

Clinical Experience using LCHF in a Medical Setting Research & Clinical Update 2018

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Disclosures

Book Royalties: Cholesterol Clarity, Keto Clarity, Adapt Program

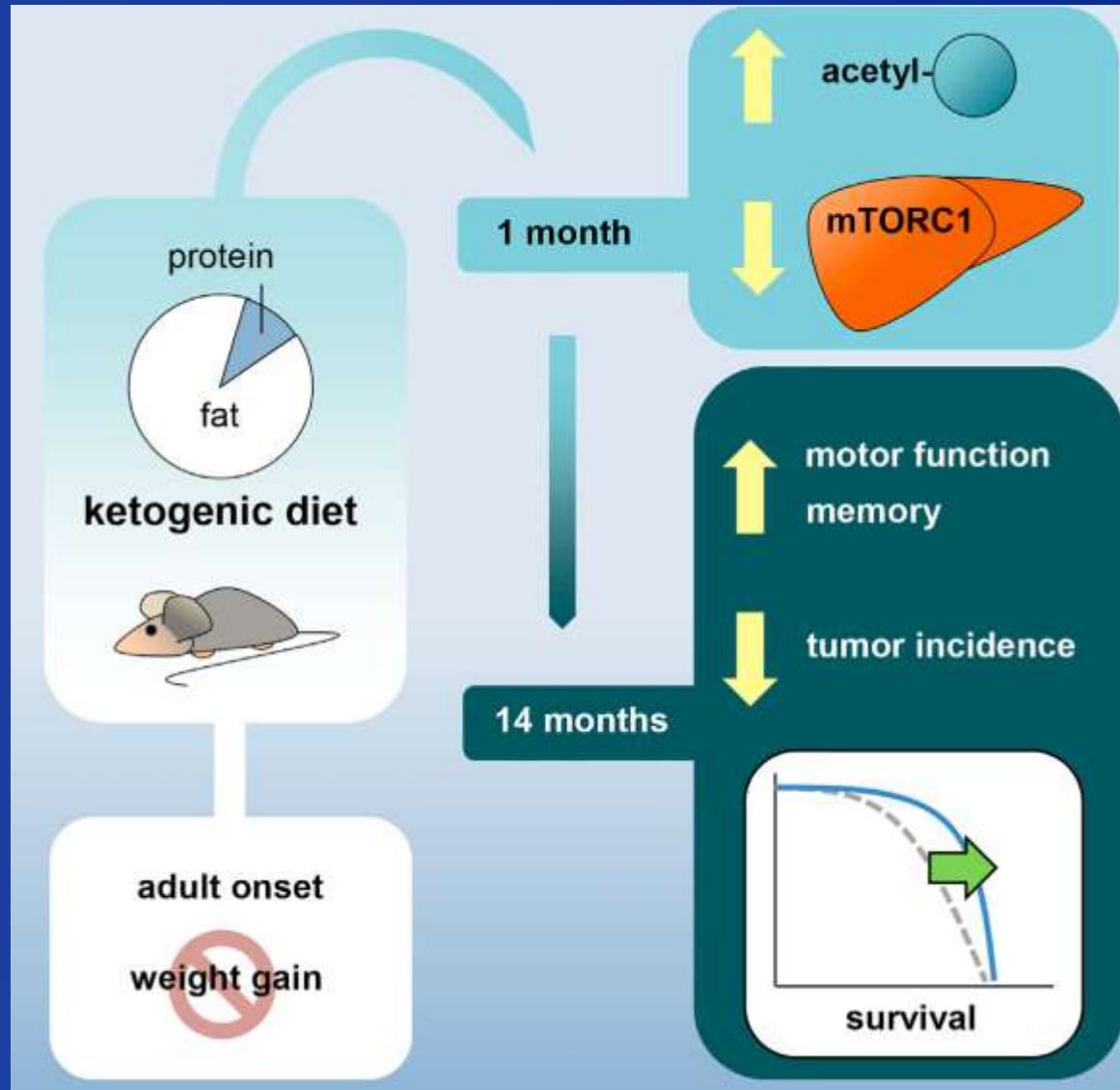
Equity: HEAL Diabetes Clinics (Healclinics.com)
(Teaching and clinical care using LCHF)

Equity: Adapt Your Life, Inc. (Adaptyourlife.com)
(Designing and manufacturing LCHF-compatible products)

Mice Fed a Keto Diet

- Objective: to determine the effect of a low carbohydrate ketogenic diet (KD) on longevity
- At 12 months of age, C57BL/6 mice were randomized to KD (89% FAT), LCD (70% FAT), or control (65% CHO)
- Median lifespans were KD=1,003, LCD=943, and control=886 days ($p < 0.05$, KD vs control, +13%)
- This study demonstrates that energy-controlled high-fat LCDs are not detrimental to health, but rather a KD extends lifespan and slows age-related decline in physiological function in mice.

