# The Battle of the Bulge: Overweight, Obesity and Adiposopathy

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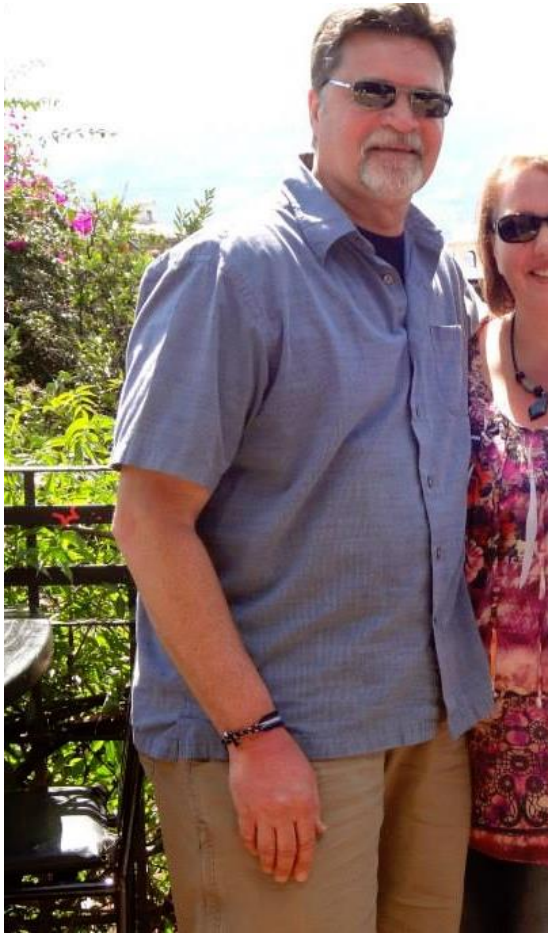
# Disclosure of Multiplicity of Interests
(2 years)

- None

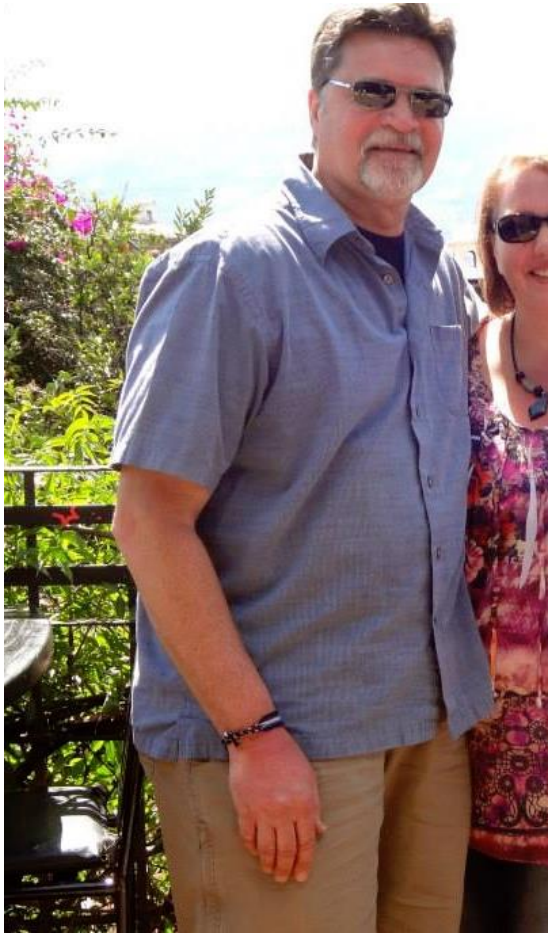
# CASE
# 55 year old man



"My wife is successfully losing weight, and I want to do the same"

- Fatigue
- Snoring
- Low back pain
- Libido loss

# CASE
# 55 year old man



BMI = 31.3 kg/m$^2$

Is he obese?

No, he is not!

Rather, he is a person who has obesity.

# Principles of Bariatric Endocrinology (1)

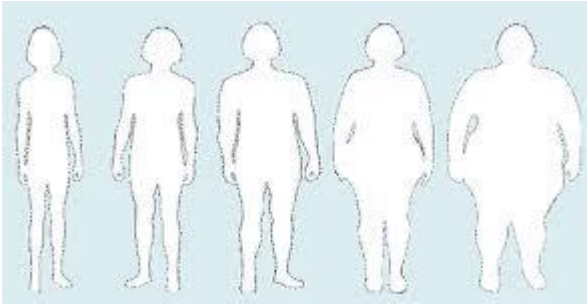
- Overweight and obesity are a continuum, and together represent a chronic, biological, preventable and treatable disease.



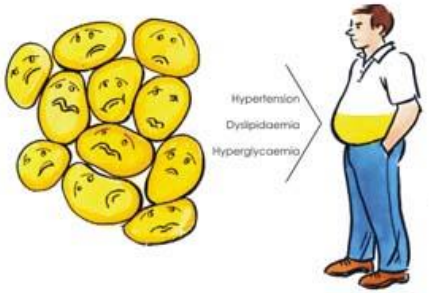
Gonzalez-Campoy et al. *Int. J. Endocrinology,* May, 2014

# Why is Obesity a disease?

- Physical changes (adiposity)



- Metabolic changes (adiposopathy)




- Psychological changes

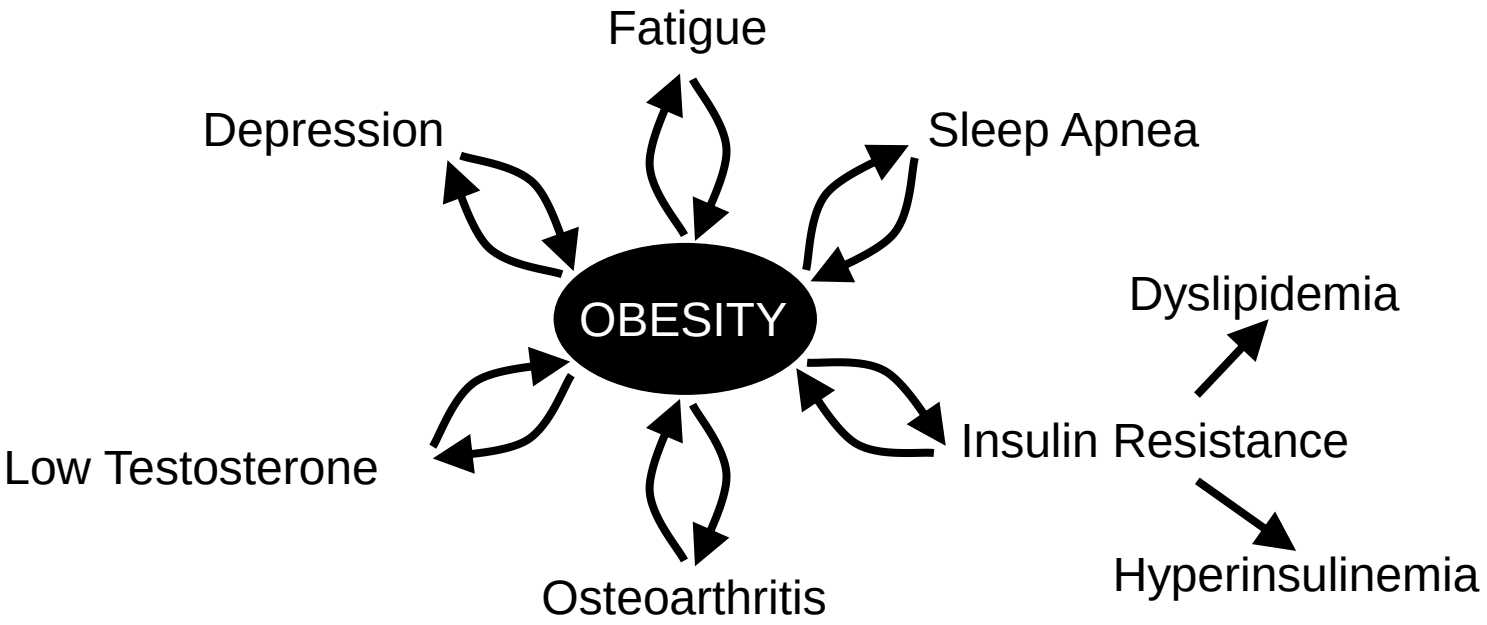
# Principles of Bariatric Endocrinology (2)

- Every patient who has overweight or obesity should be thoroughly evaluated for causes and complications of weight gain, including adipose tissue dysfunction (adiposopathy)



Gonzalez-Campoy et al. *Int. J. Endocrinology,* May, 2014

# Obesity Vicious Cycles






Gonzalez-Campoy et al. *Int. J. Endocrinology,* May, 2014

# MEDS

## Promote Weight Gain

- **Pyschiatric/Neuro**
  - Antipsychotics
  - Antidepressants
  - Lithium
  - Antiepileptics
- **Steroid hormones**
  - Prednisone
  - Estrogens, progestins
- **Diabetic agents**
  - Sulfonylureas, Thiazolidinediones, Insulin
- **Beta-adrenergic blockers**
- **Antihistamines**

## Help Maintain or lose Weight

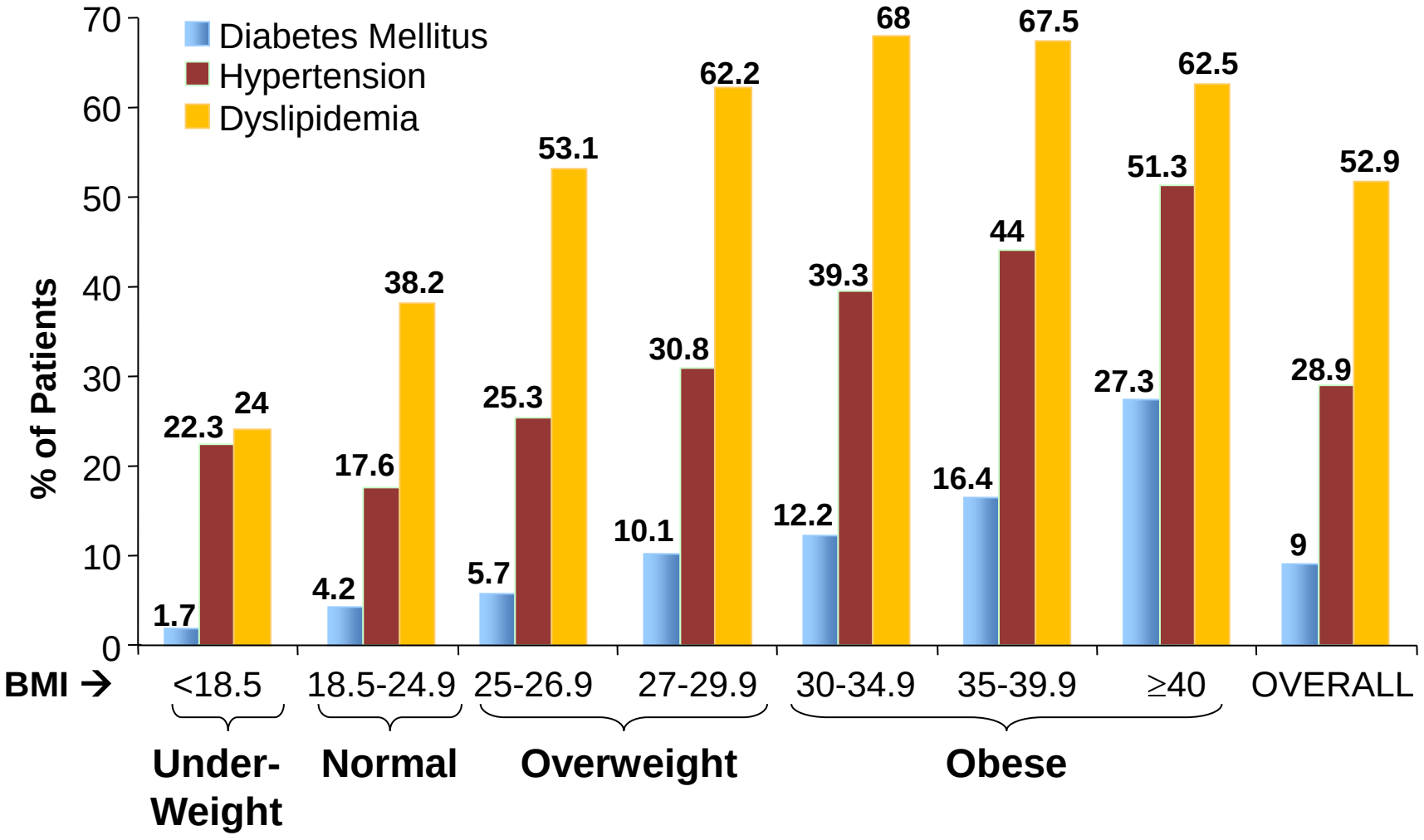
- **Pyschiatric/Neuro**
  - Ziprasodone
  - Celexa
  - Buproprion
  - Topiramate
- **Steroid hormones**
  - NSAID's
  - Barrier method
- **Diabetic agents**
  - Metformin, GLP-1 agonists, Pramlintide, α-glucosidase inhibitors, SGLT-2 blockers
- **ACE Inhibitors / ARBs**
- **Inhalers**

Is the classification of overweight and obesity based on BMI the best predictor of health risk?

