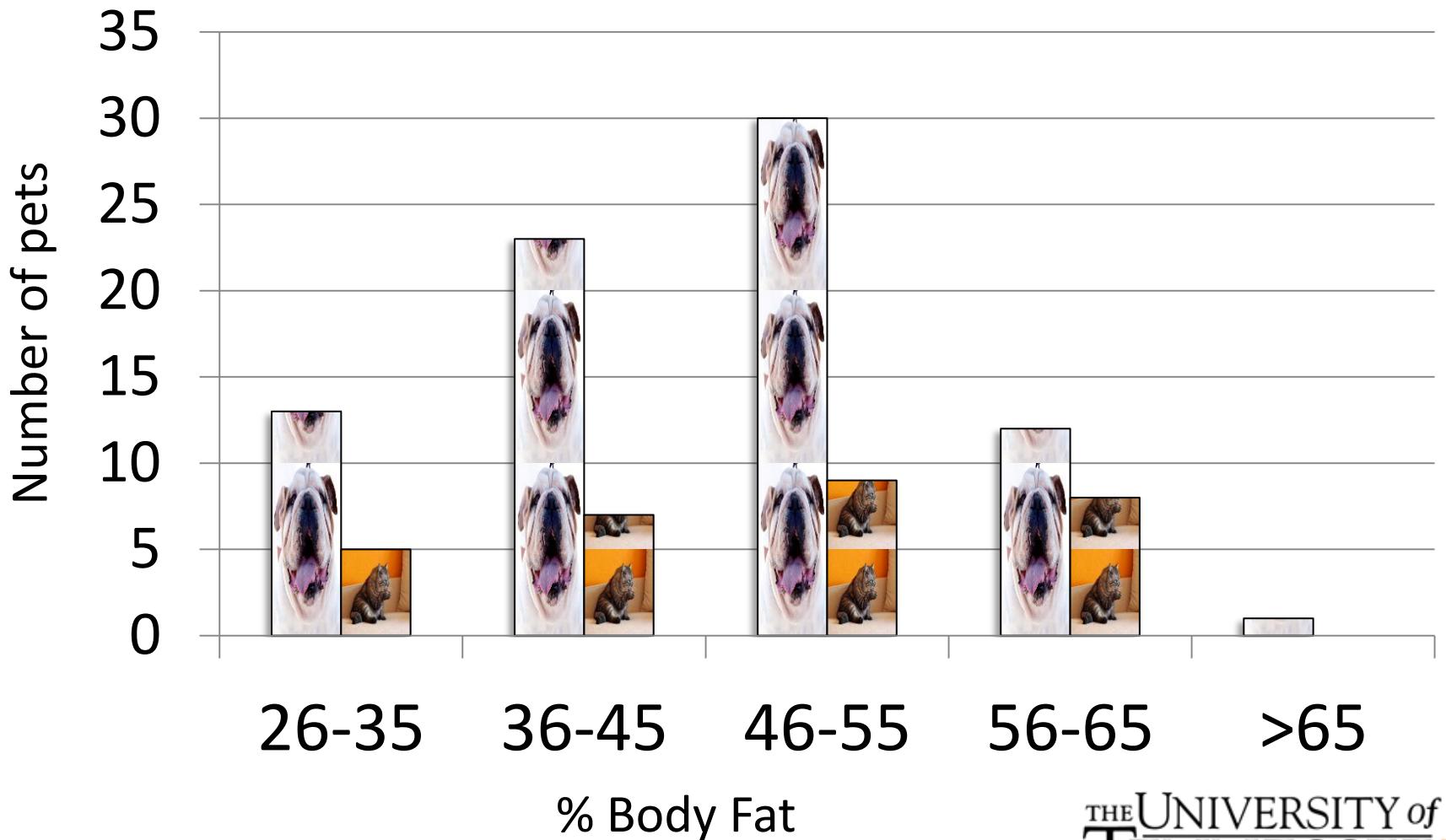
# **Diagnostic Tests** to assess Body Composition