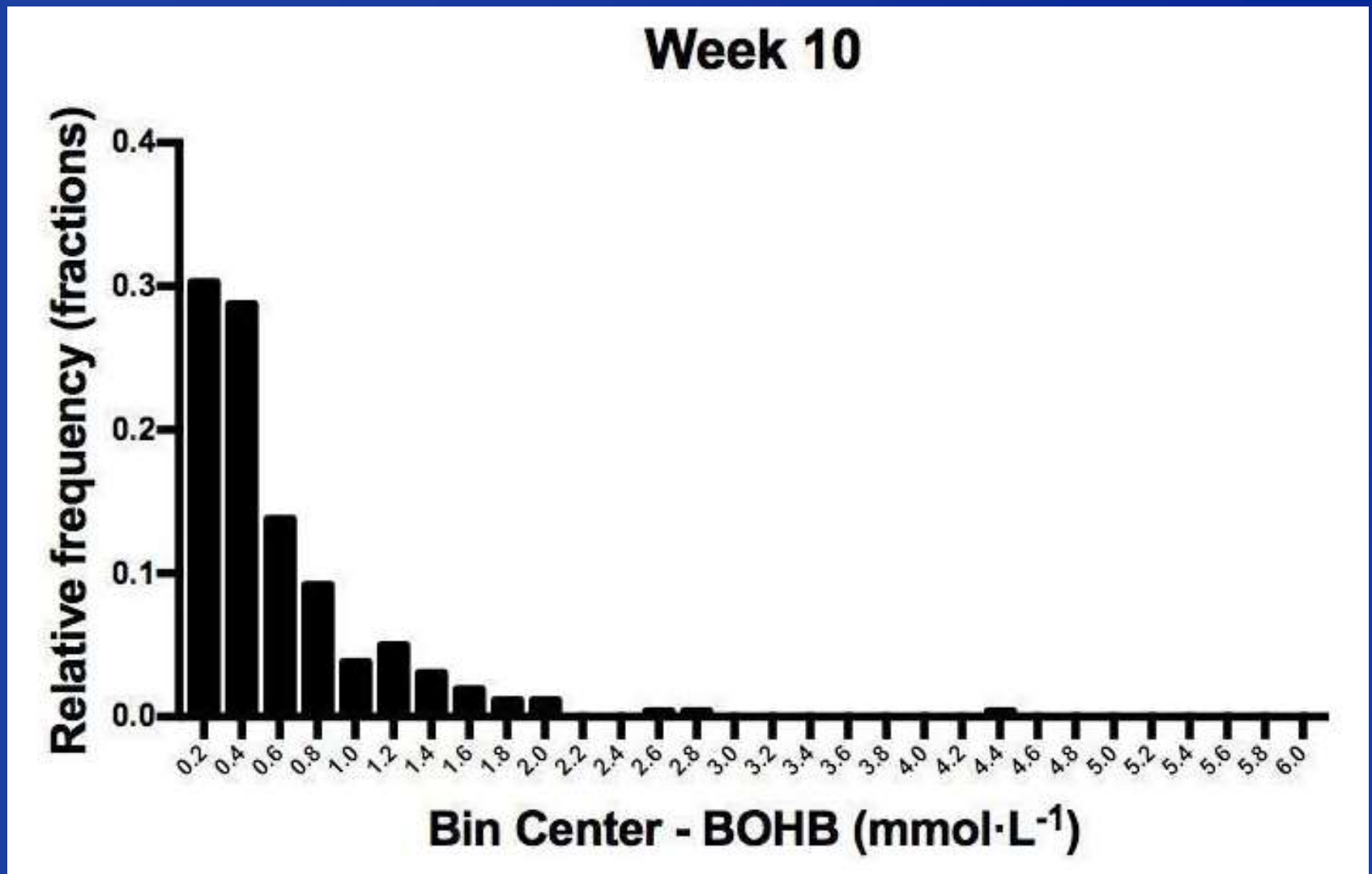
Mice Fed a Keto Diet



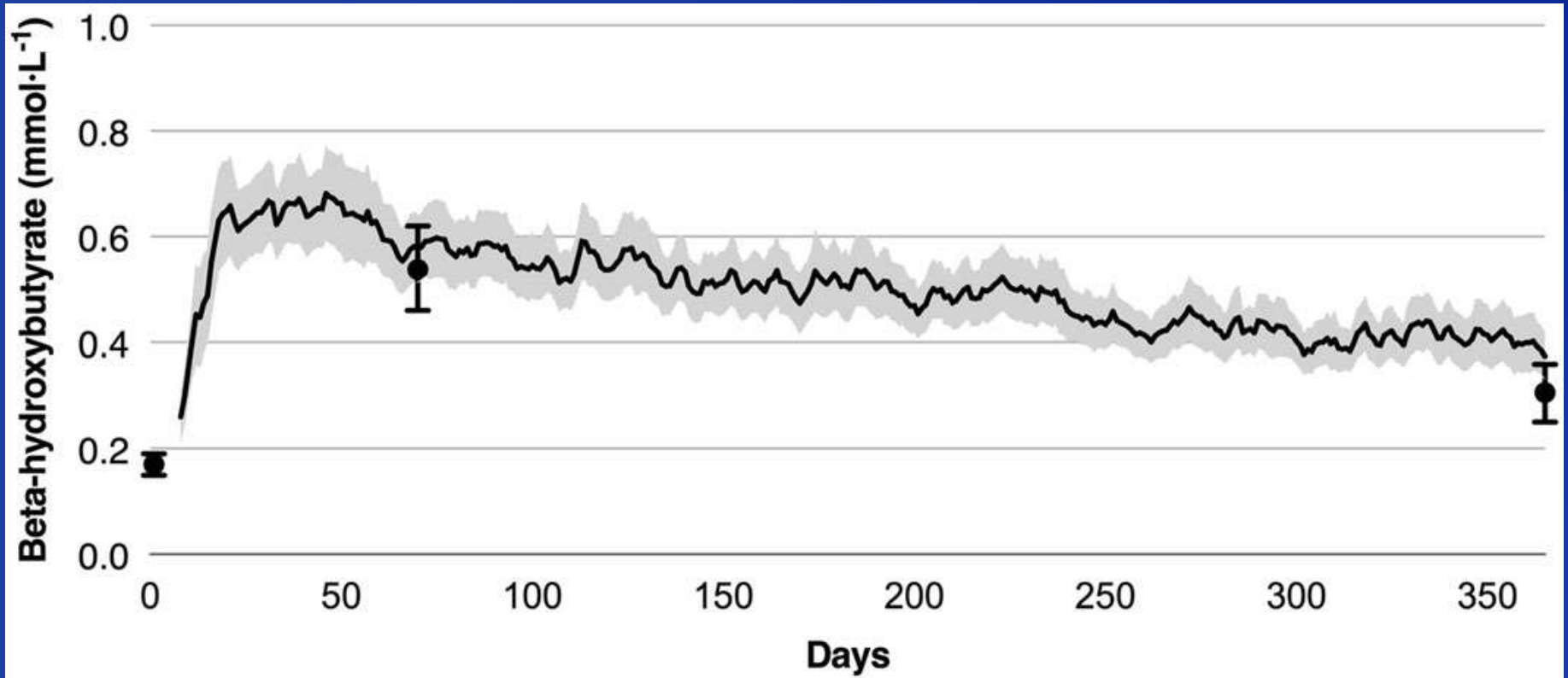
Effectiveness and Safety of a Novel Care Model for the Management of Type 2 Diabetes at 1 Year: An Open-Label, Non-Randomized, Controlled Study

- N=262, Type 2 diabetes, BMI 40.4, Caucasian
- Ketogenic diet taught through classes or web-based program
- Goal: nutritional ketosis for 1 year
- Blood ketones, body weight, “app”
- HbgA1c reduced from 7.6% to 6.3%
- Body weight change: - 14 kg
- Insulin therapy was reduced or eliminated in 94% of the 78 subjects on insulin

Blood Beta-Hydroxybutyrate Distribution



Blood Beta-Hydroxybutyrate Over Time



Effect of Low-Fat vs Low-Carbohydrate Diet on 12-Month Weight Loss in Overweight Adults and the Association With Genotype Pattern or Insulin Secretion The DIETFITS Randomized Clinical Trial

- BMI 33, 60% Caucasian, 20% Hispanic
- Diabetes excluded
- Weight change over 12 months
 - Low Fat: -5.3 kg
 - Low Carb: -6.0 kg
- “Low carb” defined as 30% daily caloric intake (90-120 grams of carbohydrate per day)
- Not a “keto” study

The DIETFITS Randomized Clinical Trial

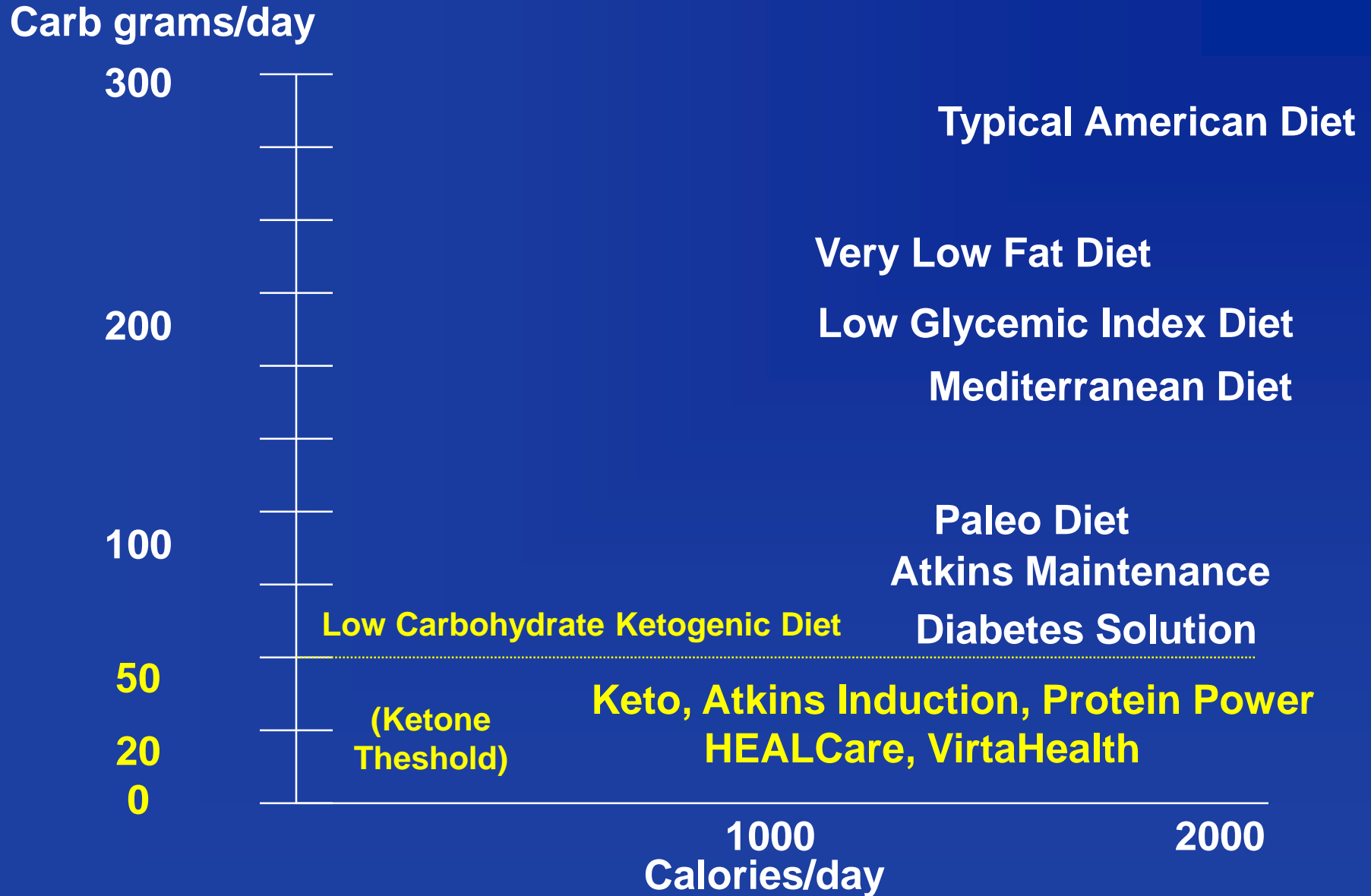
Table 2. Dietary Intake by Time Point

	Healthy Low-Fat Diet		Healthy Low-Carbohydrate Diet		Mean Between-Group Difference (95% CI) ^a
	No. of Participants	Mean (SD)	No. of Participants	Mean (SD)	
Total Energy Intake, kcal					
Baseline	304	2148.1 (39.4)	304	2222.8 (37.5)	-76.3 (-166.1 to 13.4)
3 mo	274	1515.0 (27.7)	275	1580.8 (29.1)	-56.9 (-150.2 to 36.4)
6 mo	240	1624.4 (37.3)	251	1621.3 (33.2)	0.2 (-96.9 to 97.3)
12 mo	225	1716.1 (34.5)	224	1697.1 (32.1)	2.9 (-97.2 to 103.0)
Carbohydrates, g					
Baseline	304	241.8 (5.0)	304	246.5 (4.5)	-4.9 (-16.6 to 6.9)
3 mo	274	205.2 (4.3)	275	96.6 (3.4)	109.0 (96.8 to 121.2)
6 mo	240	211.2 (5.3)	251	113.2 (4.1)	95.6 (83.0 to 108.3)
12 mo	225	212.9 (5.0)	224	132.4 (4.2)	74.2 (61.2 to 87.2)
Carbohydrates, % kcal					
Baseline	304	44.5 (0.5)	304	44.0 (0.4)	0.5 (-1.1 to 2.1)
3 mo	274	52.6 (0.6)	275	23.1 (0.7)	29.4 (27.8 to 31.0)
6 mo	240	50.8 (0.7)	251	26.5 (0.7)	24.1 (22.4 to 25.8)
12 mo	225	48.4 (0.7)	224	29.8 (0.7)	17.8 (16.0 to 19.5)