# BMI does not always reflect adiposity

- Muscularity
- Edema states
  - CHF
  - Nephrotic Syndrome
  - Cirrhosis
  - Lymphedema
- Dehydration
- Sarcopenia (especially the elderly)
- Pregnancy

# BMI and Prevalence of Metabolic Disease by BMI -- NHANES 1999-2002

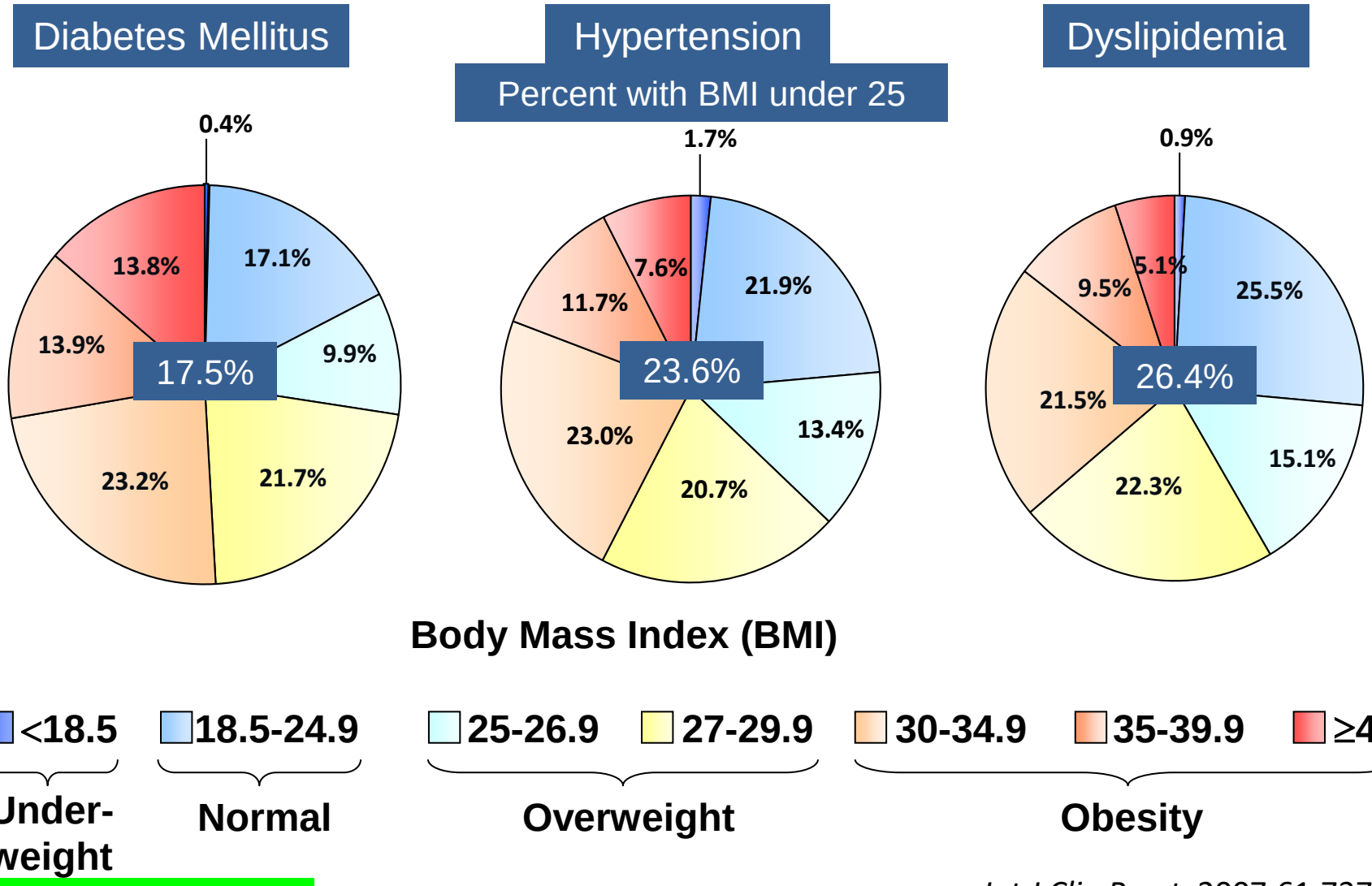



*Int J Clin Pract.* 2007;61:737-747.
*Am J Med.* 2009;122:S26-37.

Not all patients who have overweight or obesity by BMI criteria have adiposopathy (sick fat) with metabolic derangements

Not all patients with metabolic disease have overweight or obesity by BMI criteria

# BMI Among Patients With Metabolic Disease
# NHANES 1999-2002




*Int J Clin Pract.* 2007;61:737-747.
*Am J Med.* 2009;122:S26-37.

Why, for patients with a BMI under 25 $kg/m^2$, do so many have metabolic disorders?

# Adiposopathy

Harold Bays, MD

# Adiposopathy is functionally manifested by:

- Impaired adipogenesis and adipocyte hypertrophy
- Heterogeneous distribution -- visceral adiposity
- Adipocyte lipolysis in excess of lipogenesis
  - Increased free fatty acids
- Pathogenic adipose tissue endocrine responses
  - i.e. Hypoadiponectinemia // Hyperleptinemia
- Pathogenic adipose tissue immune responses
- Pathogenic crosstalk between fat and other organs



Bays, H. Int J Clin Pract. 2008 Oct;62(10):1474-83

# Adiposopathy is anatomically manifested by:

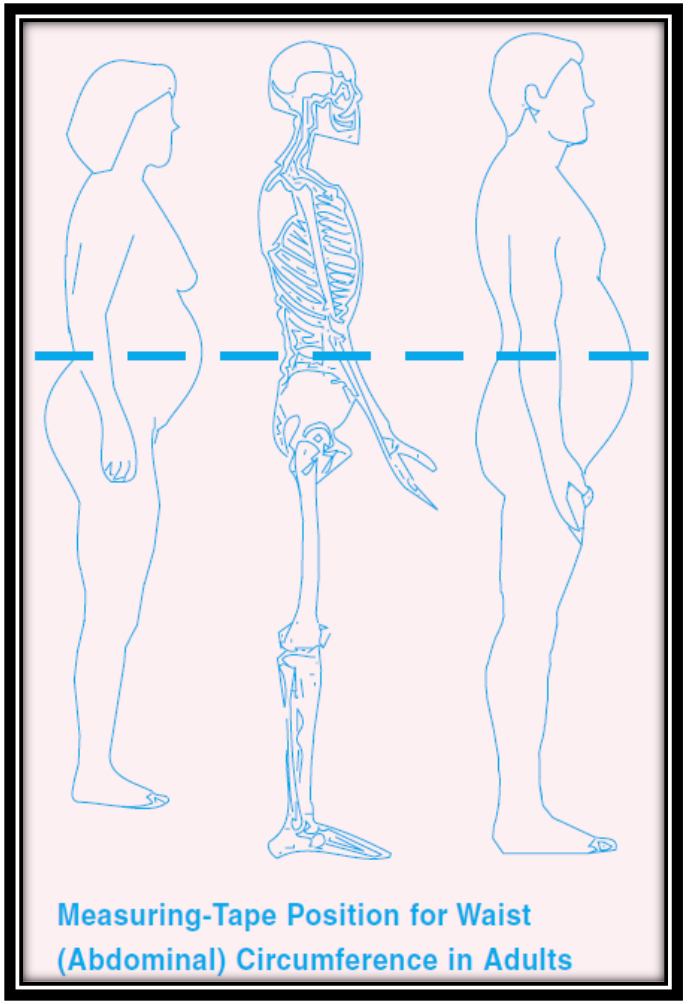
- Adipocyte hypertrophy
- Visceral adiposity
- Growth of adipose tissue beyond its vascular supply
- Increased number of adipose tissue immune cells
- Ectopic fat deposition (in other body tissues)

Bays HE et al. *Future Cardiology*. 2005;1(1):39-59
Bays HE. *Expert Rev Cardiovas Ther*. 2005;3(3):395-404
Bays HE, et. al. Expert Rev Cardiovas Ther 2008;6:343-68

Are there alternative ways to stratify health risk for patients who have overweight or obesity by BMI criteria?

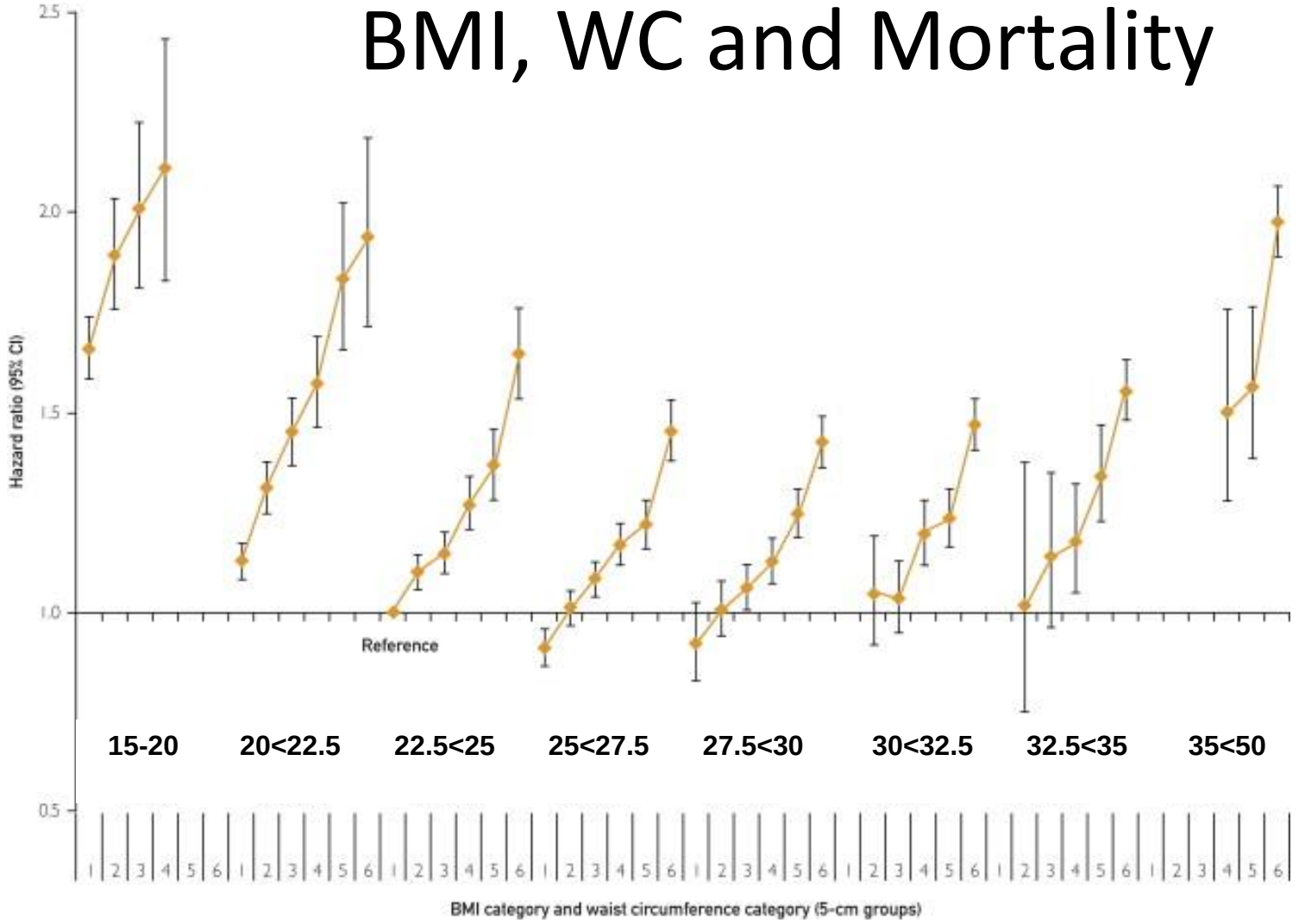
# Clinical Tools: Measuring Waist Circumference

- Locate the superior iliac crests and the lower rib margins
- Place measuring tape around abdomen above iliac crests, keeping it parallel to the floor
- Ensure tape is snug but not compressing the skin




NHLBI Obesity Education Initiative. Obesity in adults. http://www.nhlbi.nih.gov/guidelines/obesity/prctgd_c.pdf.

# BMI, WC and Mortality




**HR and 95% CIs for WC (5-cm increments) and all-cause mortality by BMI category** (men and women). Adjusted for educational level, marital status, smoking, alcohol, physical activity, and BMI. WC cut points were <90.0, 90.0 to 94.9, 95.0 to 99.9, 100.0 to 104.9, 105.0 to 109.9, and ≥110.0 cm for men and <70.0, 70.0 to 74.9, 75.0 to 79.9, 80.0 to 84.9, 85.0 to 89.9, and ≥90.0 cm for women.



Cerhan. Mayo Clinic Proceedings 2014; 89:335-345

# Ethnic Variations in Waist Circumference Risk Thresholds

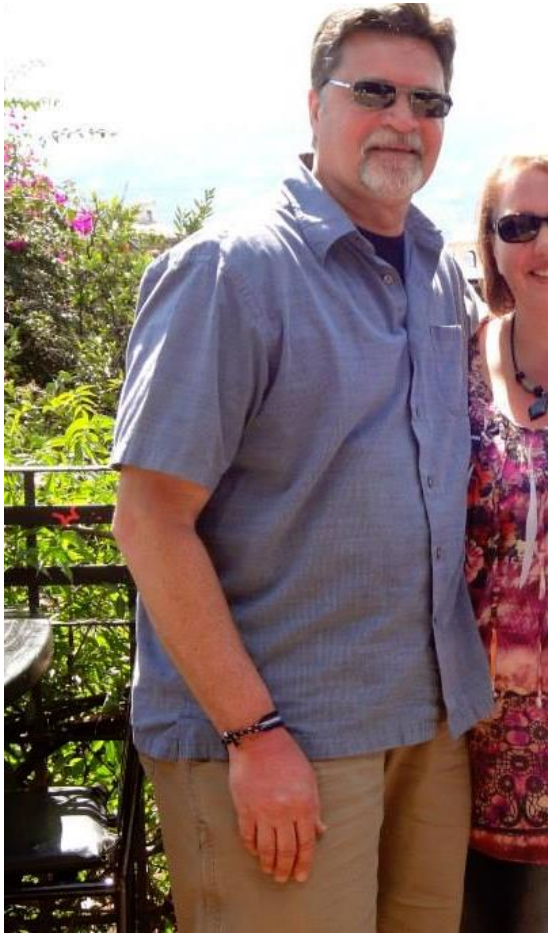
**Joint Recommendations of the IDF, NHLBI, AHA, WHF, IAS, and IASO**

| Ethnic/Regional Origin | Men, in (cm) | Women, in (cm) |
|---|---|---|
| Europid | ≥37 (94) | ≥31 (80) |
| Caucasian | ≥37 (94) | ≥31 (80) |
| North American, European | ≥40 (102) | ≥35 (88) |
| Asian | ≥35 (90) | ≥31 (80) |
| Middle Eastern, Mediterranean | ≥37 (94) | ≥31 (80) |
| Sub-Saharan African | ≥37 (94) | ≥31 (80) |
| Central and South American | ≥37 (94) | ≥31 (80) |



Alberti KGMM, et al. *Circulation.* 2009;120:1640-1645.