DEXA = Gold Standard

☐ Morphometric Measurements

☐ BFI Risk Chart

☐ Traditional BCS

ACVIM Abstracts 2010

THE UNIVERSITY *of* TENNESSEE

Accuracy of Predicting **Ideal Weight** with **Traditional BCS** Compared to DEXA
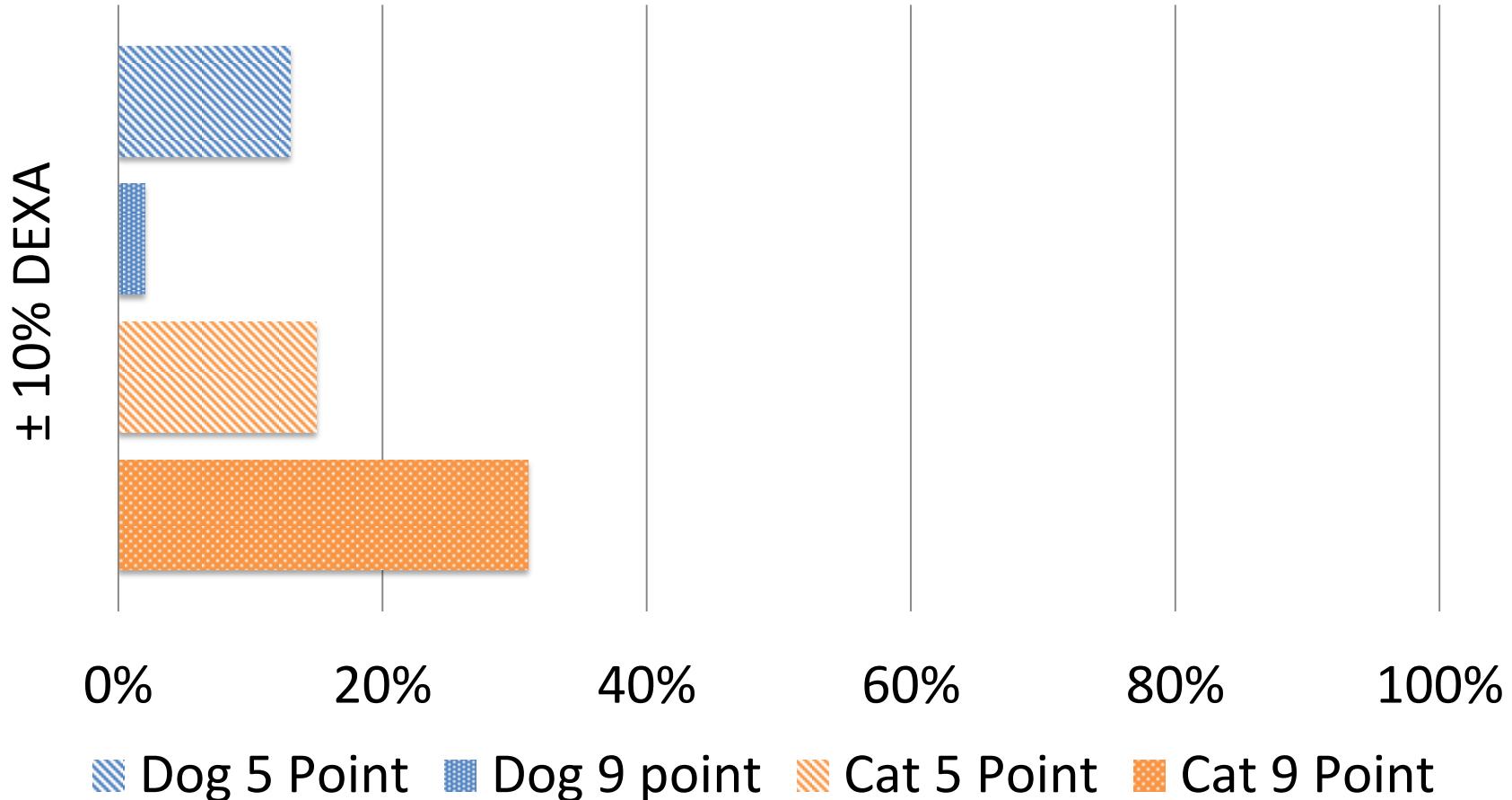
Diagnostic Tests to assess Body Composition

DEXA = Gold Standard

Morphometric Measurements

BFI Risk Chart

Traditional BCS

THE UNIVERSITY *of* TENNESSEE

BFI Risk Chart is **Validated** in dogs and cats with **> 50%** Body Fat

Hill's BFI Risk Chart

20 15-25% Body Fat	**30** 25-35% Body Fat	**40** 35-45% Body Fat	**50** 45-55% Body Fat	**60** 55-65% Body Fat	**70** 65-75% Body Fat
Low Risk	**Mild Risk**	**Moderate Risk**	**Serious Risk**	**Severe Risk**	**Extreme Risk**
Face Minimal fat cover. Prominent bony structures.	**Face** Slight fat cover. Defined bony structures.	**Face** Slight to moderate fat cover. Defined to slight bony structures.	**Face** Moderate fat cover. Slight to minimal bony structures.	**Face** Thick fat cover. Minimal to no bony structures.	**Face** Very thick fat cover. No bony structures.
Head & Neck Prominent distinction between head & shoulder. Loose scruff. No scruff fat.	**Head & Neck** Clear distinction between head & shoulder. Loose scruff. Slight scruff fat.	**Head & Neck** Clear to slight distinction between head & shoulder. Loose to snug scruff. Slight to moderate scruff fat.	**Head & Neck** Minimal distinction between head & shoulder. Loose to snug scruff. Moderate scruff fat.	**Head & Neck** Poor to no distinction between head & shoulder. Snug to tight scruff. Very thick scruff fat.	**Head & Neck** No distinction between head & shoulder. Tight scruff. Very thick scruff fat.
Sternum Prominent. Very easy to palpate. Minimal pectoral fat.	**Sternum** Defined, slightly prominent. Easy to palpate. Slight to moderate pectoral fat.	**Sternum** Minimally prominent. Palpable. Moderate pectoral fat.	**Sternum** Poorly defined. Difficult to palpate. Thick pectoral fat.	**Sternum** Not prominent. Extremely difficult to palpate. Extremely thick pectoral fat.	**Sternum** Not prominent. Impossible to palpate. Extreme pectoral fat.
Scapula Prominent. Very easy to palpate.	**Scapula** Defined, slightly prominent. Easy / Very easy to palpate.	**Scapula** Slightly prominent. Easy to palpate.	**Scapula** Minimally to not prominent. Palpable.	**Scapula** Not prominent. Difficult to palpate.	**Scapula** Not prominent. Impossible to palpate.
Ribs Prominent. Very easy to palpate.	**Ribs** Not prominent. Easy to palpate.	**Ribs** Not prominent. Palpable.	**Ribs** Not prominent. Difficult to palpate.	**Ribs** Not prominent. Extremely difficult to impossible to palpate.	**Ribs** Not prominent. Impossible to palpate.
Abdomen Loose abdominal skin. Easy to palpate abdominal contents.	**Abdomen** Loose abdominal skin with minimal fat. Easy to palpate abdominal contents.	**Abdomen** Obvious skin fold with moderate fat. Easy to palpate abdominal contents.	**Abdomen** Heavy fat pad. Difficult to palpate abdominal contents.	**Abdomen** Very heavy fat pad; indistinct from abdominal fat. Impossible to palpate abdominal contents.	**Abdomen** Extremely heavy fat pad; indistinct from abdominal fat. Impossible to palpate abdominal contents.
Tail Base Prominent bony structure. Easy to palpate. Minimal fat cover.	**Tail Base** Slightly to minimally prominent bony structure. Palpable. Slight fat cover.	**Tail Base** Minimally prominent bony structure. Palpable. Slight to moderate fat cover.	**Tail Base** Poorly defined bony structure. Difficult to palpate. Moderate to thick fat cover.	**Tail Base** Bony structure not prominent. Very difficult to palpate. Very thick fat cover.	**Tail Base** Bony structure not prominent. Extremely difficult to palpate. Extremely thick fat cover
Shape From the Side Moderate to slight abdominal tuck.	**Shape From the Side** No abdominal tuck.	**Shape From the Side** Slight abdominal bulge.	**Shape From the Side** Moderate abdominal bulge.	**Shape From the Side** Severe abdominal bulge.	**Shape From the Side** Very severe abdominal bulge.
Shape From Above Marked hourglass.	**Shape From Above** Slight hourglass / Lumbar waist.	**Shape From Above** Lumbar waist.	**Shape From Above** Broadened back.	**Shape From Above** Severely broadened back.	**Shape From Above** Extremely broadened back.