The DIETFITS Randomized Clinical Trial

- Briefly, the main goals were to achieve maximal differentiation in intake of fats and carbohydrates between the 2 diet groups while otherwise maintaining equal intensity and an emphasis on high-quality foods and beverages. Thus, **participants were instructed to reduce intake of total fat or digestible carbohydrates to 20 g/d during the first 8 weeks.** Higher priorities for reduction were given to specific foods and food groups that derived their energy content primarily from fats or carbohydrates. For example, the reduction of edible oils, fatty meats, whole-fat dairy, and nuts was prioritized for the healthy low-fat group, whereas the reduction of cereals, grains, rice, starchy vegetables, and legumes was prioritized for the healthy low-carbohydrate group. **Then individuals slowly added fats or carbohydrates back to their diets in increments of 5 to 15 g/d per week until they reached the lowest level of intake they believed could be maintained indefinitely.** No explicit instructions for energy (kilocalories) restriction were given. Both diet groups were instructed to (1) maximize vegetable intake; (2) minimize intake of added sugars, refined flours, and *trans* fats; and (3) focus on whole foods that were minimally processed, nutrient dense, and prepared at home whenever possible.

Diets, Carbohydrates and Calories



Westman EC et al. Am J Clin Nutr 2007;86:276-84.

The DIETFITS Randomized Clinical Trial

Carb grams/day

300

200

100

50

20

0

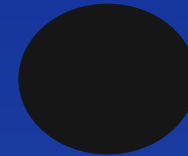
Baseline

“Low Fat”



200-210 g
-5.3 kg

“Low Carb”



90 -130 g
-6.0 kg

Low Carbohydrate Ketogenic Diet

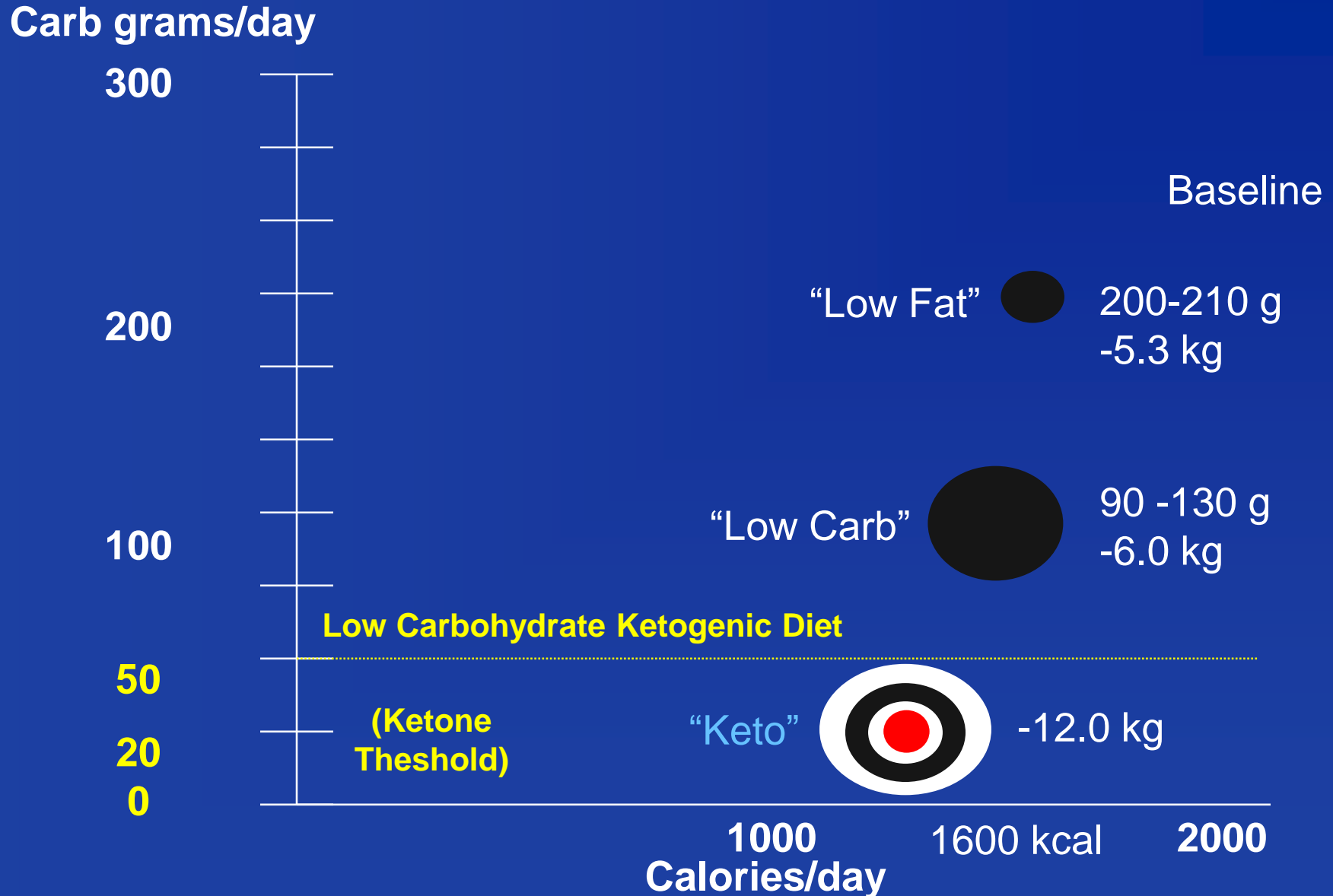
(Ketone
Theshold)

1000
Calories/day

1600 kcal

2000

Clinical Trial Comparison



Gardner CD et al JAMA 2018;319(7):667-679.

Hallberg SJ et al. Diabetes Ther 2008. Published online Feb 7, 2018.

Duke Lifestyle Medicine Clinic Experience

- Established 2006, uses LCHF as first-line therapy
- Number of patients seen: 4,023 in 28,008 clinic visits

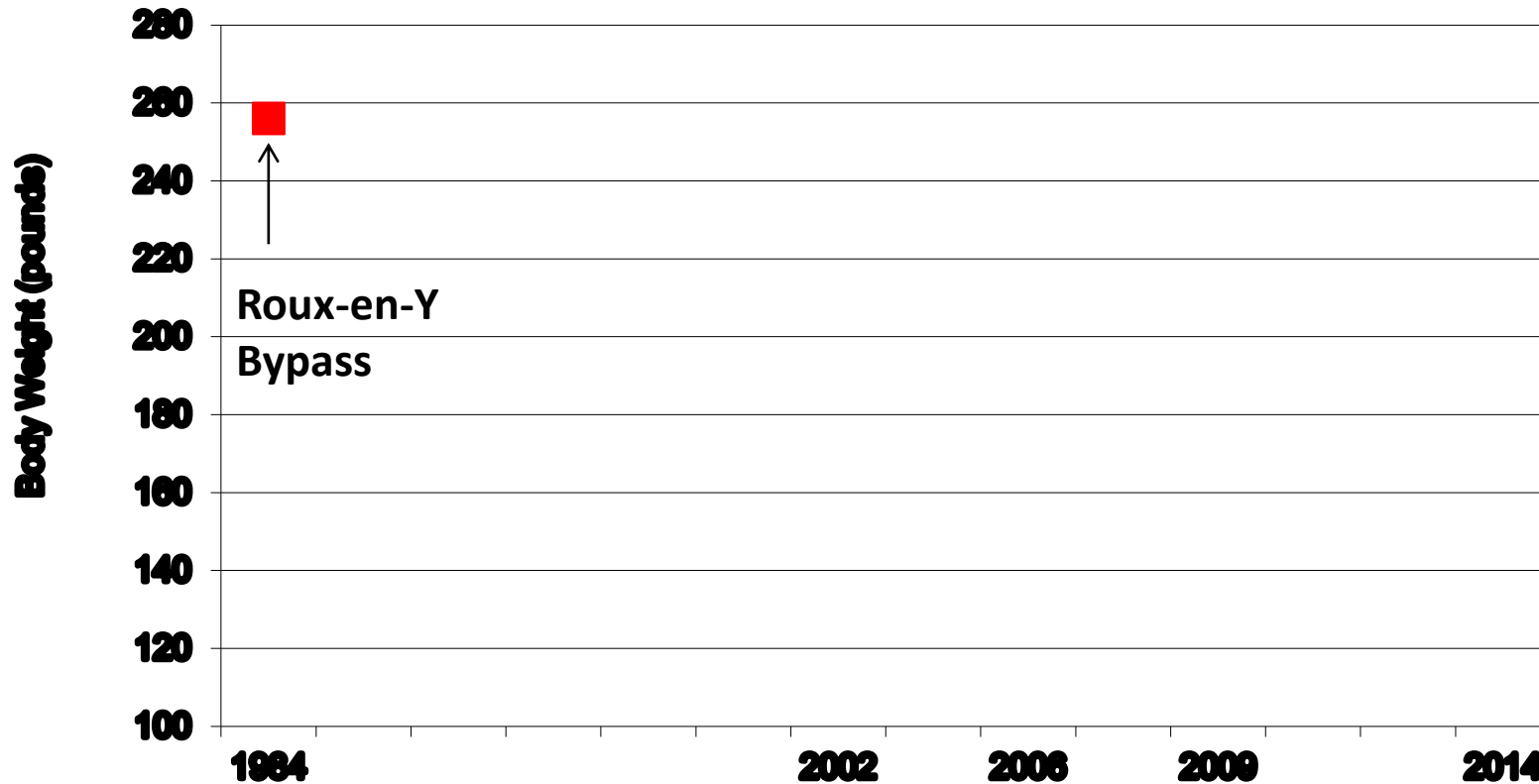
Patient Characteristics (average):

- Age, in years 50.5
- Gender 74% Female
- Race 53% Caucasian
41% African-American
- BMI, kg/m² 40.5
- Payor mix: about 50% private, 50% public insurance
- Last 2 years: 2,000 patients, 26,000 pounds lost!