# CASE
# 55 year old man



BMI = 31.3 kg/m$^2$

WC = 44 inches

# Physical Examination
## The Patient with Obesity

- **Examination for complications of obesity**
  - Height, weight, and BMI
  - Distribution of adiposity – neck, WC, WHR
  - Abdomen – liver
  - Cardiovascular – SBP/DBP, heart, vessels, dyspnea
  - Muscular-skeletal – joints and gait
  - Extremities – edema, lymphedema, venous stasis
  - Skin – acanthosis nigricans, hirsutism, skin tags
- **Endocrine exam for causes of obesity**
  - Insulin resistance, thyroid, Cushing's syndrome

# Physical Examination

## Acanthosis and skin tags

# Physical Examination

## Acanthosis and skin tags

# Assessment of Body Composition

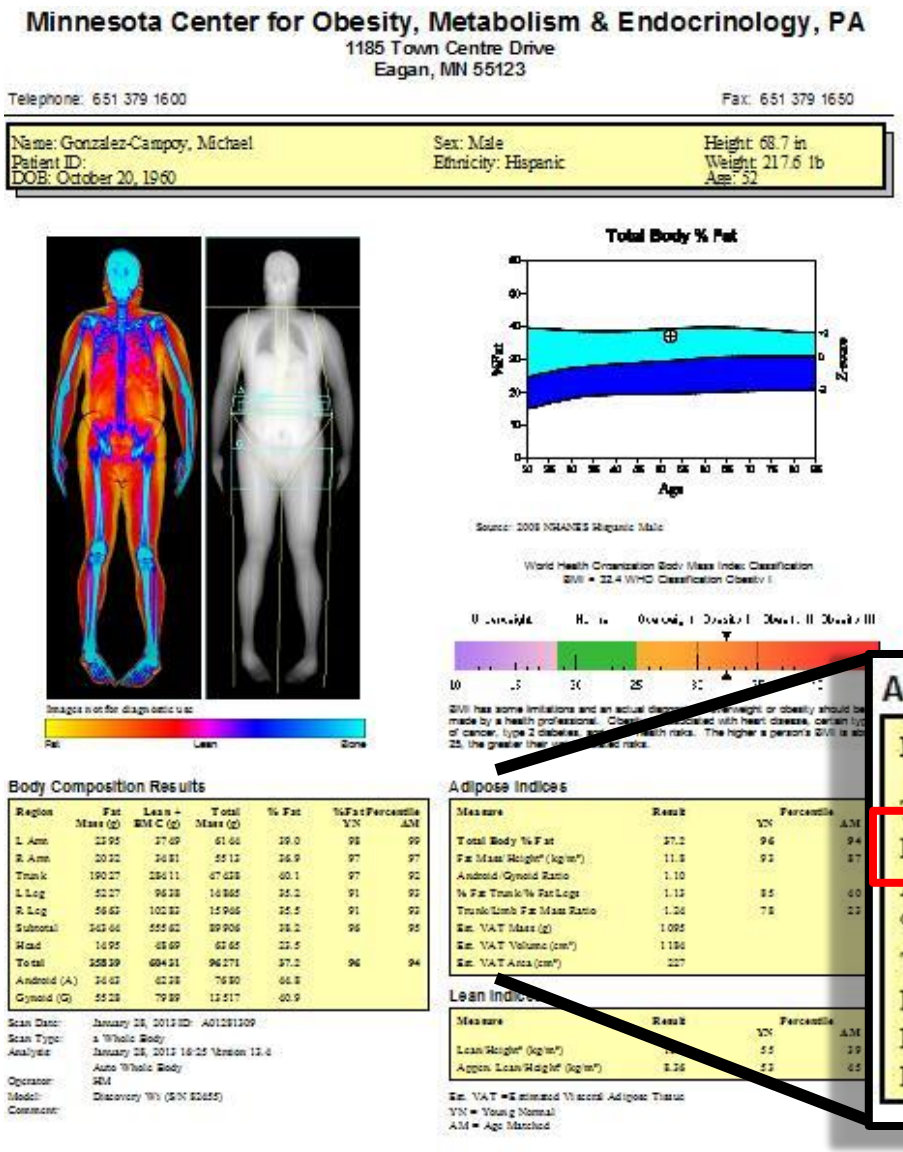
| Method | Feature measured | Advantages | Limitations |
|---|---|---|---|
| Bioelectrical impedance analysis (BIA) | Total body water<br>Extracellular and intracellular fluid spaces | Ease of use<br>Low cost<br>Speed (fast) | Population specific, poor accuracy in individuals |
| Dual-energy X-ray absorptiometry (DXA) | Total and regional body fat<br>Total and regional lean mass | Ease of use<br>Low radiation exposure<br>Accurate | Biased for body size, sex, fatness<br>High equipment cost<br>Specially trained personnel |
| Dilution techniques | Total body water<br>Extracellular fluid | Ease of use<br>OK for all ages | Inaccurate in disease<br>High equipment cost<br>Labor-intensive analysis |
| Air displacement plethysmography | Total body volume<br>Total body fat | Relatively good accuracy<br>Speed (fast) | Less accurate in disease<br>High equipment cost |
| 3D photonic scanning | Total and regional body volume | OK for very obese<br>Ease of use | Limited availability |
| Quantitative magnetic resonance | Total body water<br>Total body fat | Ease of use<br>Safety<br>Speed (fast) | High equipment cost<br>Limited availability |
| Magnetic resonance imaging (MRI) | Total and regional adipose tissue<br>Skeletal muscle | Highly accurate and reproducible | Costly |



Lee SY, Gallagher D. *Curr Opin Clin Nutr Metab Care*. 2008;11:566-572.

# DXA - BCA

# Fat Mass Index



**Minnesota Center for Obesity, Metabolism & Endocrinology, PA**
1185 Town Centre Drive
Eagan, MN 55123

Telephone: 651 379 1600 Fax: 651 379 1650

Name: Gonzalez-Campoy, Michael
Patient ID:
DOB: October 20, 1960

Sex: Male
Ethnicity: Hispanic

Height: 68.7 in
Weight: 217.6 lb
Age: 52

Total Body % Fat

Source: 2008 NHANES Hispanic Male

World Health Organization Body Mass Index Classification
BMI = 32.4 WHO Classification Obesity I

Body Composition Results

| Region | Fat Mass (g) | Lean + BMC (g) | Total Mass (g) | % Fat | %Fat Percentile YN | %Fat Percentile AM |
|---|---|---|---|---|---|---|
| L Arm | 2395 | 3769 | 6164 | 39.0 | 98 | 99 |
| R Arm | 2032 | 3681 | 5713 | 36.9 | 97 | 97 |
| Trunk | 19027 | 28411 | 47438 | 60.1 | 97 | 92 |
| L Leg | 5227 | 9638 | 14865 | 35.2 | 91 | 92 |
| R Leg | 5663 | 10283 | 15946 | 35.5 | 91 | 92 |
| Subtotal | 34366 | 55562 | 89928 | 38.2 | 96 | 95 |
| Head | 1495 | 6169 | 7665 | 19.5 | | |
| Total | 35839 | 60431 | 96271 | 37.2 | 96 | 94 |
| Android (A) | 3463 | 4238 | 7680 | 44.9 | | |
| Gynoid (G) | 5528 | 7989 | 13517 | 40.9 | | |

Scan Date: January 28, 2013 ID: A01281309
Scan Type: a Whole Body
Analysis: January 28, 2013 16:25 Version 12.4
Auto Whole Body
Operator: RM
Model: Discovery Wi (S/N 82655)
Comment:

Adipose Indices

| Measure | Result | Percentile YN | Percentile AM |
|---|---|---|---|
| Total Body % Fat | 37.2 | 96 | 94 |
| Fat Mass/Height² (kg/m²) | 11.8 | 93 | 87 |
| Android/Gynoid Ratio | 1.10 | | |
| % Fat Trunk/% Fat Legs | 1.13 | 85 | 40 |
| Trunk/Limb Fat Mass Ratio | 1.24 | 78 | 23 |
| Est. VAT Mass (g) | 1095 | | |
| Est. VAT Volume (cm³) | 1184 | | |
| Est. VAT Area (cm²) | 227 | | |

Lean Indices

| Measure | Result | Percentile YN | Percentile AM |
|---|---|---|---|
| Lean/Height² (kg/m²) | 16.1 | 55 | 39 |
| Appen. Lean/Height² (kg/m²) | 5.36 | 53 | 65 |

Est. VAT = Estimated Visceral Adipose Tissue
YN = Young Normal
AM = Age Matched

TRAR102 - NHANES RCA calibration

HOLOGIC

Fat weight (in kilograms), divided by the height (in meters squared).

# Fat Mass Index Classification

| Fat Mass Index (FMI) Class | Male | Female |
|---|---|---|
| Severe fat deficit | <2 | <3.5 |
| Moderate fat deficit | 2 to <2.3 | 3.5-<4 |
| Mild fat deficit | 2.3 to <3 | 4 to < 5 |
| Normal | 3 to 6 | 5 to 9 |
| Excess fat | >6 to 9 | >9-13 |
| Obese class I | > 9 to 12 | >13 to 17 |
| Obese class II | > 12 to 15 | >17 to 21 |
| Obese class III | > 15 | >21 |



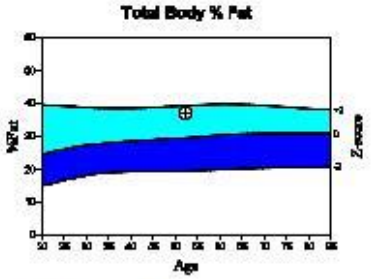
Bays. *J. Clinical Lipidology*, 2013: 7, 304-383

# Visceral Adipose Tissue (VAT)

**Minnesota Center for Obesity, Metabolism & Endocrinology, PA**
1185 Town Centre Drive
Eagan, MN 55123

Telephone: 651 379 1600 Fax: 651 379 1650

| | | |
|---|---|---|
| Name: Gonzalez-Campoy, Michael | Sex: Male | Height: 68.7 in |
| Patient ID: | Ethnicity: Hispanic | Weight: 217.6 lb |
| DOB: October 20, 1960 | | Age: 52 |




Source: 2008 NHANES Hispanic Male

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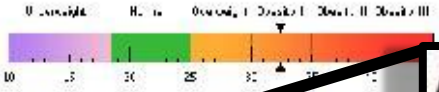

BMI has some limitations and an actual diagnosis of overweight or obesity should be made by a health professional. Obesity is associated with heart disease, certain types of cancer, type 2 diabetes, and other health risks. The higher a person's BMI is above 25, the greater their medical risks.




Images not for diagnostic use

**Body Composition Results**

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Est. VAT = Estimated Visceral Adipose Tissue
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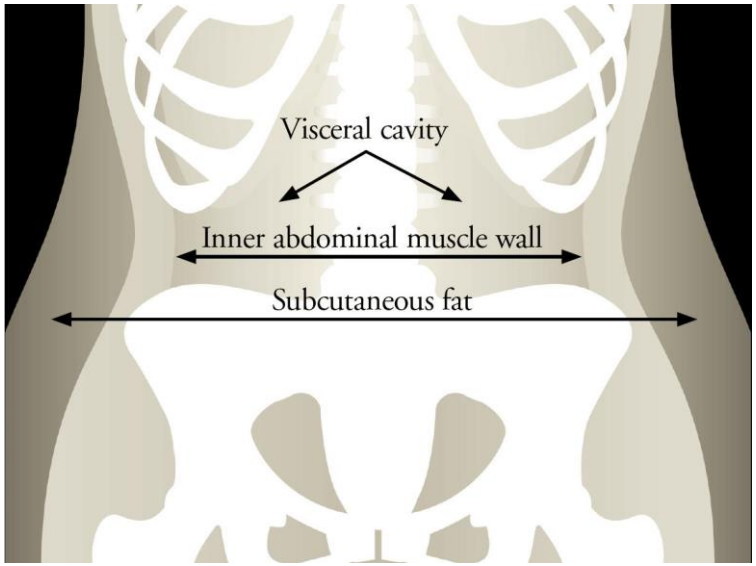


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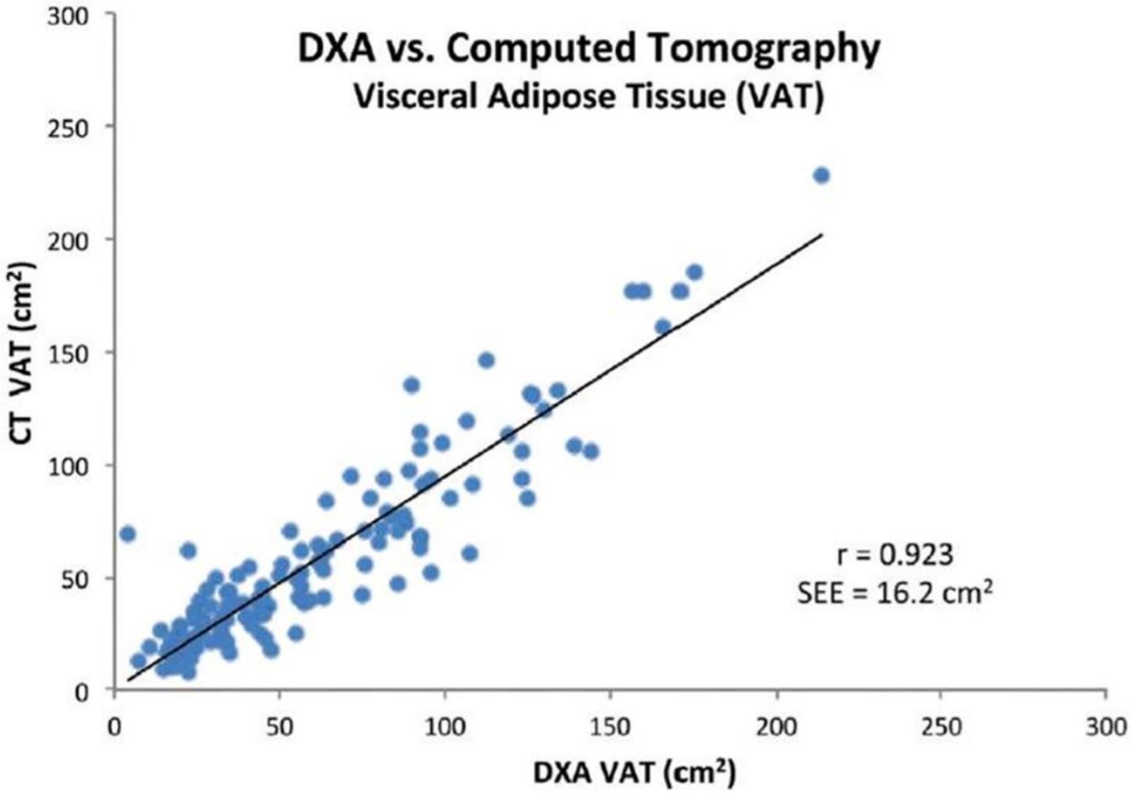
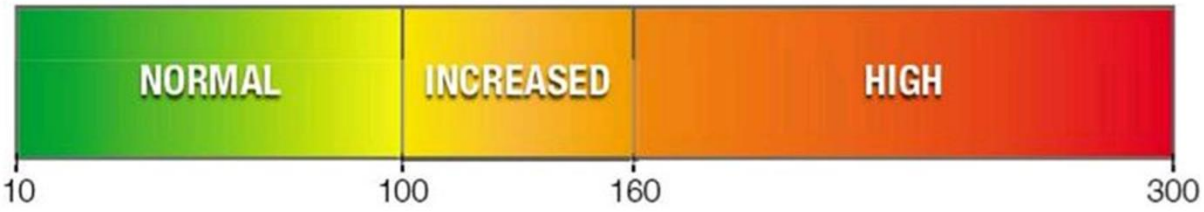
TRAR102 - NHANES RCA calibration

HOLOGIC

# Visceral Tissue Area




Risk of adiposopathy

Bays. *J. Clinical Lipidology*, 2013: 7, 304-383

What laboratory tests are appropriate to evaluate patients with overweight and obesity?