Directly links excess body fat (BFI) to the increased health risks.

Hill's BFI Risk Chart

20 15-25% Body Fat	**30** 25-35% Body Fat	**40** 35-45% Body Fat	**50** 45-55% Body Fat	**60** 55-65% Body Fat	**70** 65-75% Body Fat
Low Risk	**Mild Risk**	**Moderate Risk**	**Serious Risk**	**Severe Risk**	**Extreme Risk**

Low Risk
Ribs
Slightly prominent. Easily felt. Thin fat cover.
Shape From Above
Well proportioned lumbar waist.
Shape From the Side
Abdominal tuck present.
Shape From Behind
Clear muscle definition, smooth contour.
Tall Base Bones
Slightly prominent. Easily felt.
Tall Base Fat
Thin fat cover.

Mild Risk
Ribs
Slightly to not prominent. Can be felt. Moderate fat cover.
Shape From Above
Detectable lumbar waist.
Shape From the Side
Slight abdominal tuck.
Shape From Behind
Losing muscle definition, rounded appearance.
Tall Base Bones
Slightly to not prominent. Can be felt.
Tall Base Fat
Moderate fat cover.

Moderate Risk
Ribs
Not prominent. Very difficult to feel. Thick fat cover.
Shape From Above
Loss of lumbar waist, broadened back.
Shape From the Side
Flat to bulging abdomen.
Shape From Behind
Rounded to square appearance.
Tall Base Bones
Not prominent. Very difficult to feel.
Tall Base Fat
Thick fat cover. May have a small fat dimple.

Serious Risk
Ribs
Not prominent. Extremely difficult to feel. Very thick fat cover.
Shape From Above
Markedly broadened back.
Shape From the Side
Marked abdominal bulge.
Shape From Behind
Square appearance.
Tall Base Bones
Not prominent. Extremely difficult to feel.
Tall Base Fat
Very thick fat cover. Fat dimple or fold present.

Severe Risk
Ribs
Not prominent. Impossible to feel. Extremely thick fat cover.
Shape From Above
Extremely broadened back.
Shape From the Side
Severe abdominal bulge.
Shape From Behind
Square appearance.
Tall Base Bones
Not prominent. Impossible to feel.
Tall Base Fat
Extremely thick fat cover. Large fat dimple or fat fold.

Extreme Risk
Ribs
Unidentifiable. Impossible to feel. Extremely thick fat cover.
Shape From Above
Extremely broadened back, bulging mid-section.
Shape From the Side
Very severe abdominal bulge.
Shape From Behind
Irregular or upside down pear shape.
Tall Base Bones
Unidentifiable.
Tall Base Fat
Extremely thick fat cover. Large fat folds or pads.

# BFI Risk Chart associates body composition with risk

Traditional BCS Validated for pets with **< 50% Body Fat** and uses **stigmatized language** to communicate

Discuss **RISK** not weight

5 Point BCS	% Body Fat	9 Point BCS	% Body Fat
3	16-25	5	11-27
4	25-35	6	28-32
5	36-45	7	33-38
		8	38-44
		9	45-47

BFI Risk Chart	% Body Fat	Risk
20	16-25	Normal
30	25-35	Moderate
40	36-45	High
50	46-55	Serious
60	56-65	Severe
70	66-75	Extreme