Post Bariatric Surgery Lifestyle Change

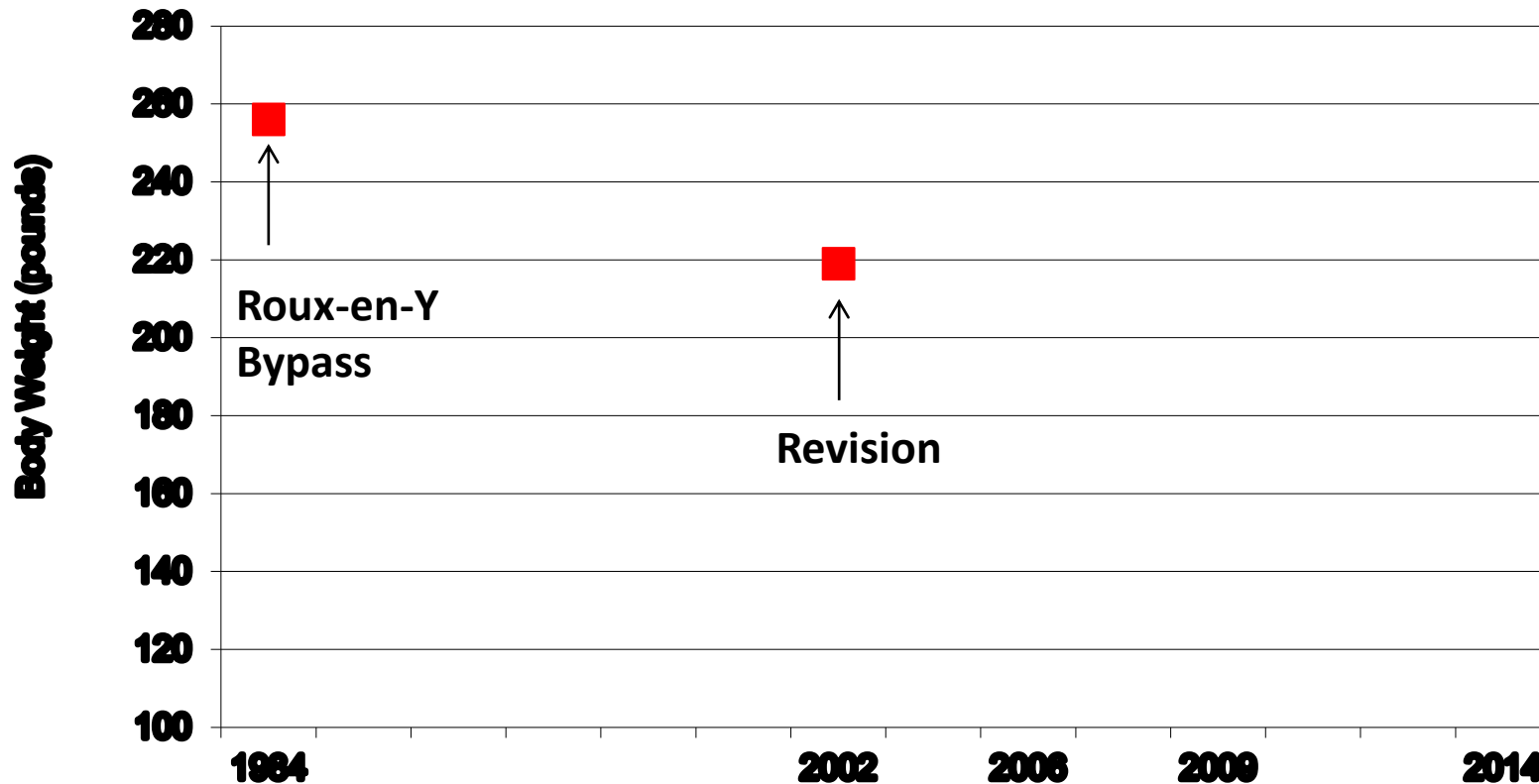
70 y/o White Female, BMI at Baseline 42.6 kg/m²





Post Bariatric Surgery Lifestyle Change

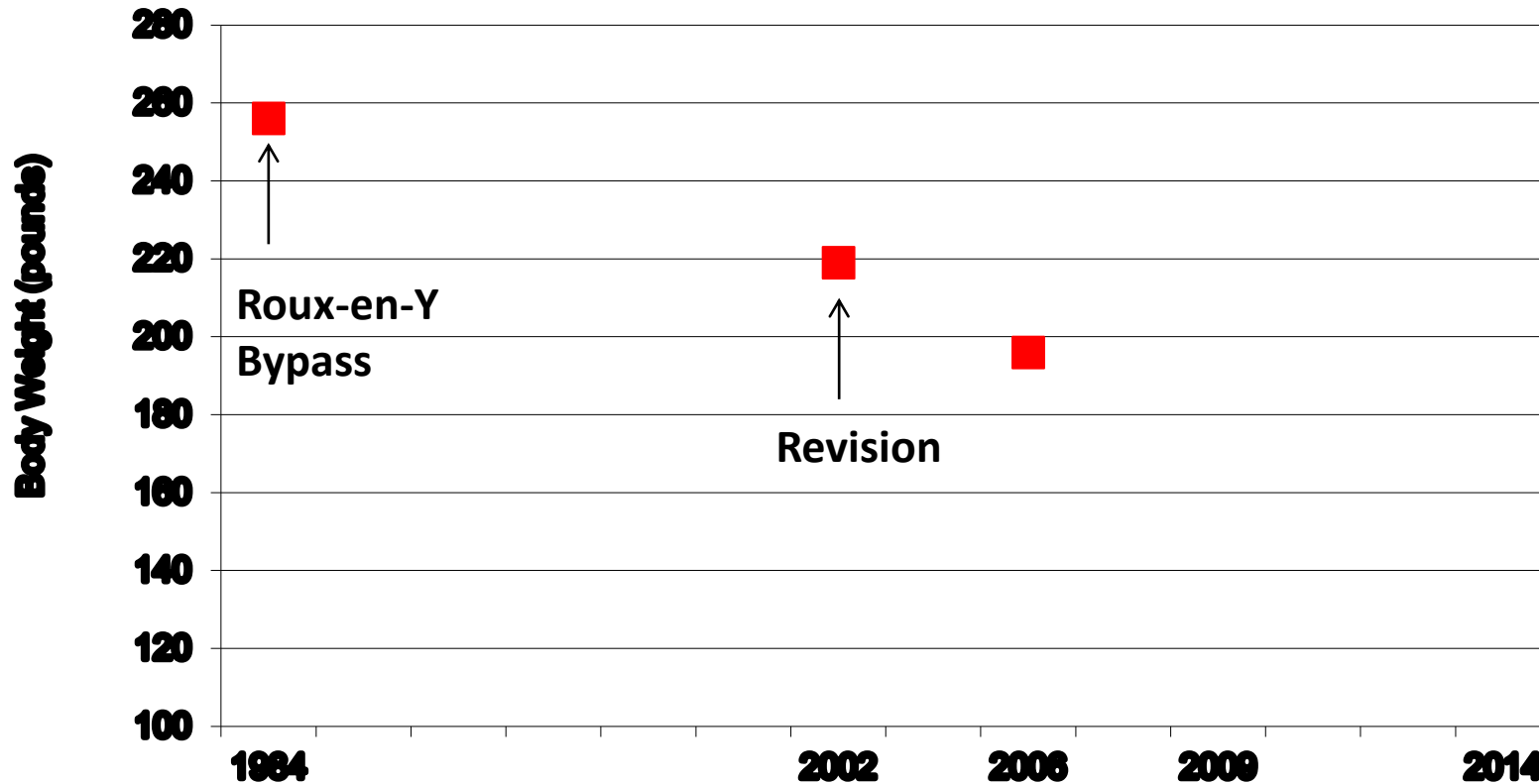
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Post Bariatric Surgery Lifestyle Change