# Laboratory Testing

- **Primary screening tests**
  - CBC
  - A1c
  - Complete metabolic panel
  - Lipids
- **Secondary tests based on History and Exam**
  - Overnight oximetry
  - TSH
  - Testosterone
  - 25-hydroxyvitamin D
  - Indirect calorimetry



Gonzalez-Campoy et al. *Int. J. Endocrinology,* May, 2014

# Evaluation of Patients with Overweight or Obesity: Staging

| Diagnosis | Anthropometric Component: BMI kg/m$^2$ | Clinical Component | Prevention and/or Treatment |
|---|---|---|---|
| Normal | < 25 | | Primary |
| Overweight | 25 -29.9<br>(≥ 23 some ethnicities) | No obesity-related complications | Secondary |
| Obesity Stage 0 | ≥ 30 | No obesity-related complications | Secondary |
| Obesity Stage 1 | ≥ 25 | Presence of one or more mild to moderate obesity-related complications | Tertiary |
| Obesity Stage 2 | ≥ 25 | Presence of one or more severe obesity- related complications | Tertiary |



Garvey. Endocr Pract. 2014; 20:977-989

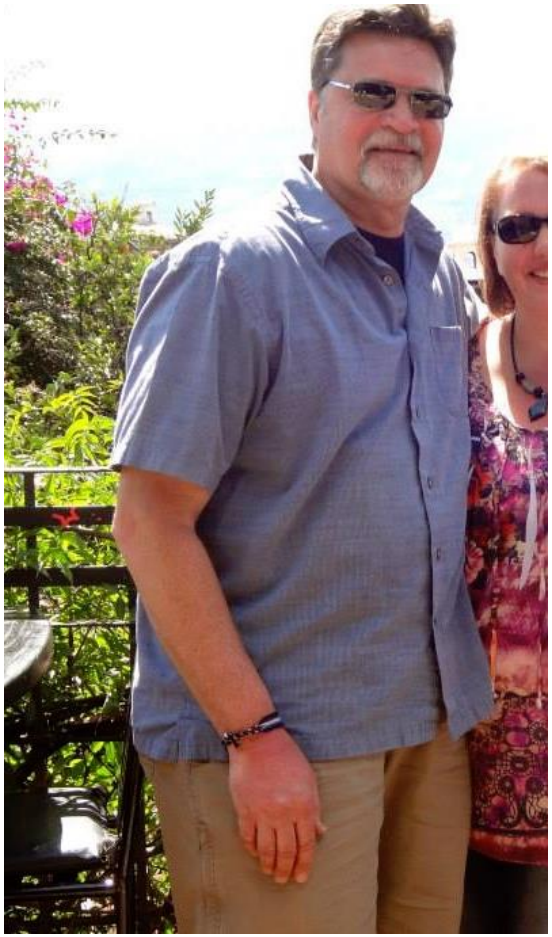
# Laboratory Testing in bariatric endocrinology

- C-reactive protein
- 11 pm salivary cortisol
- Gonadal axis evaluation
- Fasting insulin or c-peptide
- Leptin to adiponectin ratio



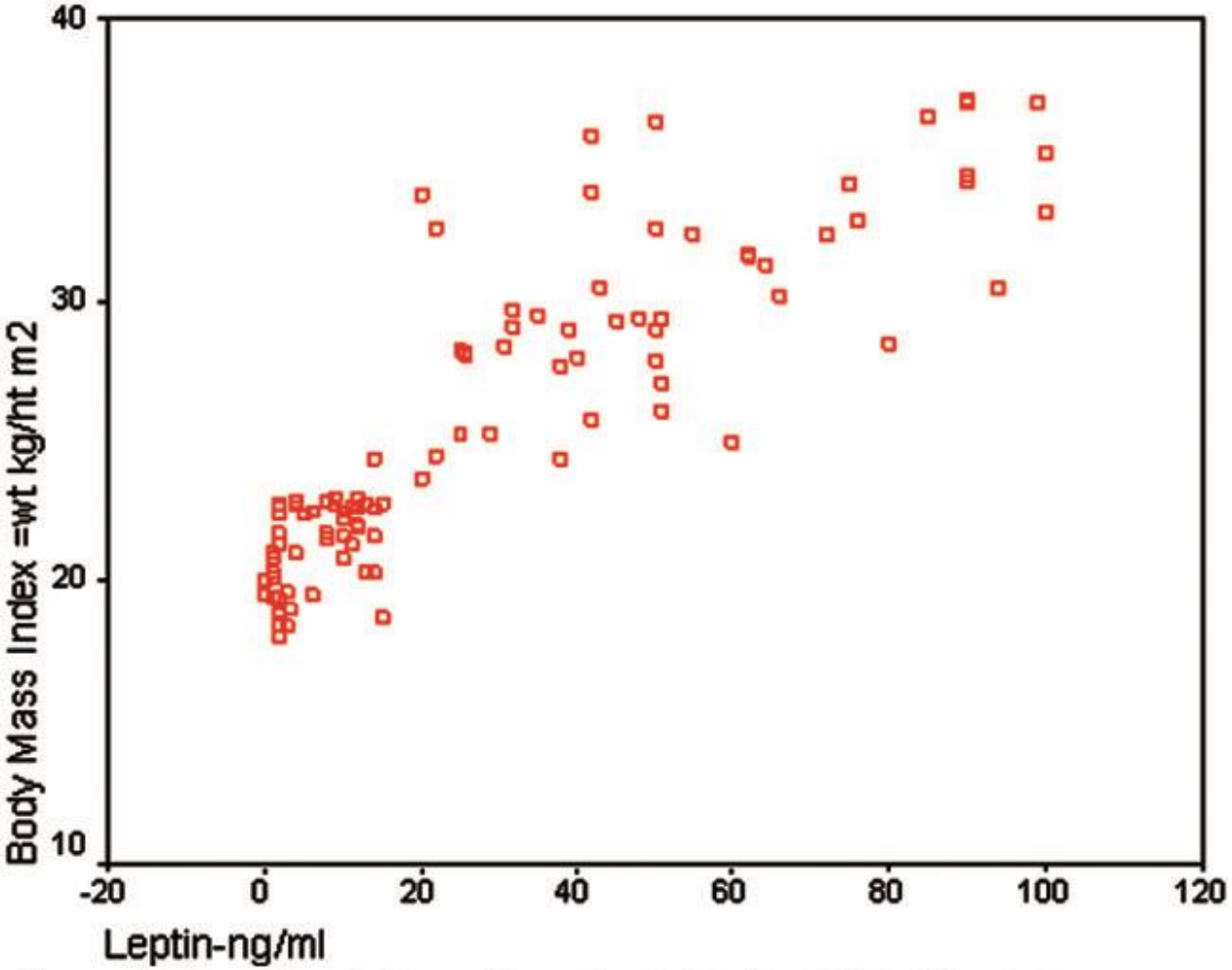
Gonzalez-Campoy et al. *Int. J. Endocrinology,* May, 2014

# CASE
# 55 year old man



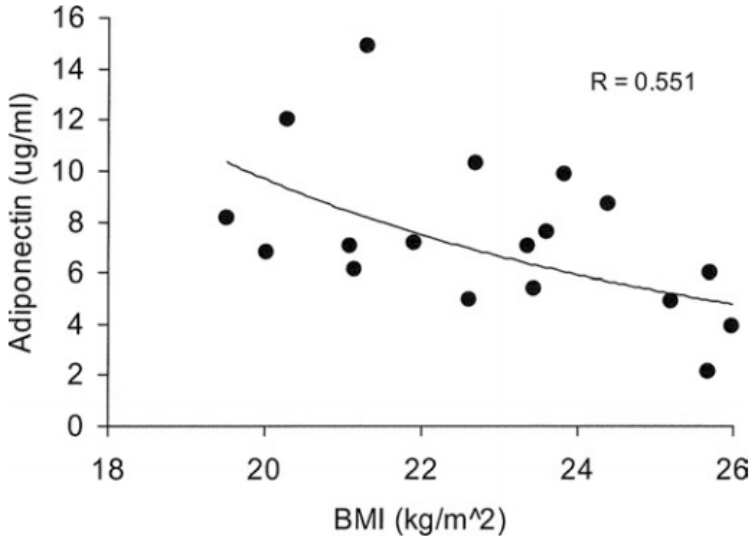
- Adiponectin = 3.6 µg/mL (2.2 – 19.9)
- Leptin = 10.6 ng/mL
- Leptin to adiponectin ratio = 2.9

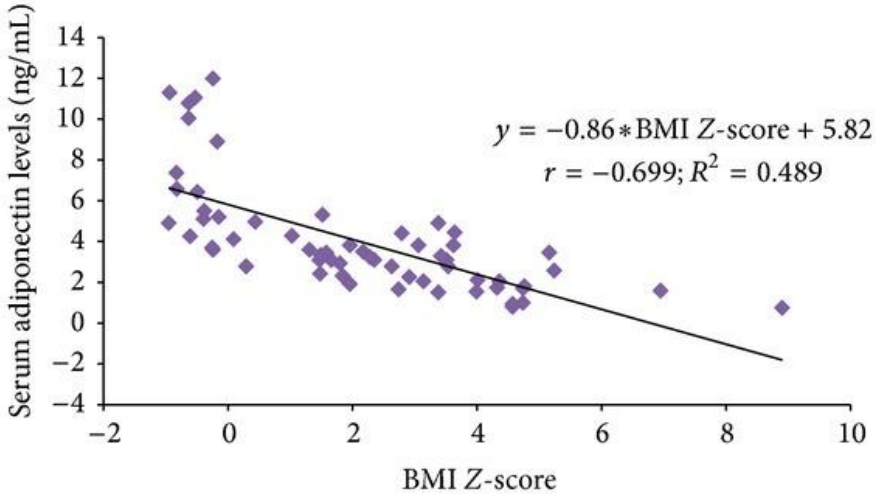
# Leptin levels rise with increasing BMI




Kazmi, JPMA, 63: 245; 2013

# Adiponectin levels fall with increasing BMI




Poppitt, Nutrition, 2008
Wahab, Journal of Allergy, 2013

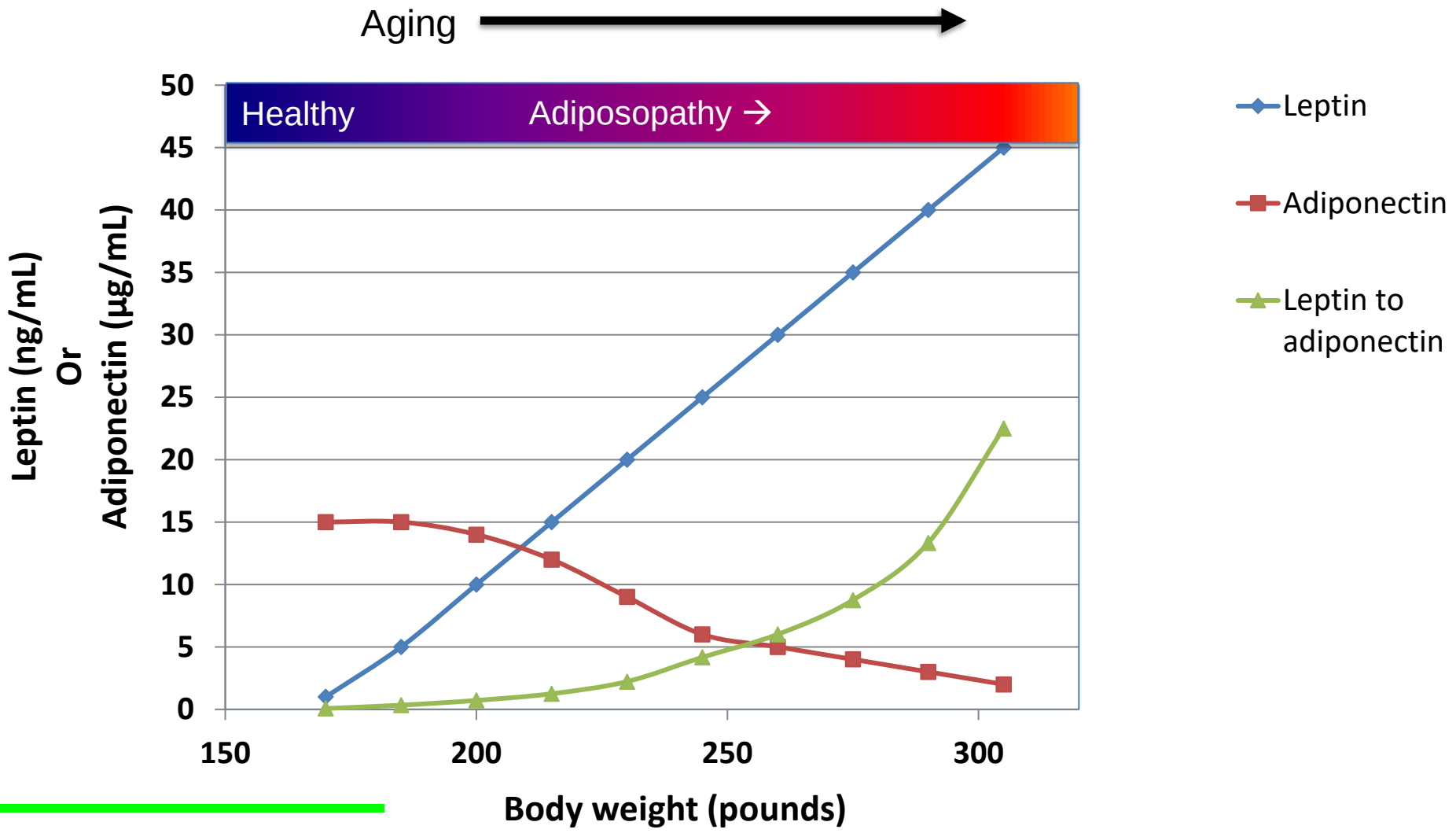
# Principles of Bariatric Endocrinology (3)