Accuracy of Predicting **Ideal Weight** with **BFI Risk Chart** Compared to DEXA
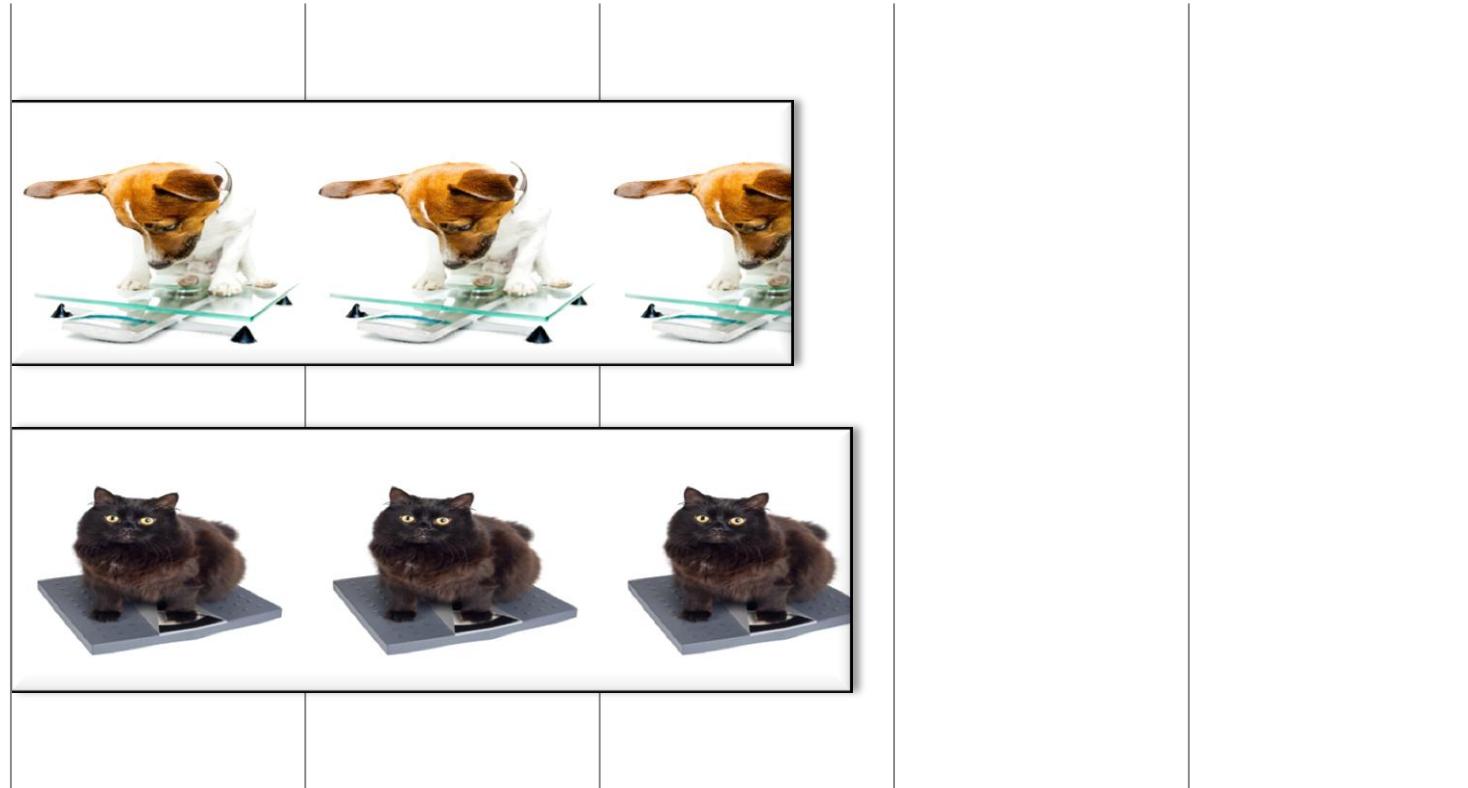
Diagnostic Tests to assess Body Composition

DEXA = Gold Standard

Morphometric Measurements

BFI Risk Chart

Traditional BCS

ACVIM Abstracts 2010

THE UNIVERSITY *of* TENNESSEE

Simple Body **Measurements**
using a tailors tape ~ 2 mins
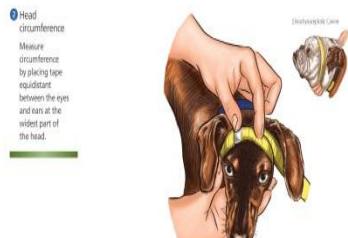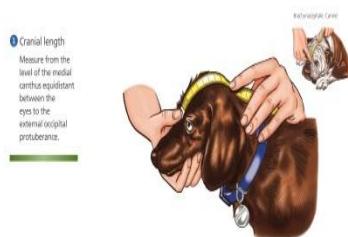
4 Measurements   **6 Measurements**
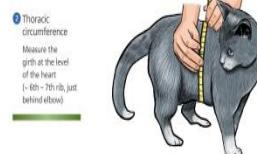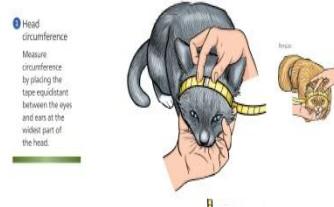
Accuracy of Predicting **Ideal Weight** with **Body Measurements** Compared to DEXA