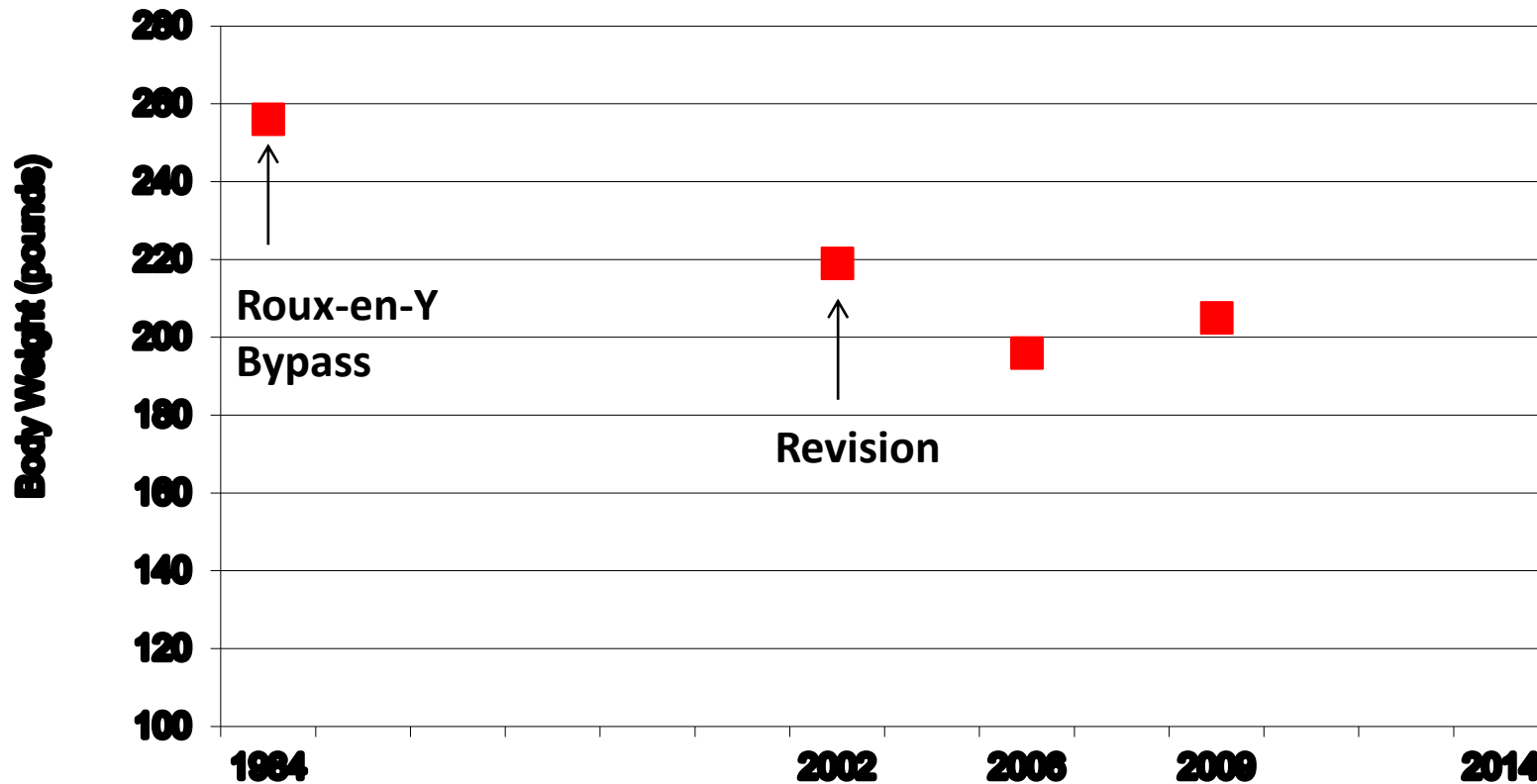
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Post Bariatric Surgery Lifestyle Change

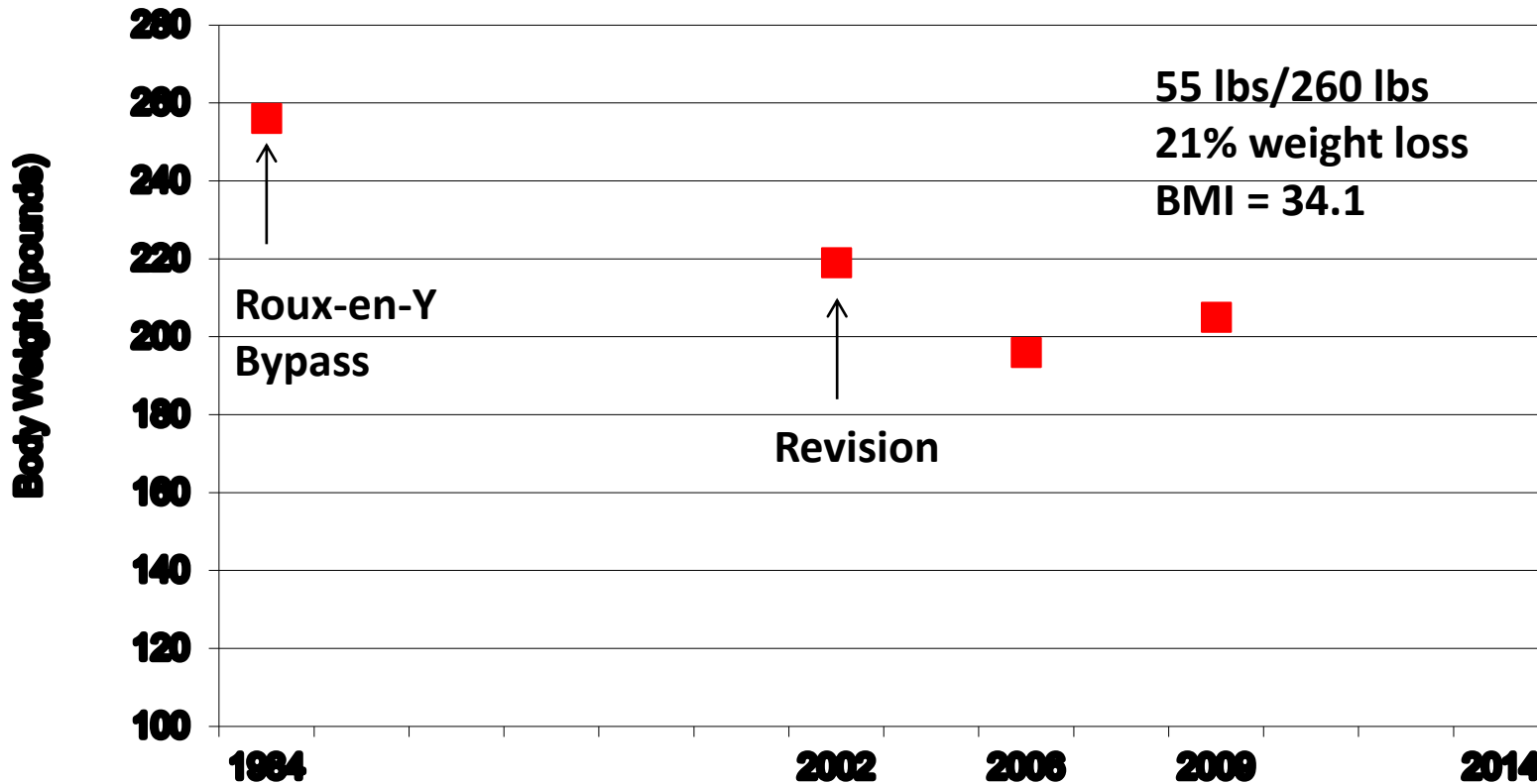
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Post Bariatric Surgery Lifestyle Change



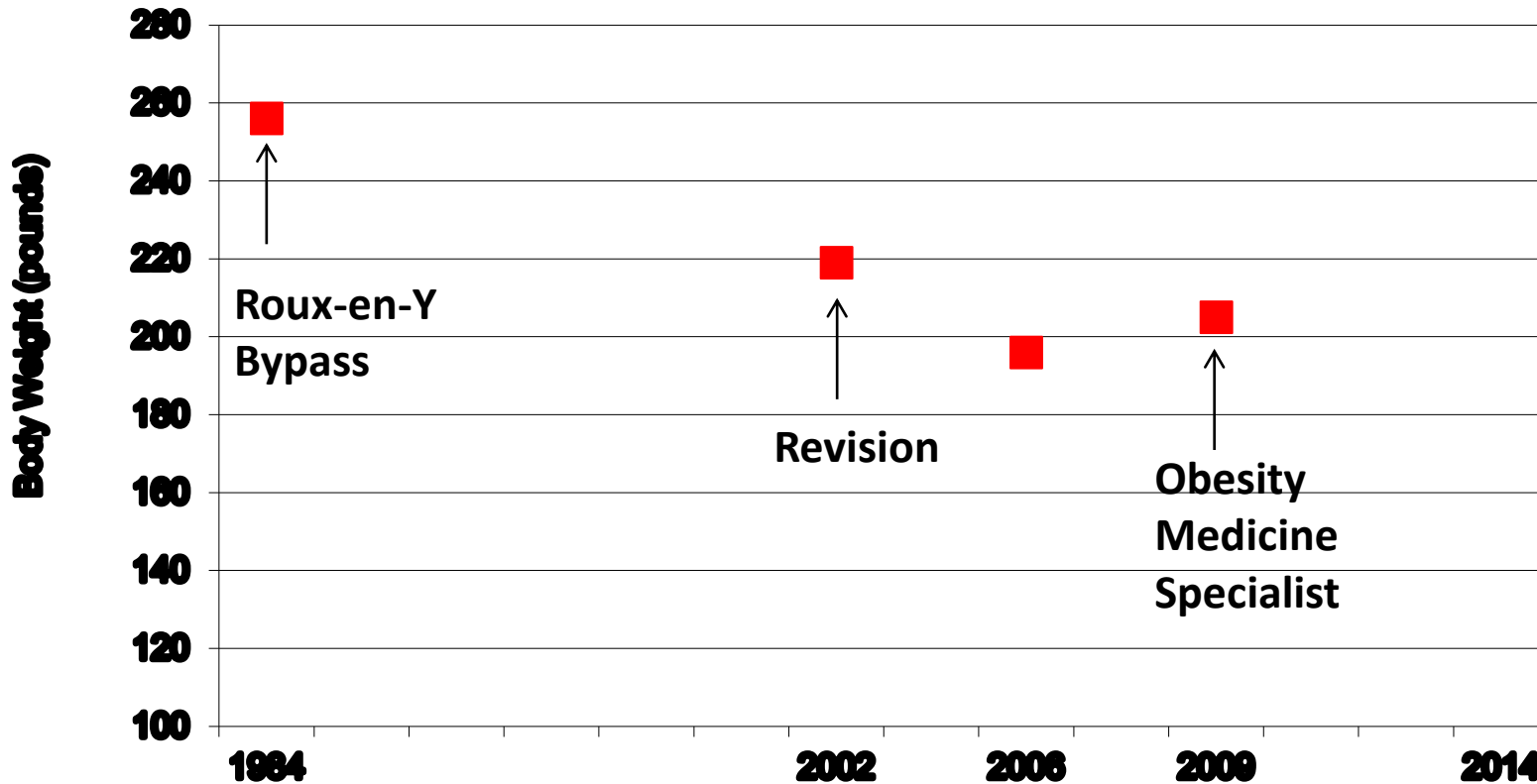
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Post Bariatric Surgery Lifestyle Change