- Every patient who has overweight or obesity should have a thorough risk re-stratification on a periodic basis

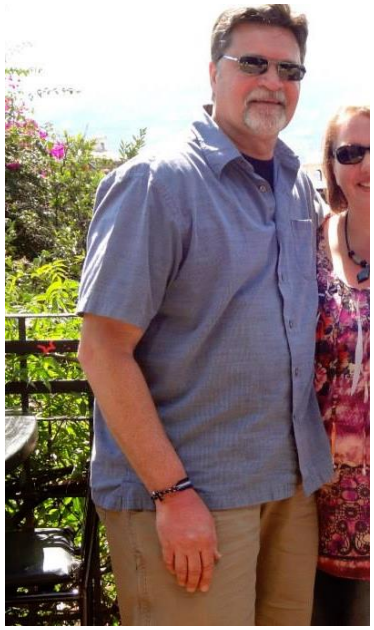


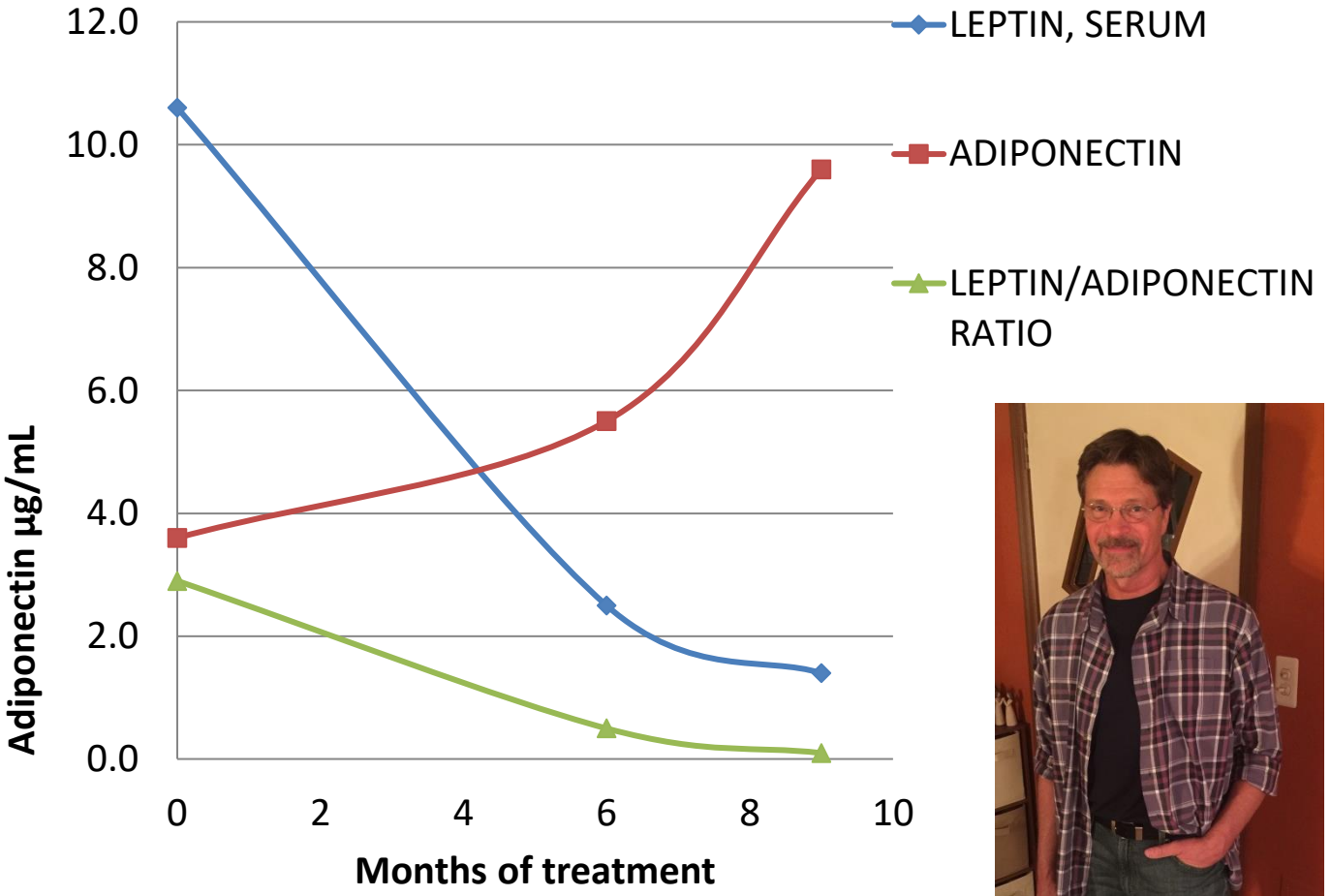
Gonzalez-Campoy et al. *Int. J. Endocrinology,* May, 2014

# Leptin to Adiponectin Ratio

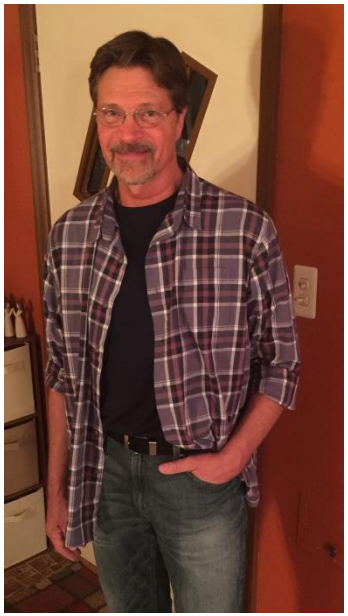


# Leptin to Adiponectin Ratio Trending






| | | | |
|---|---|---|---|
| CRP mg/L | 7.48 (Abn) | 6.40 (Abn) | 4.10 |



# Principles of Bariatric Endocrinology (4)

- Overweight and obesity should be treated with the same model of chronic disease management that we use for other chronic diseases



Gonzalez-Campoy et al. *Int. J. Endocrinology,* May, 2014

# A Successful Model of Care

| Diabetes Mellitus | Overweight and Obesity |
|---|---|
| Initial Workup/Risk Assessment | Initial Workup/Risk Assessment |
| Institute Treatment | Institute Treatment |
| Patient & Family Education | Patient & Family Education |
| Glucose Self-Monitoring | Step Count & Weekly Weight |
| Quarterly Office Assessments<br>Follow A1c, BMI, BP | Quarterly Office Assessments<br>Follow BMI, BP, WC |
| Periodic Screening for complications and risk re-stratification | Periodic Screening for complications and risk re-stratification |

# Principles of Bariatric Endocrinology (5)

- Effective behavior modification to achieve a negative energy balance is the primary long-term goal of the medical treatment of overweight and obesity



Gonzalez-Campoy et al. *Int. J. Endocrinology,* May, 2014

# Conditions for success

- Engagement with the health team
- Support at home (and at work)
- Patience
- Persistence
- Realism – set goals
  - Beginning today, the weight treatment goal is to lose 5 to 10% of current body weight over the next 6 to 12 months.
  - Perpetual goal until BMI is 18.5 to 24.9



Gonzalez-Campoy et al. *Int. J. Endocrinology,* May, 2014

# Principles of Bariatric Endocrinology (6)

- The team approach to overweight and obesity should be offered to all patients to provide nutrition education and physical activity coaching



Gonzalez-Campoy et al. *Int. J. Endocrinology,* May, 2014


HEALTHY
EATING

# Healthy Eating

**CLINICAL PRACTICE GUIDELINES FOR HEALTHY EATING FOR THE PREVENTION AND TREATMENT OF METABOLIC AND ENDOCRINE DISEASES IN ADULTS: COSPONSORED BY THE AMERICAN ASSOCIATION OF CLINICAL ENDOCRINOLOGISTS/ THE AMERICAN COLLEGE OF ENDOCRINOLOGY AND THE OBESITY SOCIETY**

*J. Michael Gonzalez-Campoy, MD, PhD, FACE[1]; Sachiko T. St. Jeor, PhD, RD[2]; Kristin Castorino, DO[3]; Ayesha Ebrahim, MD, FACE[4]; Dan Hurley, MD, FACE[5]; Lois Jovanovic, MD, MACE[6]; Jeffrey I. Mechanick, MD, FACP, FACN, FACE, ECNU[7]; Steven M. Petak, MD, JD, MACE, FCLM[8]; Yi-Hao Yu, MD, PhD, FACE[9]; Kristina A. Harris[10]; Penny Kris-Etherton, PhD, RD[11]; Robert Kushner, MD[12]; Maureen Molini-Blandford, MPH, RD[13]; Quang T. Nguyen, DO[14]; Raymond Plodkowski, MD[15]; David B. Sarwer, PhD[16]; Karmella T. Thomas, RD[17]*



Gonzalez-Campoy et al. *ENDOCRINE PRACTICE Vol 19 (Suppl 3) 2013*

# Healthy Eating

- Portion Control
- Freshness
- Plant-based meals
- Limit of animal fats
- Water to drink



Gonzalez-Campoy et al. *ENDOCRINE PRACTICE Vol 19 (Suppl 3) 2013*

# Physical Activity

- Not “exercise”
- Start with limited amount, repeatedly during the day
- Realistic, achievable, sustainable and incremental



Gonzalez-Campoy et al. *ENDOCRINE PRACTICE Vol 19 (Suppl 3) 2013*

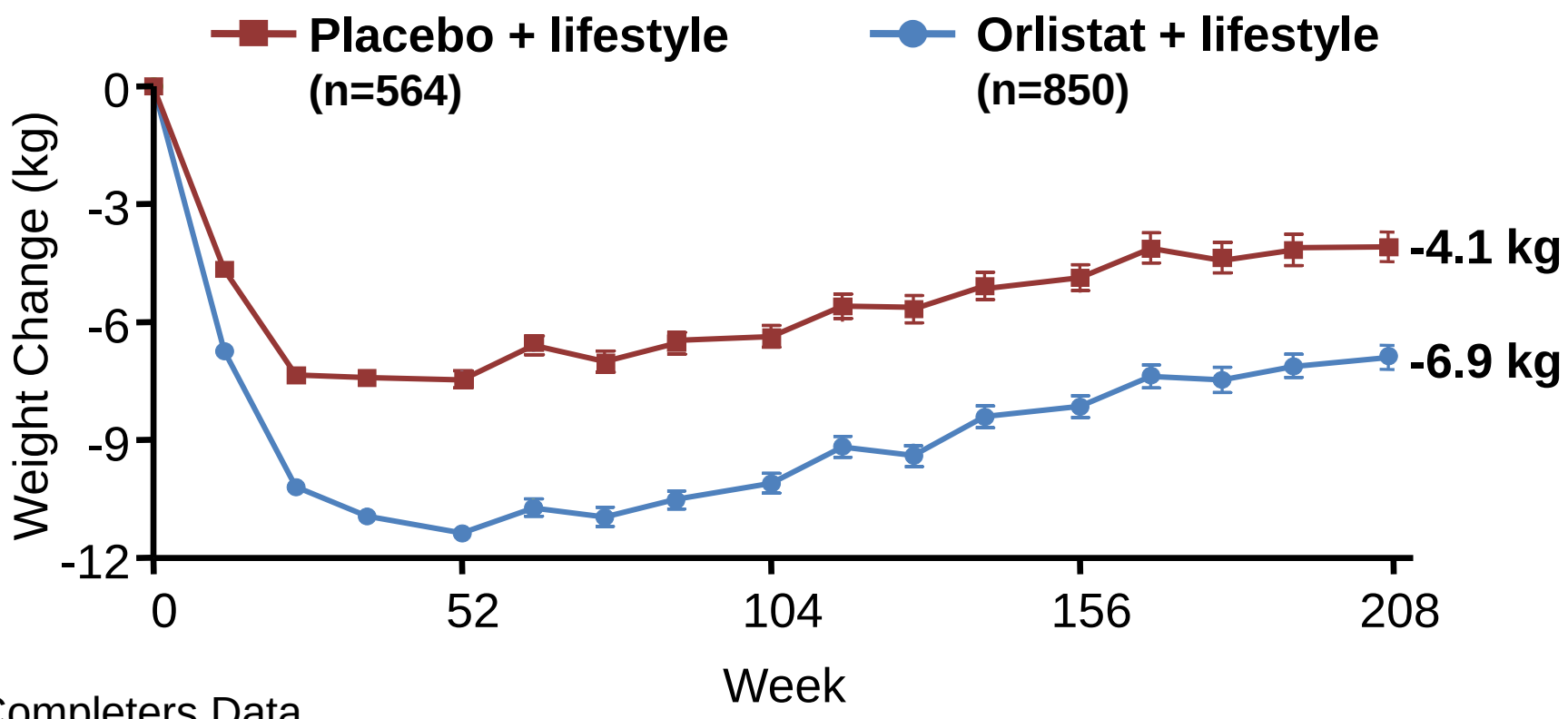
# Principles of Bariatric Endocrinology (7)

- Pharmacotherapy to optimize metabolism and to reset the hypothalamic and CNS controls over energy balance and energy stores should be used indefinitely in the management of overweight and obesity (i.e. achieving a treatment goal is not a reason to stop treatment)