± 10% DEXA

0%   20%   40%   60%   80%   100%
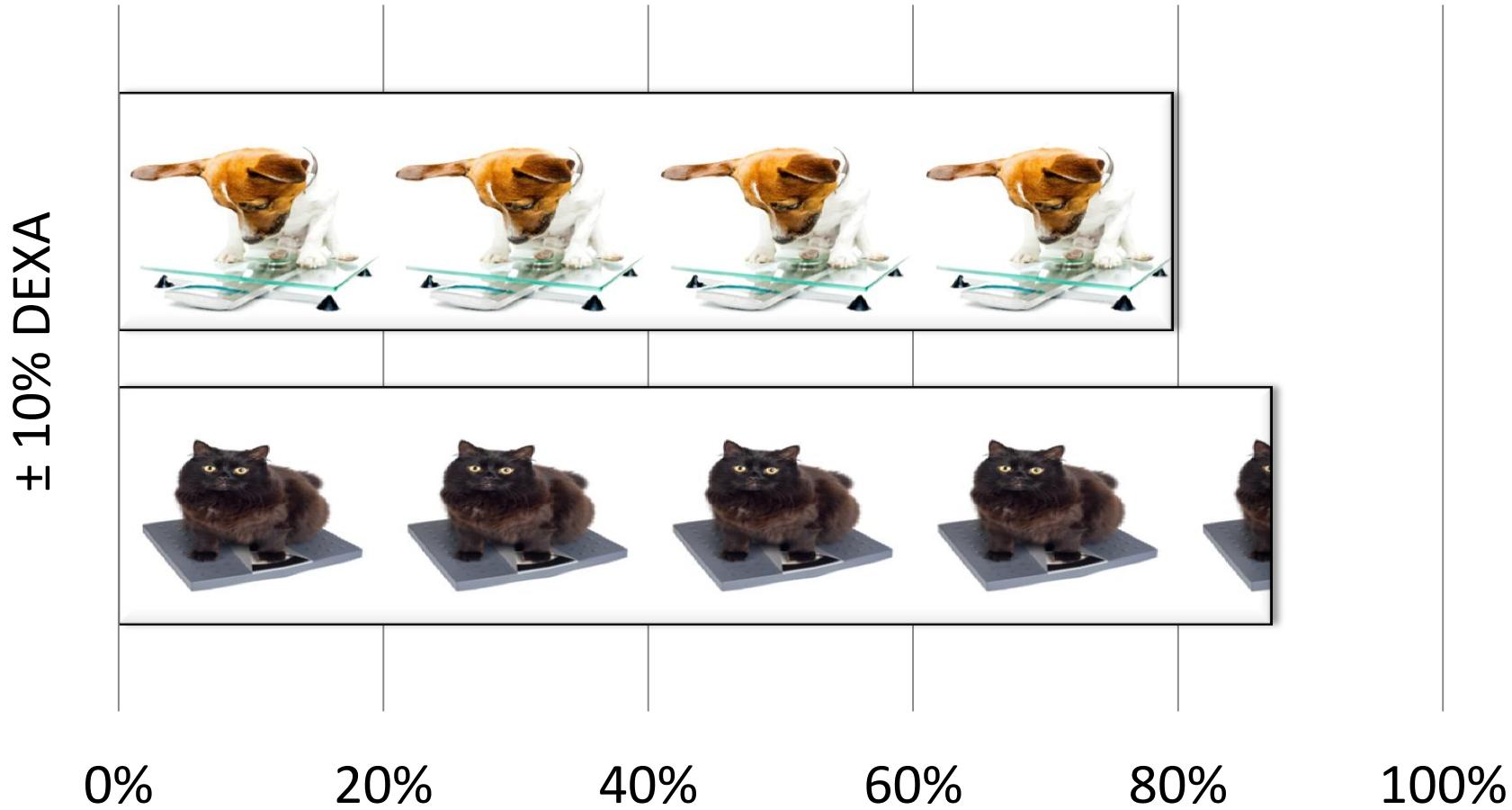
Relative **Accuracy** of Predicting **Ideal Weight**

Bar chart showing relative accuracy:
- Body Measurements: ~80%
- BFI Risk Chart: ~50%
- Traditional BCS: 30% or <

Y-axis: 0, 20, 40, 60, 80, 100

THE UNIVERSITY *of* TENNESSEE UT
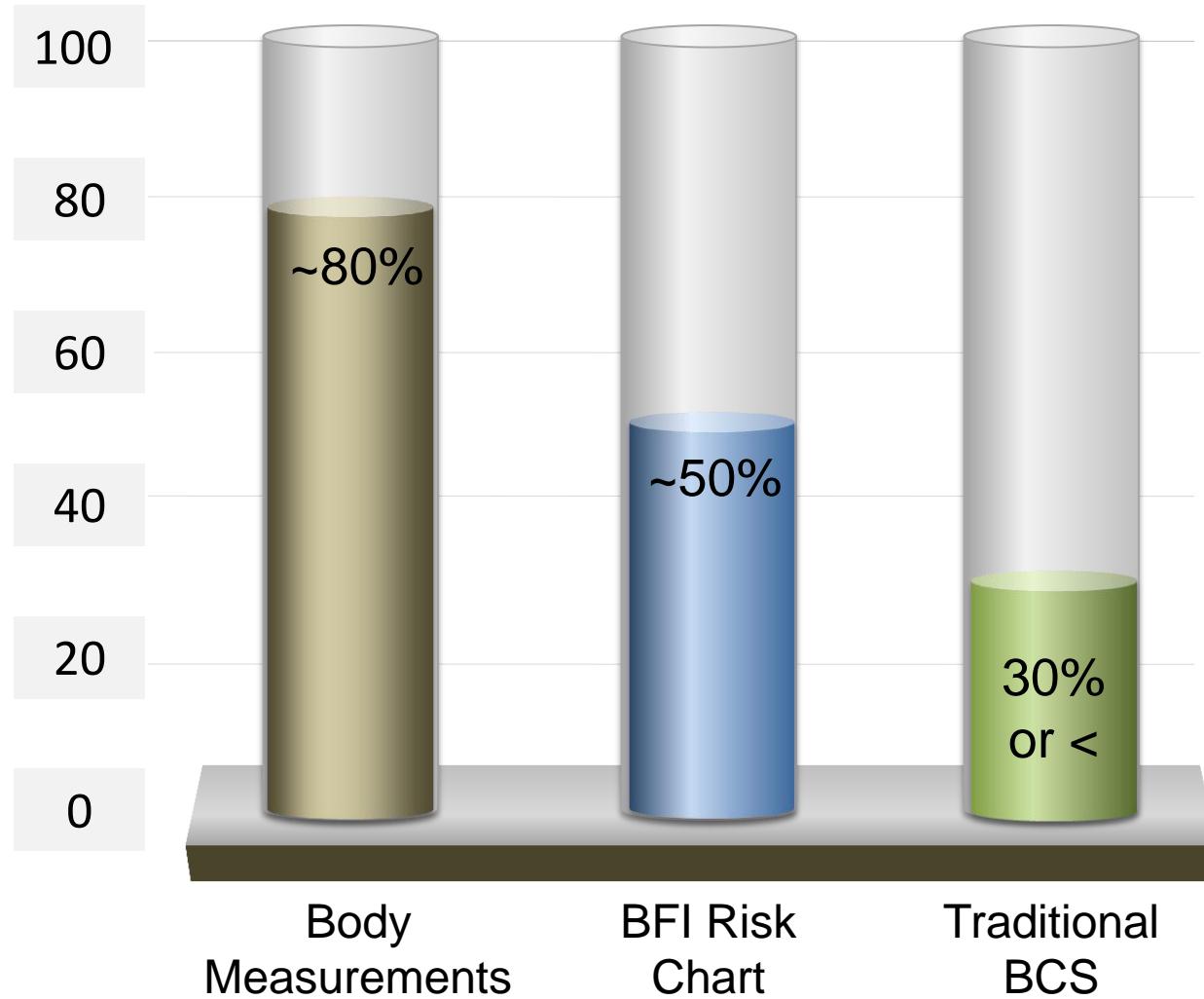
Healthy Weight Protocol
Diagnostic Tools