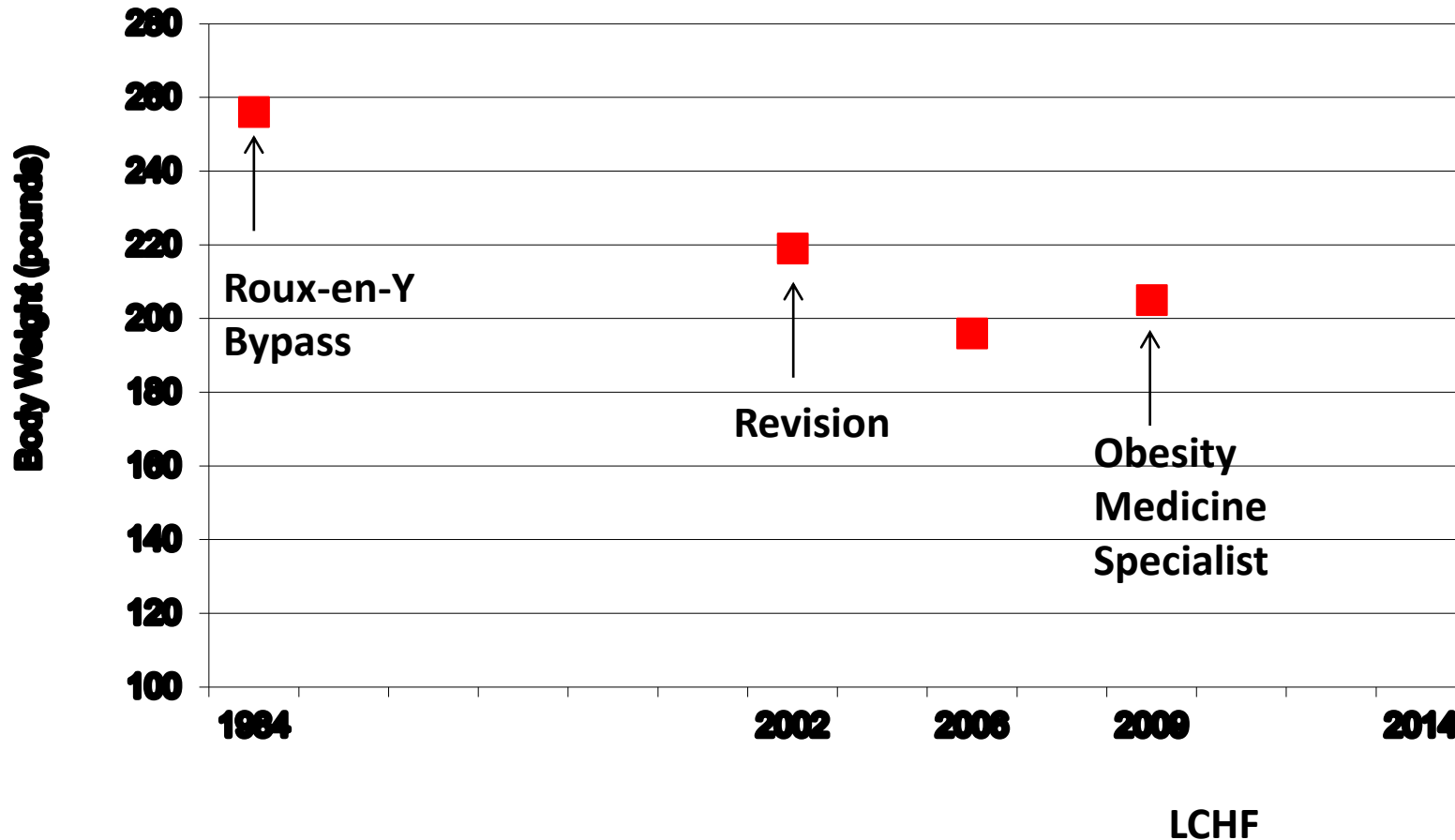
70 y/o White Female, BMI at Baseline 42.6 kg/m²





Post Bariatric Surgery Lifestyle Change

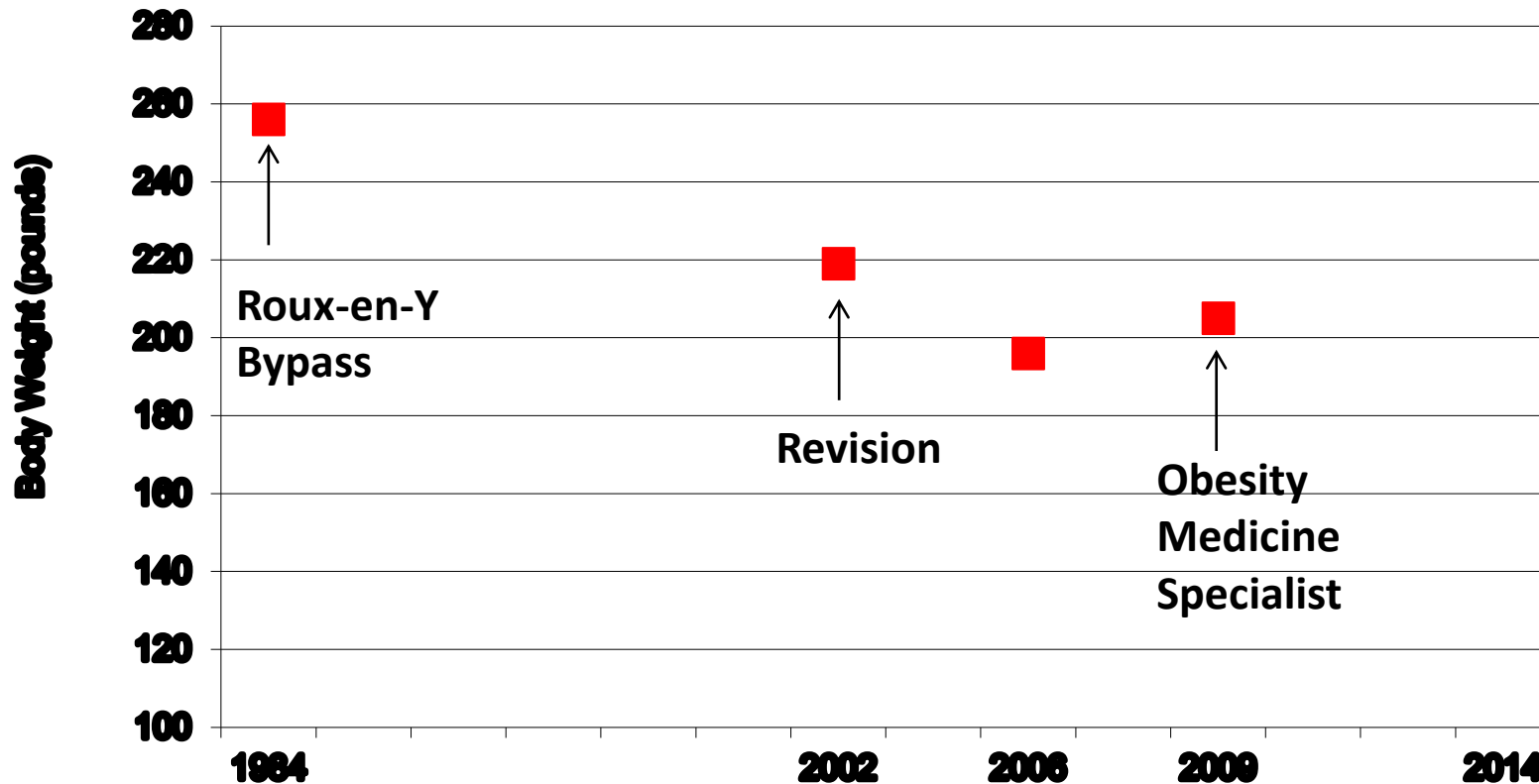
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Post Bariatric Surgery Lifestyle Change