Gonzalez-Campoy et al. *Int. J. Endocrinology,* May, 2014

# Effect of Long-Term Treatment With Orlistat: XENDOS Study



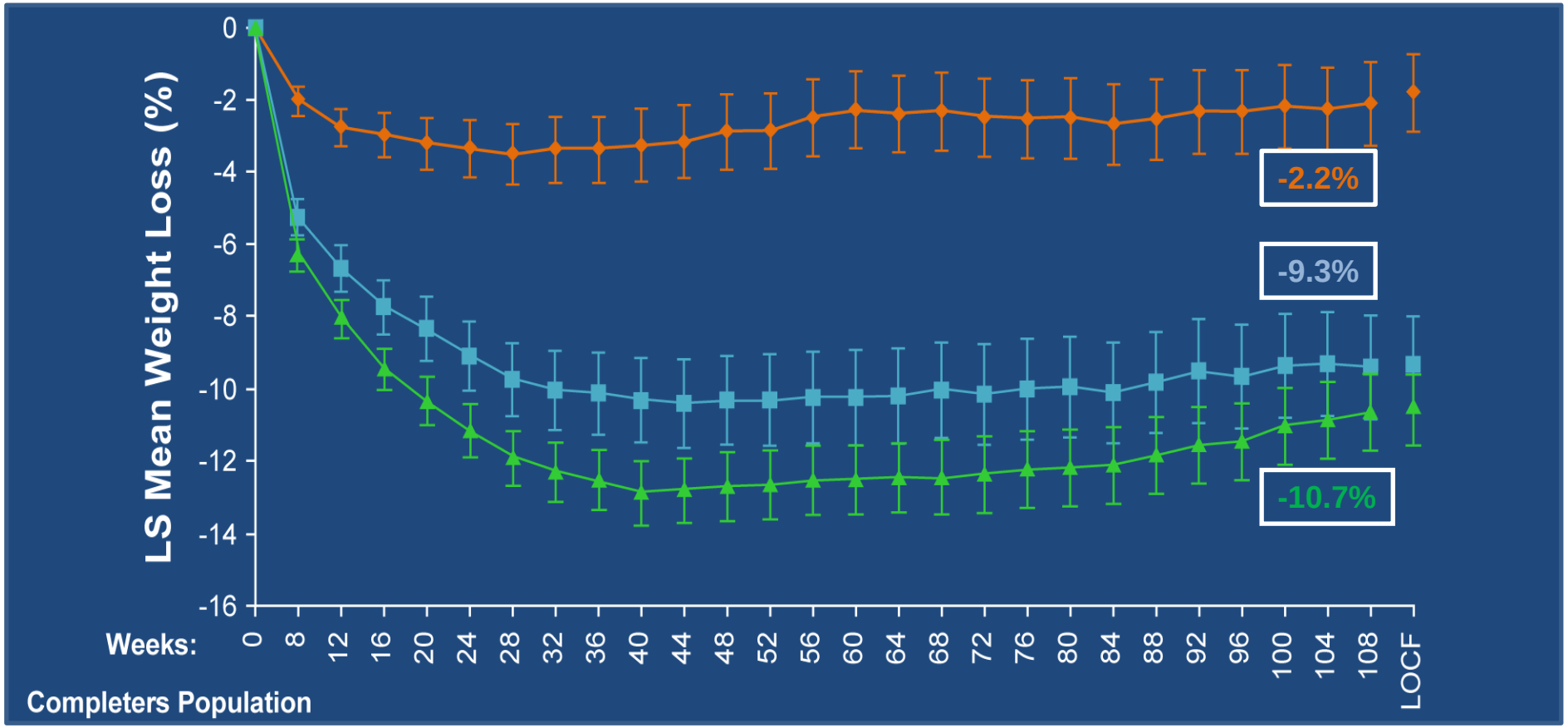

Completers Data

*P*<0.001 vs placebo



Torgerson JS, et al. *Diabetes Care*. 2004;27:155-161.

# Weight Change Over 2 Years With Phentermine/Topiramate ER

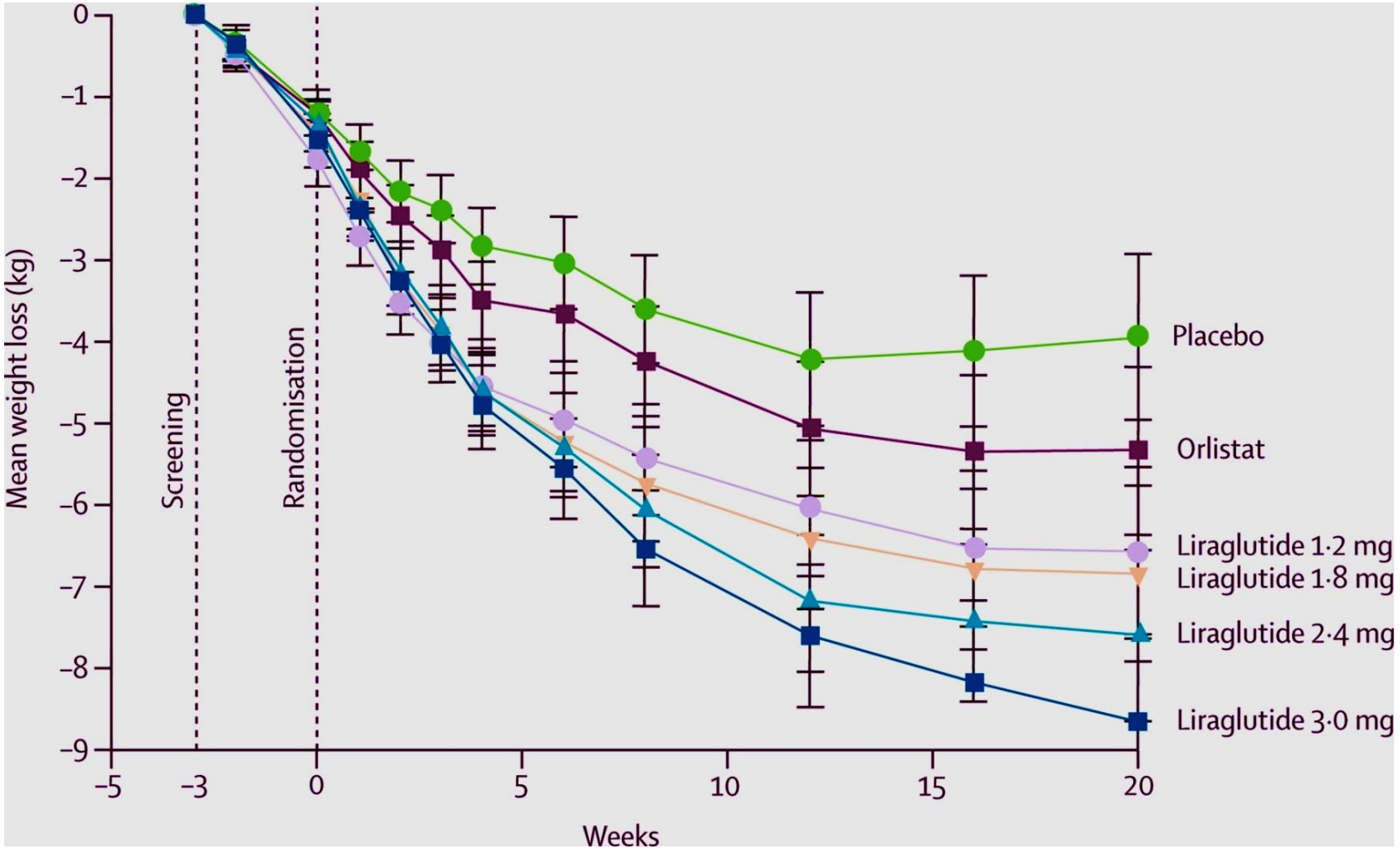



Data are shown with least squares mean (95% CI).



Garvey WT, et al. *Am J Clin Nutr*. 2012;95:297-308.

# Effects of Liraglutide and Orlistat on Body Weight in Non-diabetic Obese Adults

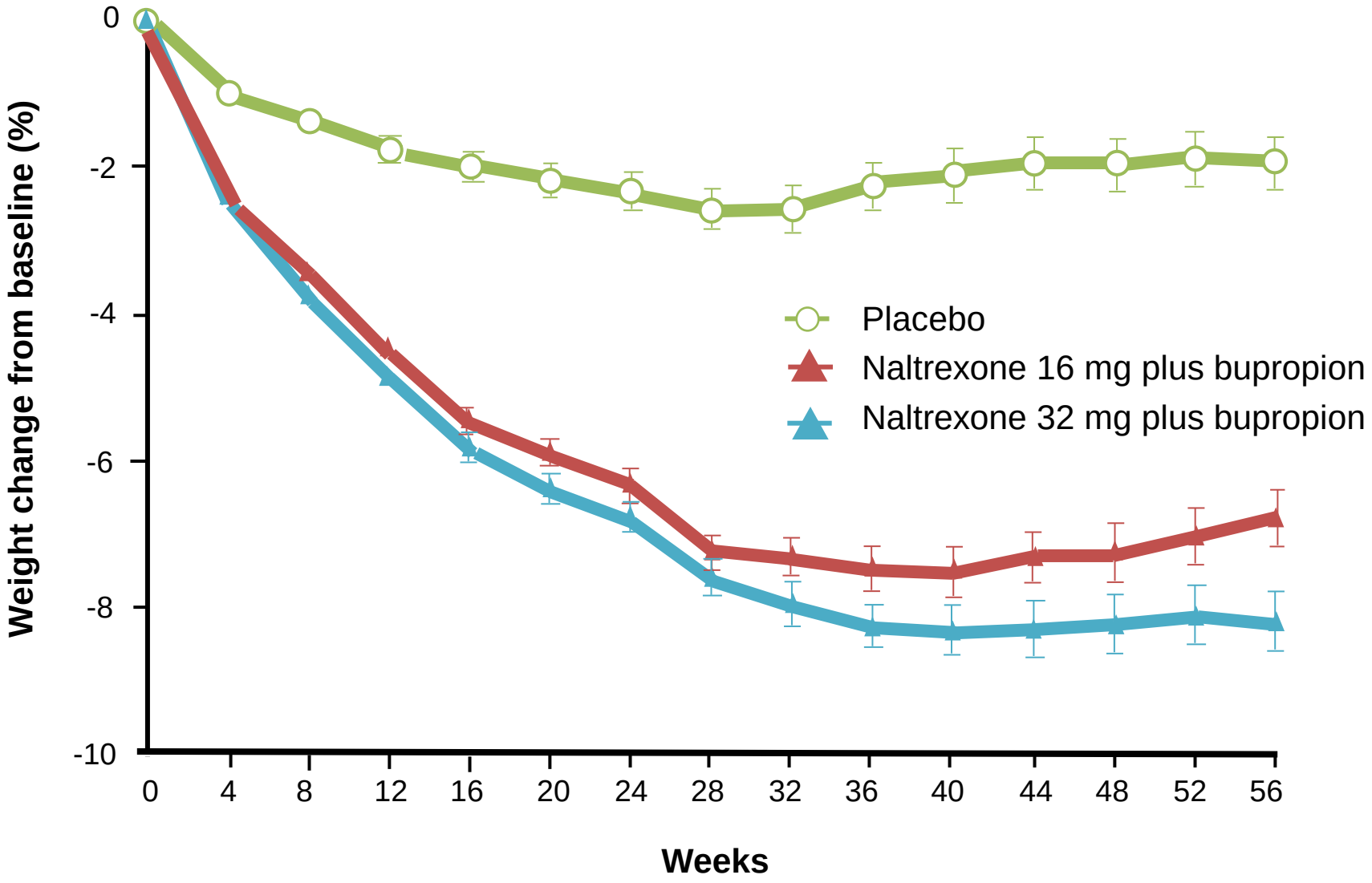



Data are mean (95% CI) for the ITT population



Astrup A, et al. *Lancet.* 2009;374:1606-1616.

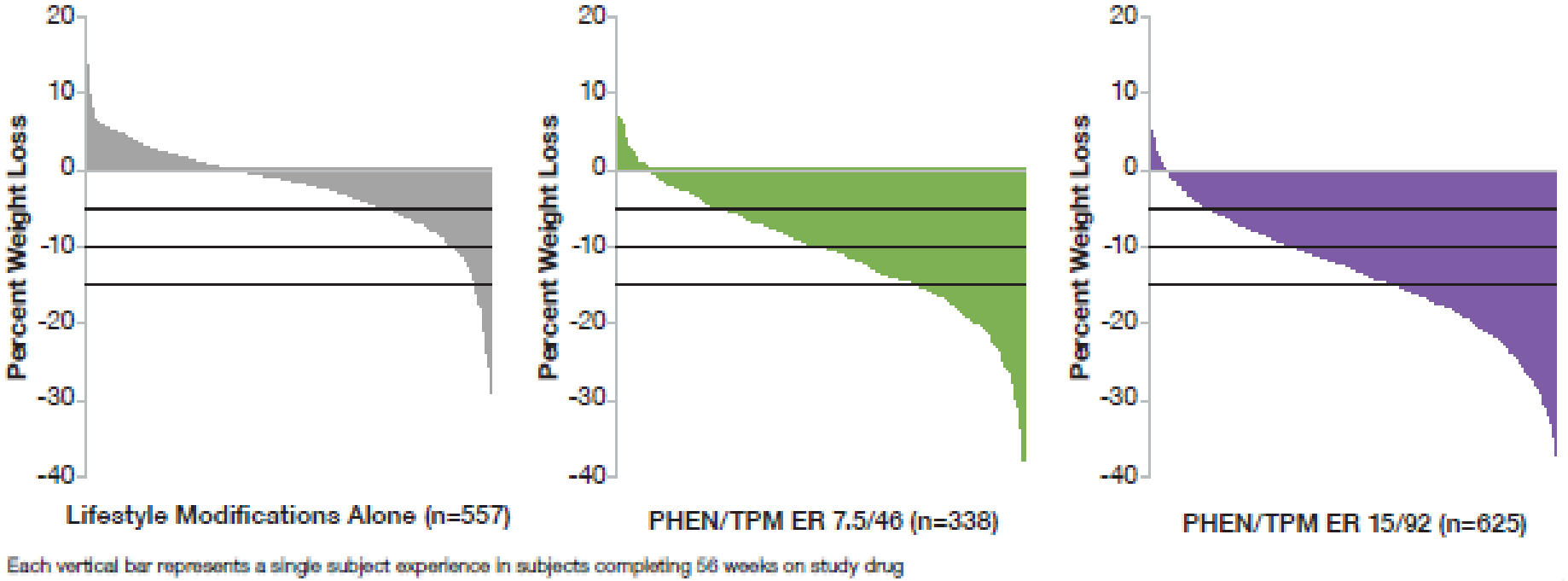
# Buproprion – Naltrexone






Greenway, FL, et al. *Lancet*. 2010;376(9741):595-605

# When individual weight loss is displayed, it looks like this:

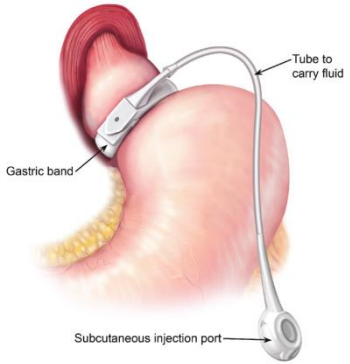




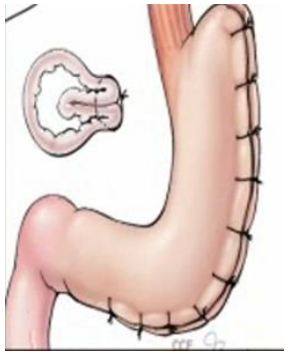

McCullough PA, et al. Poster AANP 2013.