To determine **ideal body weight** in **overweight** pets

Overweight BCS > 3/5 or 5/9 BCS

Healthy weight protocol tools

Morfometric measurements

BFI assessment tool

Discuss with owner BFI risk chart

Feeding recommendation

Morphometric measurements

- Validate only for overweight and obese patients.

- For dogs from 5kg to 73 kg
- For cats from 3 kg to 11.5 kg

- Not enough information for pets outside of that range.

How to perform measurements?

- A series of body frame (morphometric) measurements are taken using a flexible tape measure

- ## Canine Measurements (1/4) :

Head Length
Measure from the external occipital protuberance to the point equidistant between the eyes

Canine Measurements 2/4 :

Front Leg Length
Measure the length from top of the central foot pad to elbow. Carpus must be straight.

Canine Measurements 3/4:

Head circumference

Measure between the eyes and the ears at the widest part of the head

Canine Measurements 4/4:

Hind Leg Length
Measure the length of the hind leg from the top of the central foot pad to the dorsal tip of the calcaneal process

Ready for the cat?

Feline Measurements 1/6

Head circumference
Wrapping tape snugly, measure between the eyes and the ears at the widest part of the head.

Feline Measurements 2/6

Thoracic circumference
Wrap tape snugly around rib cage at the heart girth (behind elbow)

Feline Measurements 3/6

Front Leg Circumference
Wrap tape snugly around front leg at the midpoint between the carpus and the elbow

Feline Measurements 4/6

Front Leg Length
Measure the length from top of the central foot pad to the point of the elbow. Carpus must be straight.

Feline Measurements 5/6

Hind Leg Length
Measure the length of the hind leg from the top of the central foot pad to the dorsal tip of the calcaneal process.

Feline Measurements 5/6

Body Length
Measure from the tip of the nose to the base of the tail where it meets the body. Hold tape gently along the dorsal midline.