70 y/o White Female, BMI at Baseline 42.6 kg/m²



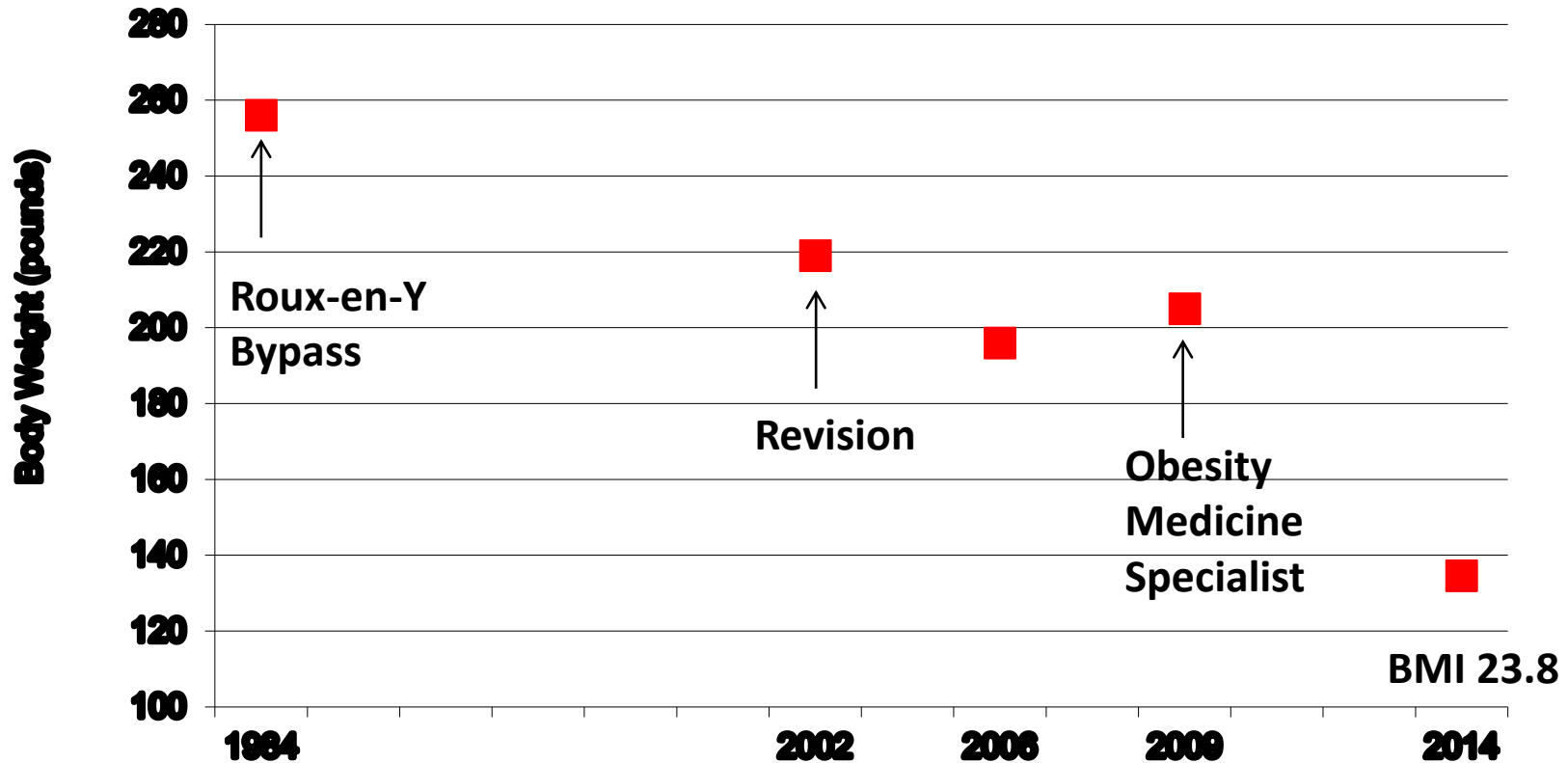
LCHF

Lasix, KCl



Post Bariatric Surgery Lifestyle Change

70 y/o White Female, BMI at Baseline 42.6 kg/m²

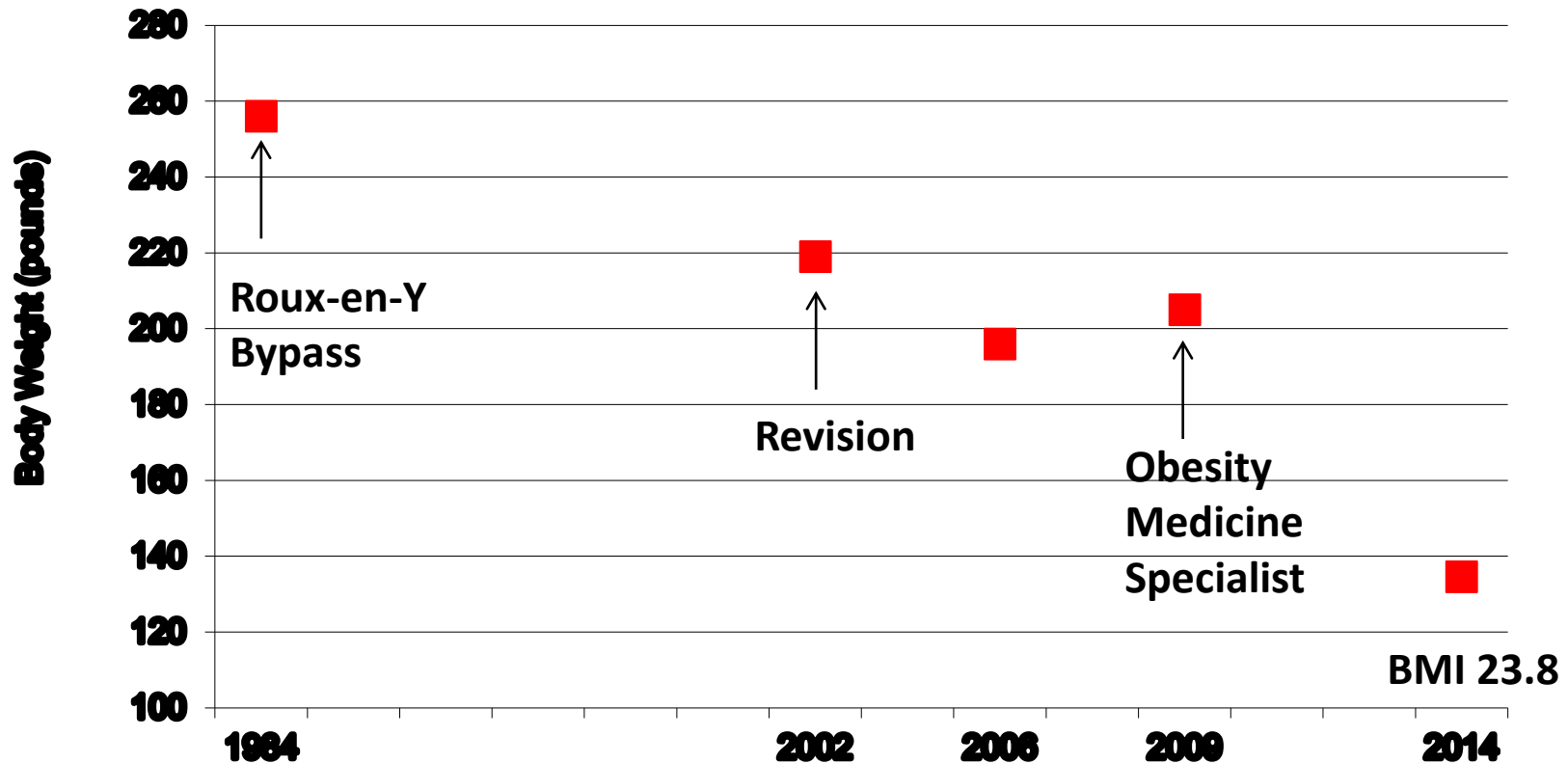


LCHF
Lasix, KCL



Post Bariatric Surgery Lifestyle Change

70 y/o White Female, BMI at Baseline 42.6 kg/m²



LCHF

Lasix prn

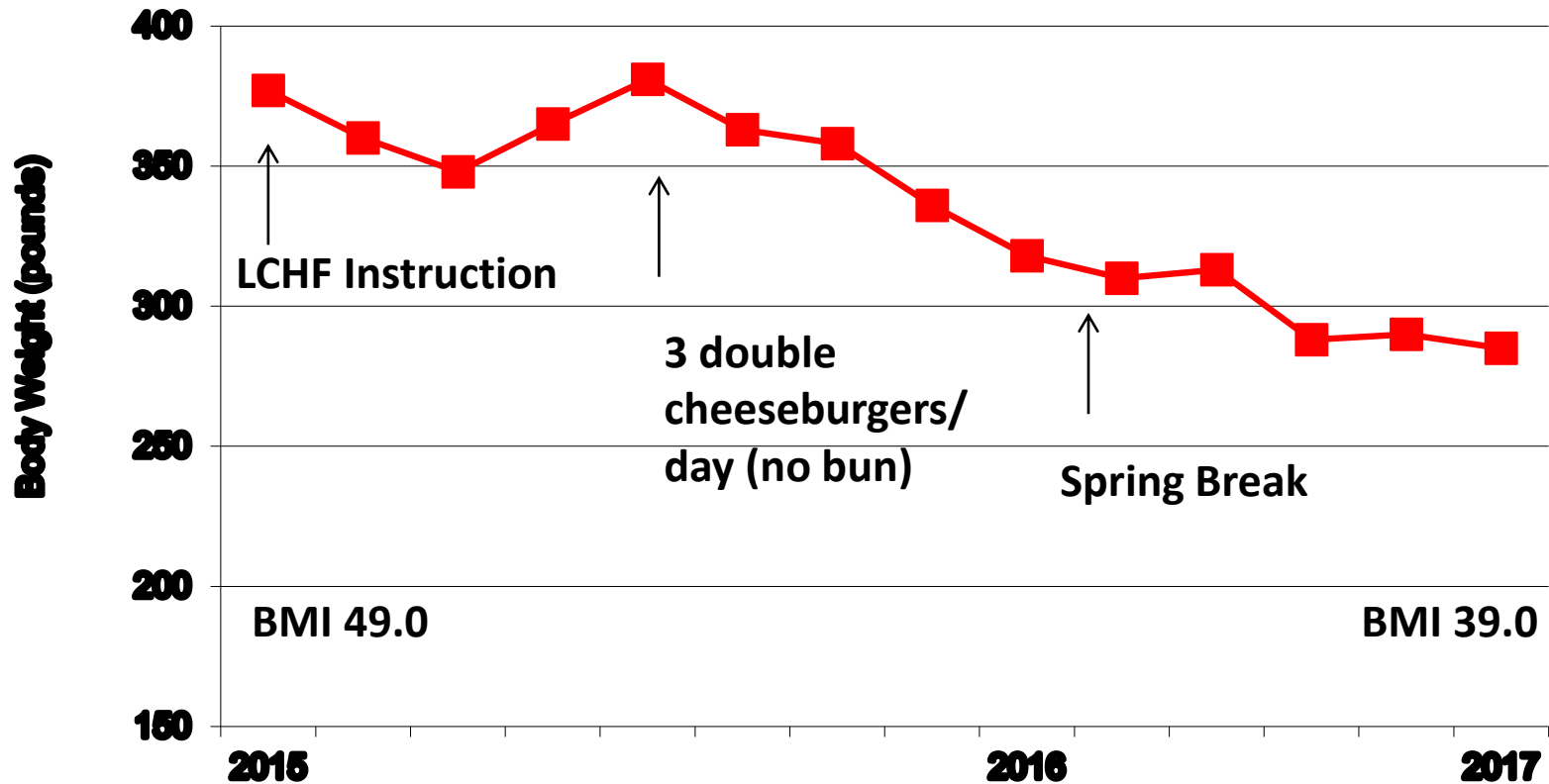
54 visits/5 years

\$4,050

Carb Quantity More Important Than Food Quality



25 y/o White Male, BMI at Baseline 49 kg/m²



LCHF
Multivitamin daily
\$3/day

Heart Failure

- 73 y/o WM with CHF, CKD, DM, EF 25%
- s/p LVAD implant x 5 years
- LCHF, “Keto” diet, + Na, water, Vit K restriction
- Home daily weights, home monitoring of PT INR
- Over 1 year, he has lost 44 pounds, from 313 to 269 pounds, exercise tolerance has improved
- Insulin decreased from 100 units to 45 units/day
- CRF: creatinine improved 1.8 to 1.5 mg/dL
- Most recent left ventricular ejection fraction = 40%
- Consideration of LVAD removal

Clinical Frontiers: Using Fat for Fuel

- McArdle disease is a rare disease of skeletal muscle metabolism which prevents stored muscle glycogen from being converted to glucose
- Nutritional ketosis changes the muscle fuel to fatty acids and ketones, thereby allowing better function