# Bariatric Surgery Procedures

## Gastric Restriction Procedures

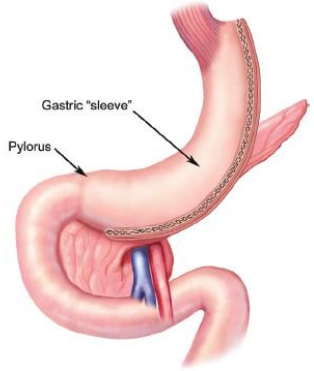



**Laparoscopic Adjustable Gastric Band (LABG)**

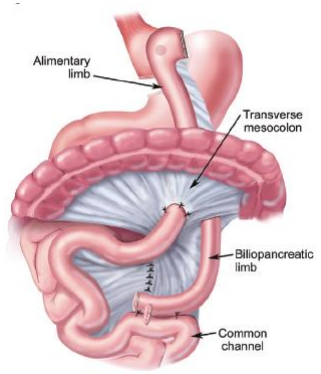


**Gastric Plication (Experimental)**

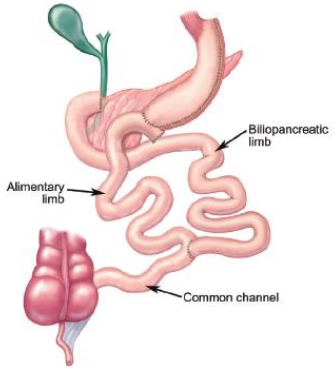
## Metabolic Procedures




**Laparoscopic Sleeve Gastrectomy (LSG)**



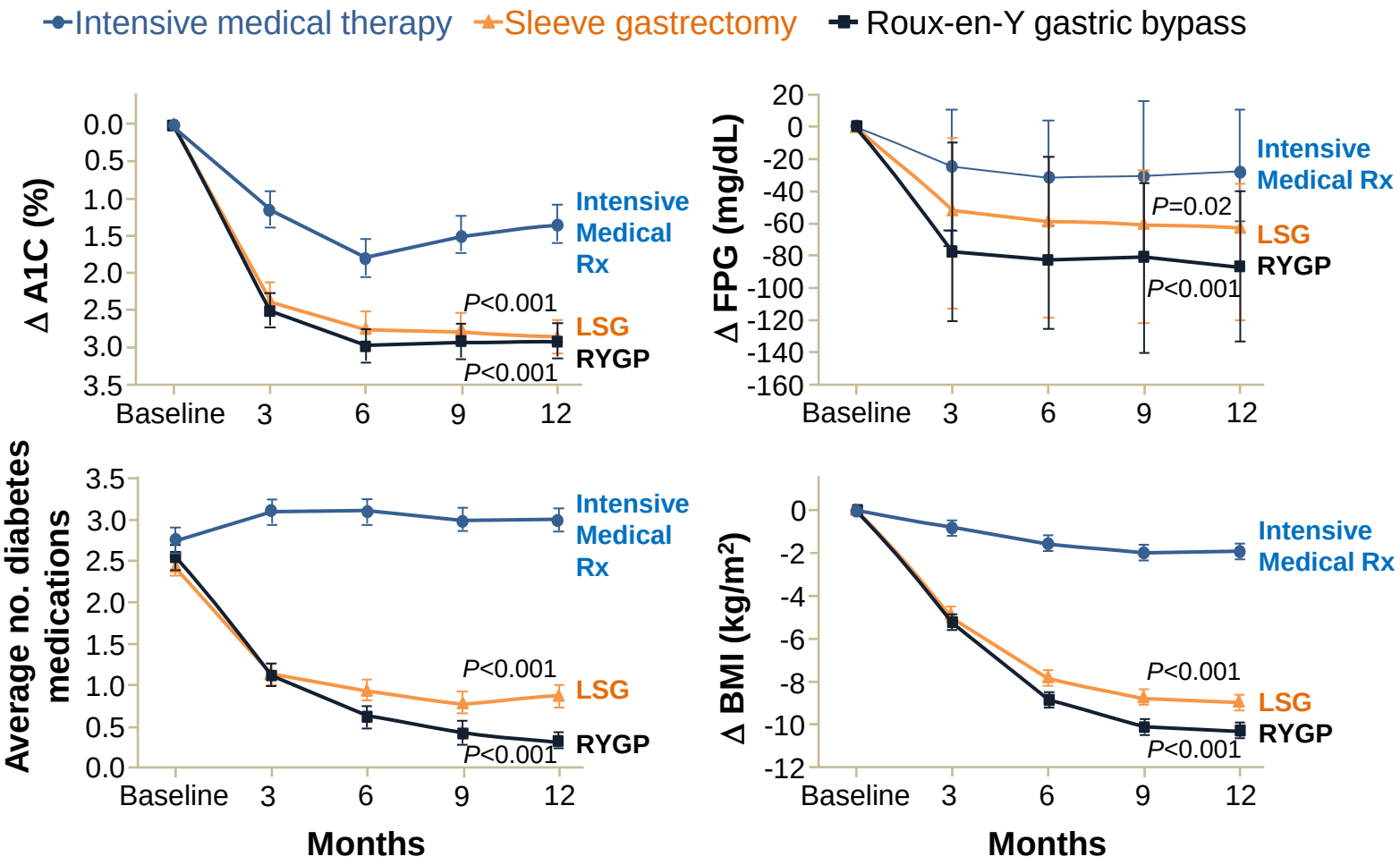

**Roux-en-Y Gastric Bypass (RYGB)**




**Biliopancreatic Diversion (BPD)**

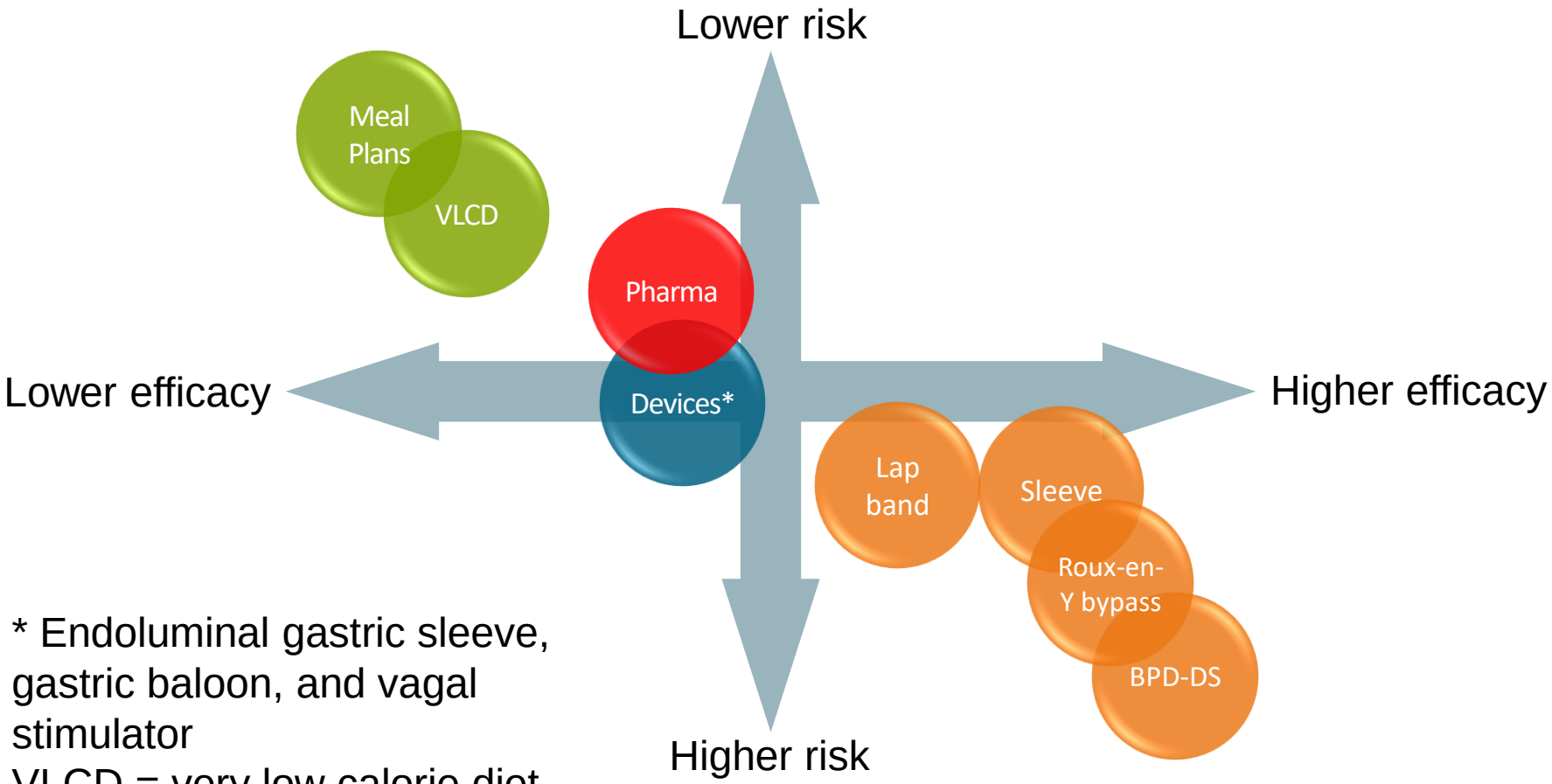
# Bariatric Surgery Outcomes

## Patients With Type 2 Diabetes




Schauer PR, et al. *N Engl J Med*. 2012;366:1567-1576.

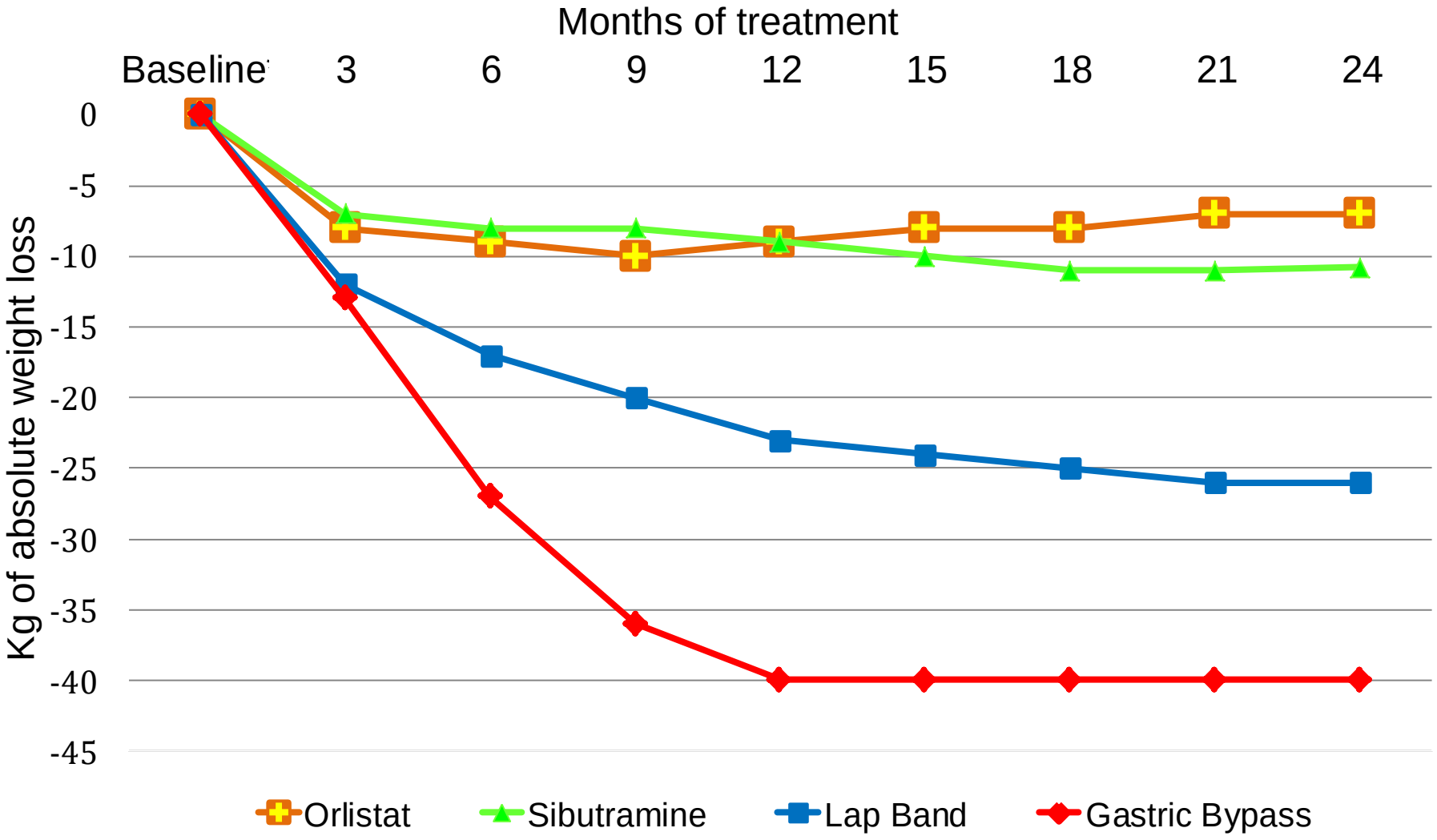
# Risks and Efficacy




- * Endoluminal gastric sleeve, gastric baloon, and vagal stimulator
- VLCD = very low calorie diet.

Jensen MD, J Am Coll Cardiol. 2013;pii:S0735-1097(13) 06030-0.
http://formularyjournal.modernmedicine.com/print/368664.