Video
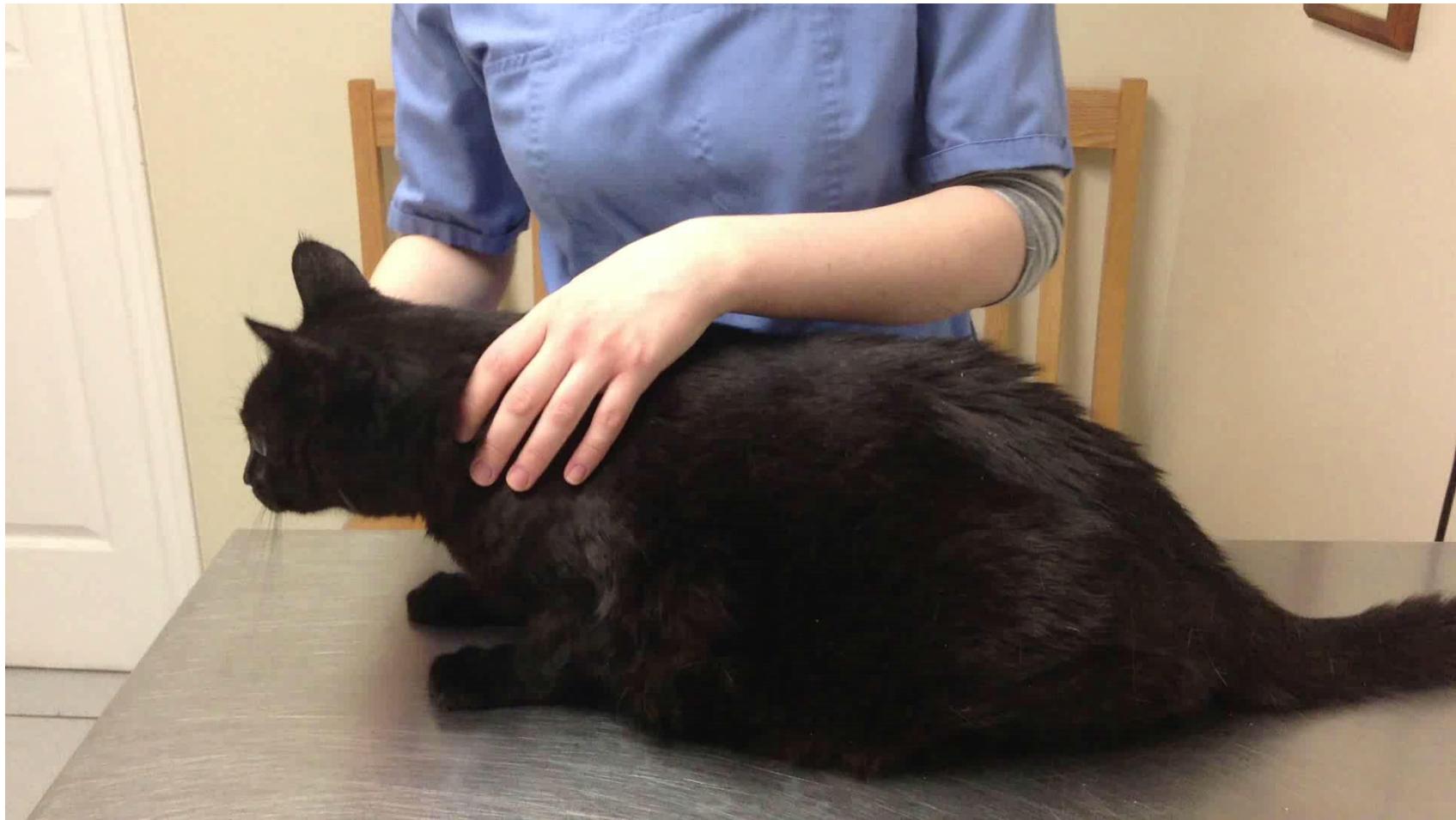
Road to Weight Loss **Success**

Monthly Recheck evaluations

Make a specific Nutritional Recommendation

Calculate Food Dose

TALK TO THE OWNER

Determine **Ideal Weight**
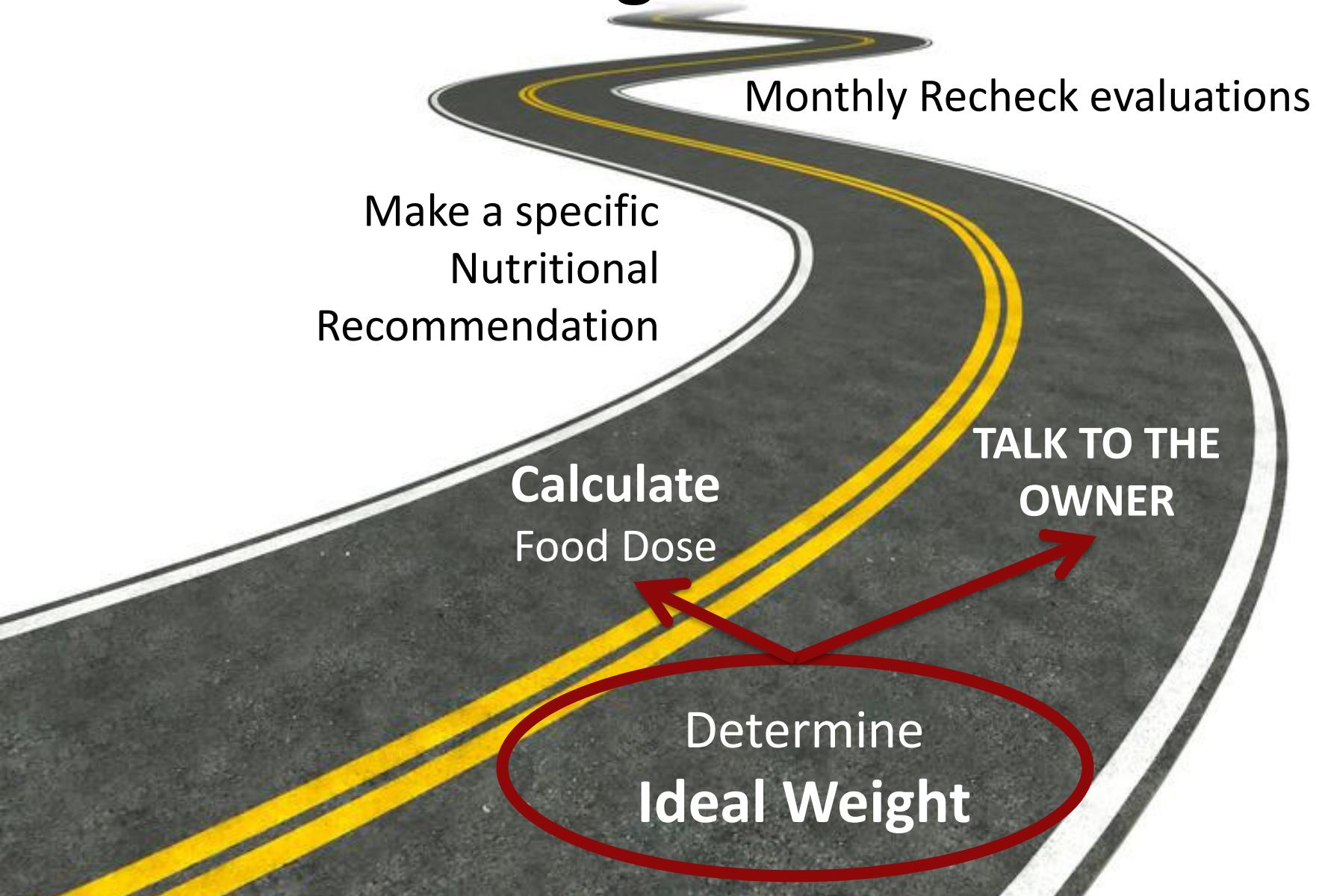
Thank you

References HWP

- Scarlett JM, Donoghue S. Associations between body condition and disease in cats. *J Am Vet Med Assoc* 1998;212:1725-1731.

-

- Laflamme DP. Understanding and managing obesity in dogs and cats. *Vet Clin North Am Small Anim Pract* 2006;36:1283-1295, vii.
- Laflamme DP, Kealy RD, Schmidt DA. Estimation of body fat by body condition score (abstract). . Twelfth Annual Veterinary Medical Forum, American College of Veterinary Internal Medicine 1994;985.
- Laflamme DP. Development and validation of a body condition score system for cats: A clinical tool. *Feline Practice* 1997;25:13-18.
- Laflamme DP. Development and validation of a body condition score system for dogs: A clinical tool. *Canine Practice* 1997;22:10-15.