- At Low Carb USA, several individuals told their stories. Dr. Reason tracked them down.
- 3 patients (12 y/o female, 45 y/o female, 54 y/o male) followed a Ketogenic Diet > 6 months noted improvements in activity and exercise tolerance, and lower blood CK levels

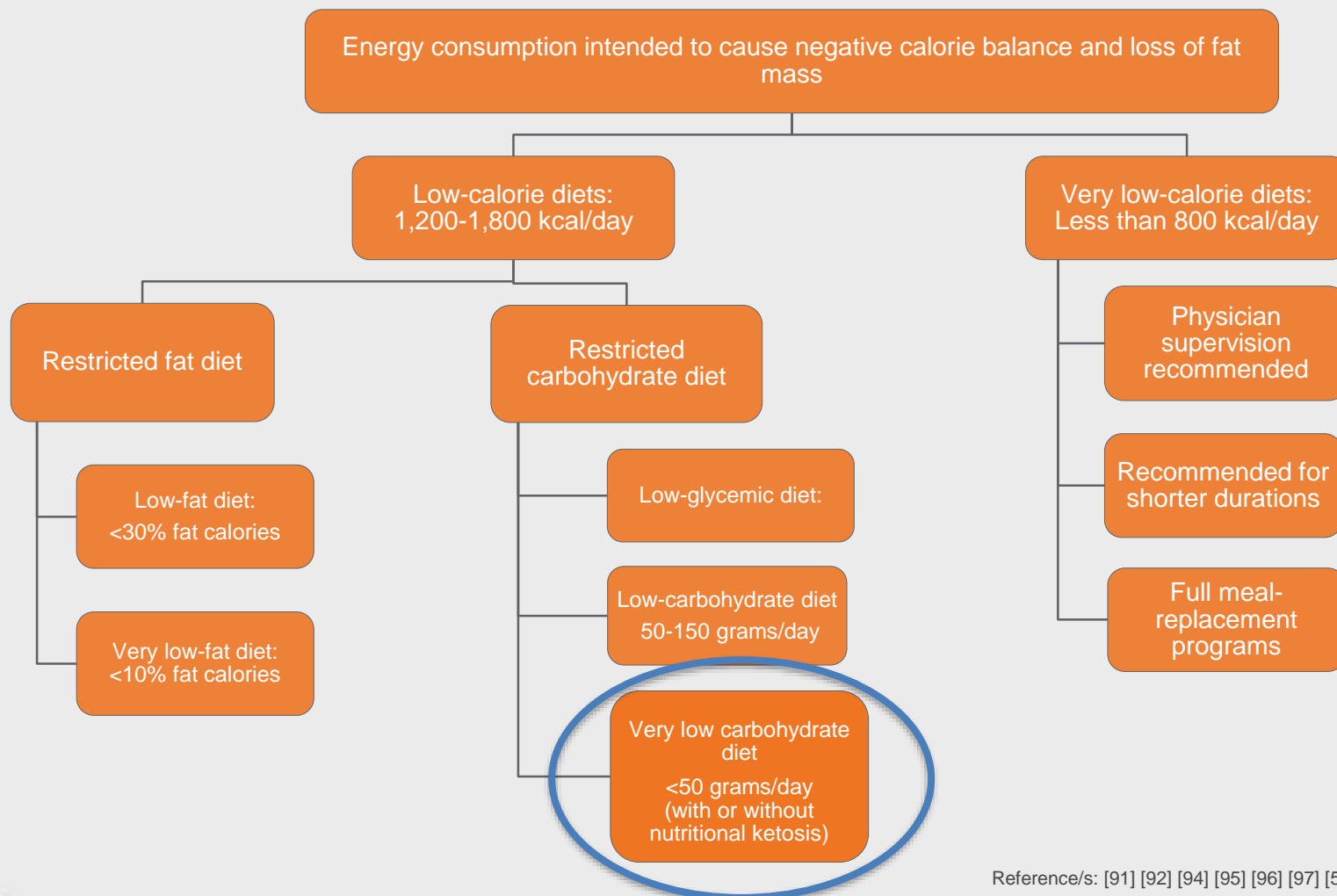
Clinical Alert

- Sodium-glucose cotransporter 2 (SGLT-2) inhibitors are a novel class of antihyperglycemic agents that inhibit glucose reuptake in the kidney
- SGLT-2 inhibitors can cause normoglycemic ketoacidosis on any diet, including a keto diet
- At the Duke clinic, we've seen 2 cases of SGLT-2 inhibitor-induced ketoacidosis in patients following a low carbohydrate ketogenic diet. The degree of acidosis was life-threatening.
- Stop SGLT-2 inhibitors when initiating a ketogenic diet

Hayami T et al. Case of ketoacidosis by a sodium-glucose cotransporter 2 inhibitor in a diabetic patient with a low-carbohydrate diet. *J Diabetes Invest* 2015; 6: 587–590.

Obesity Medicine Association

Obesity Algorithm: Nutritional Therapy for Obesity



Reference/s: [91] [92] [94] [95] [96] [97] [509]

Obesity Algorithm®. ©2015-2016 Obesity Medicine Association.

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Research & Clinical Update 2018

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