-

- Mawby DI, Bartges JW, d'Avignon A, et al. Comparison of various methods for estimating body fat in dogs. *J Am Anim Hosp Assoc* 2004;40:109-114.

-

- Toll PW, Paetau-Robinson I, Lusby AL, et al. Effectiveness of morphometric measurements for predicting body composition in overweight and obese dogs *Journal of Veterinary Internal Medicine* 2010;24:717.

-

- Lusby AL, Kirk CA, Toll PW, et al. Effectiveness of BCS for Estimation of Ideal Body Weight and Energy Requirements in Overweight and Obese Dogs Compared to DXA (abstract). *Journal of Veterinary Internal Medicine* 2010;24:717.

- ***EFFECTIVENESS OF MORPHOMETRIC MEASUREMENTS FOR PREDICTING BODY COMPOSITION IN OVERWEIGHT AND OBESE DOGS. PW Toll,[1] I Paetau-Robinson[1], AL Lusby,[2] GA Henry,[2] CA Kirk,[2] 1. Hills Pet Nutrition, Topeka, KS 2. University of Tennessee Department of Small Animal Clinical Sciences, Knoxville, TN***

- In a prior study we demonstrated that current methods of estimating ideal body weight for weight loss feeding are inaccurate in dogs having > 45% body fat. The purpose of this study was to develop simple and accurate methods of measuring body composition in clinical practice in overweight to morbidly obese dogs. Current morphometric measurement methods do not adequately predict body composition in obese dogs. Additionally, these methods tend to be difficult to use and have poor accuracy. This study evaluated two methods of predicting lean body mass (LBM) from animal morphology, radiographic measurement of skeletal size and external physical measurement of body size.

- Thirty-six client-owned overweight or obese adult dogs (28% to 64% body fat) weighing 5 to 73.6 kg underwent dual energy x-ray absorptiometry (DXA) scanning to assess their body composition. Nine measurements were made from digital radiographs to assess skeletal size and 16 external physical measurements were made to assess body size. Body weight was also measured. Multiple regression analysis using DXA results as the dependent variable was used to develop regression equations for the prediction of LBM from the skeletal size and body size data. Several equations were developed that had high (>0.9) correlation coefficients for both methods when the dogs were divided into 2 size groups (≤ 40 lbs and > 40 lbs). The best equations were applied to the data from the same group of dogs to evaluate how well values for individuals were predicted (within ± 10% of the DXA value). The best equations using skeletal size data resulted in a r^2 = 0.99 and a predictability (± 10%) ≥ 86% using ≤ 8 variables (including BW) for both size groups. The best equations using body size data resulted in a r^2 = 0.99 and a predictability (± 10%) = 100% using ≤ 8 variables (including BW and age) for both size groups.

- Multiple regression analysis demonstrated that both methods could be used to predict LBM using a variety of regression equations. This approach shows great potential for the development of simple and accurate tools to be used in clinical practice. Further studies must be done to validate the equations in a population of dogs other than those used to develop the equations.

EFFECTIVENESS OF BCS FOR ESTIMATION OF IDEAL BODY WEIGHT AND ENERGY REQUIREMENTS IN OVERWEIGHT AND OBESE DOGS COMPARED TO DXA. AL Lusby,[1] CA Kirk,[1] PW Toll,[2] I Paetau-Robinson[2] 1. University of Tennessee Department of Small Animal Clinical Sciences, Knoxville, TN 2. Hills Pet Nutrition, Topeka, KS

With an estimated 35-40% of pet dogs being overweight or obese, veterinarians must accurately assess energy needs to prescribe appropriate food doses. Body condition scoring (BCS) is the most popular and accessible method for estimating degrees of obesity in dogs, but these scales were designed to assess animals with body fat percentages below about 45%. Many obese dogs have body fat percentages of 50% and greater. This project compared the accuracy of using body fat percentages to the 5 and 9 point BCS systems for estimating ideal body weight and resting energy requirements (RER) in overweight dogs. Thirty-six healthy, client-owned dogs ranging from 5 to 73.6 kg underwent dual energy x-ray absorptiometry (DXA) scanning to assess their percentage of body fat (BF). BF percentage was then used to estimate ideal body weight, calculate RER, and classify each animal into the 5 and 9 point BCS system. Once a BCS was assigned, the median body fat percentage for each score was used to estimate ideal body weight and RER (5 point scale - 4=30%, 5=40%; 9 point scale - 6=30%, 7=35%, 8=40%, 9=45%). Based on DXA, body fat ranged from 28.3% to 63.7% with a mean of 45.9%. To assess the accuracy of BCS for moderately versus morbidly obese dogs, patients were divided into two groups: <45% body fat (n=15) and >45% body fat (n=21). Compared to DXA, estimations of ideal body weight were significantly higher using the 5 (23.0 vs. 19.2 kg) and 9 (21.1 vs. 19.2 kg) point BCS in dogs with BF >45% ($p<0.001$) but did not differ in dogs with <45% BF ($p>0.05$). DXA estimations of RER were also significantly lower than estimations using the 5 (709 vs. 616 Kcal/day) and 9 (665 vs. 616 Kcal/day) point scales in dogs with BF>45% ($p <0.001$), but did not differ in dogs with <45% BF ($p>0.05$). The results of this study demonstrate current BCS systems provide good estimates of ideal body weight and RER in dogs with less than 45% BF, but are inadequate for calculating RER and ideal body weight in morbidly obese dogs (BF>45%). As a result, food dose calculations will be overestimated and this may affect weight loss efficacy. As canine obesity rates climb, we must develop new methods to assess our most obese patients and provide better weight management.