# Pharmacotherapy vs Surgery for Obesity (kg of absolute wt loss)



# Principles of Bariatric Endocrinology (8)

- Failure of monotherapy to achieve effective weight loss should not lead to discontinuation of treatment, but rather the institution of combination therapy



Gonzalez-Campoy et al. *Int. J. Endocrinology,* May, 2014

# Case Study #1

Before, BMI = 42,
Weight = 313 lbs

After, BMI = 32,
Weight = 235 lbs

Down 78 pounds

# Case Study #2

Before, BMI = 57,
Weight = 315 lbs

After, BMI = 40,
Weight = 222 lbs

Down 93 pounds

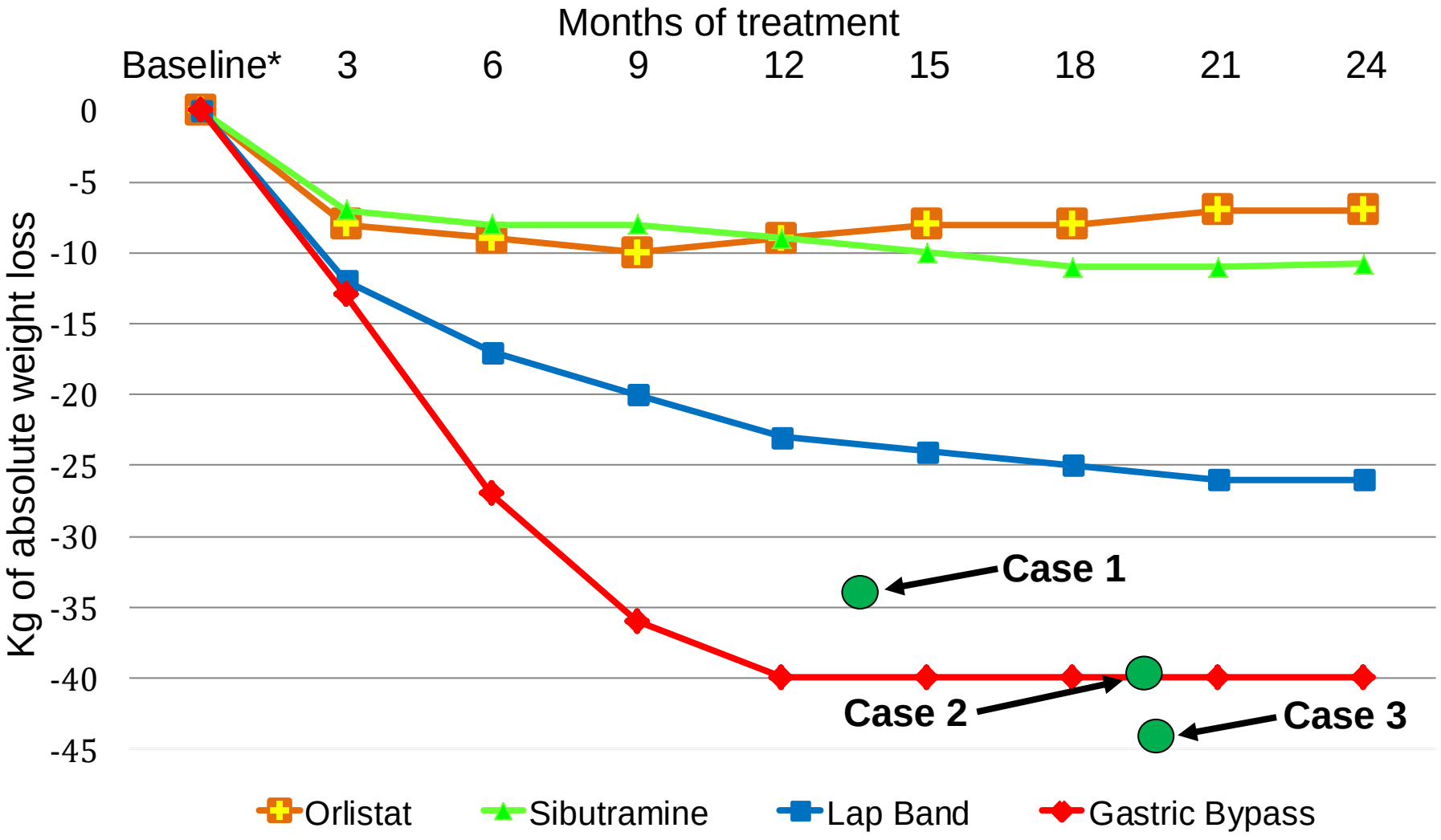
# Case Study #3

Before, BMI = 43,
Weight = 279 lbs

After, BMI = 27,
Weight = 176 lbs

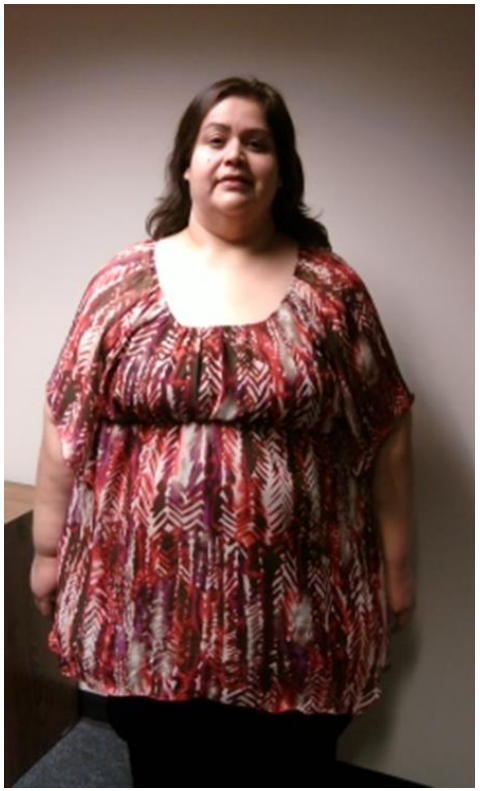
Down 103 pounds

# Pharmacotherapy vs Surgery for Obesity (kg of absolute wt loss)



# How does MNCOME do with extreme obesity?

July 10, 2004:
Weight = 629 pounds
BMI = 91.65



August 24, 2012:
Weight = 464 pounds
BMI = 69.7

Down 165 pounds in 8 years

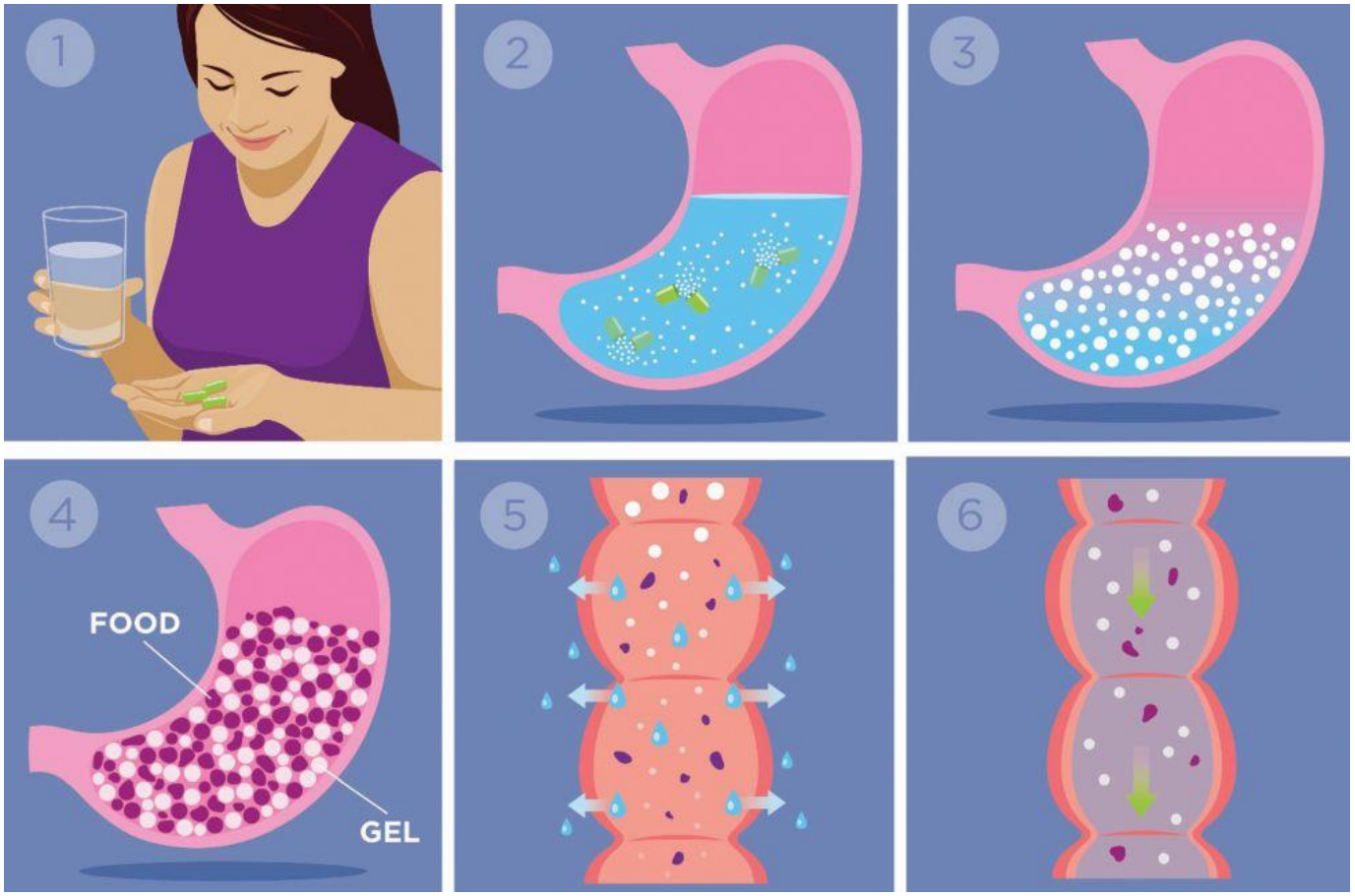
# Will extreme obesity respond to medical management?

September 13, 2006:
Weight = 513 pounds
BMI = 71.62

July 21, 2012:
Weight = 248 pounds
BMI = 34.6

Down 265 pounds in 6 years

# Superabsorbent Hydrogel Particles in Capsules






https://www.myplenity.com/static/pdfs/patient-isi.pdf

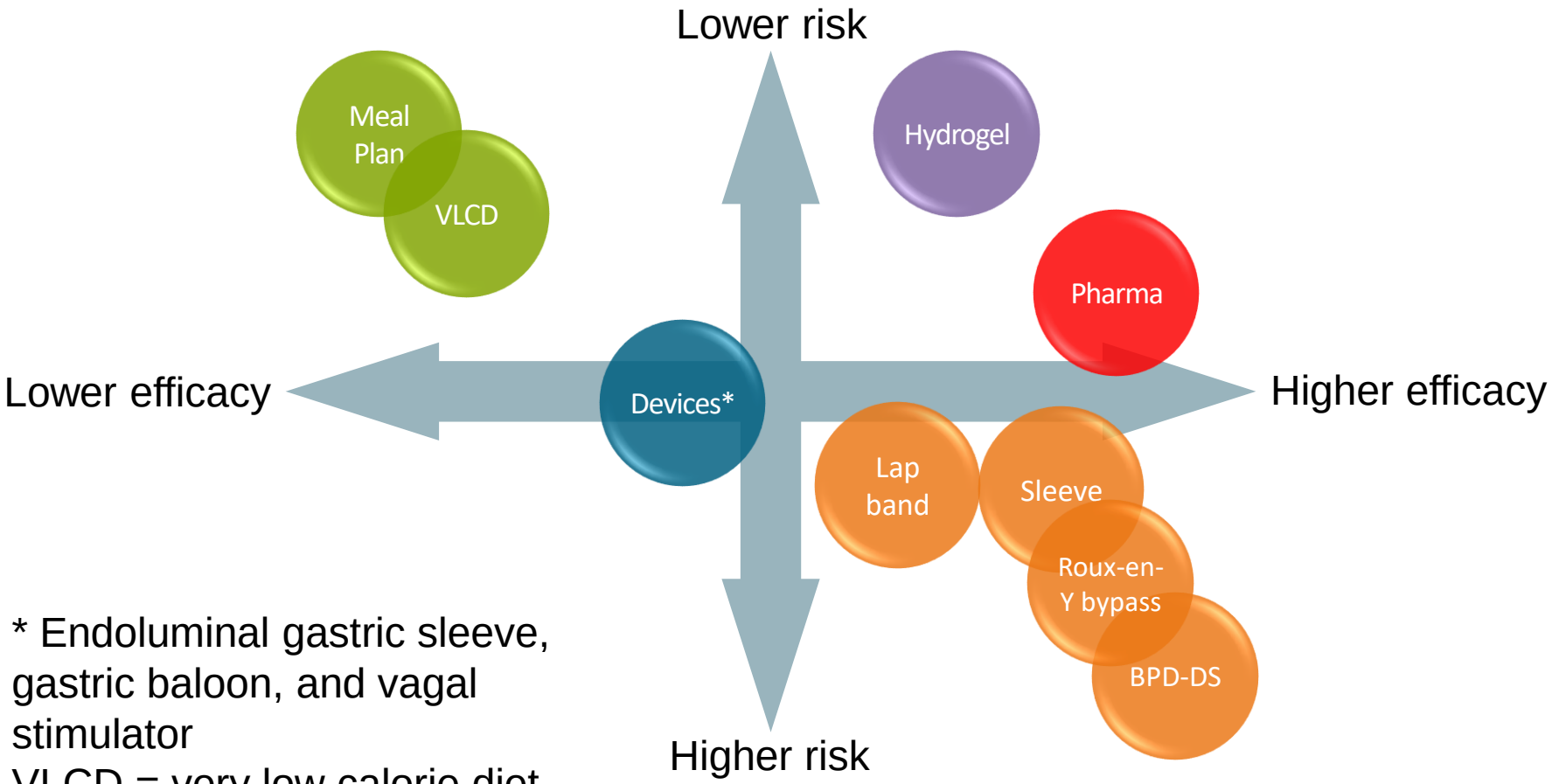
# Superabsorbent Hydrogel Particles in Capsules

- ~6 out of 10 adults treated with superabsorbent hydrogel particles achieved ≥5% weight loss (an average weight loss of 10% or ~22 pounds).
- 1 in 4 adults treated with superabsorbent hydrogel particles achieved ≥10% weight loss (an average weight loss of 14% or ~30 pounds)



Greenway. Obesity 27(2), 2019

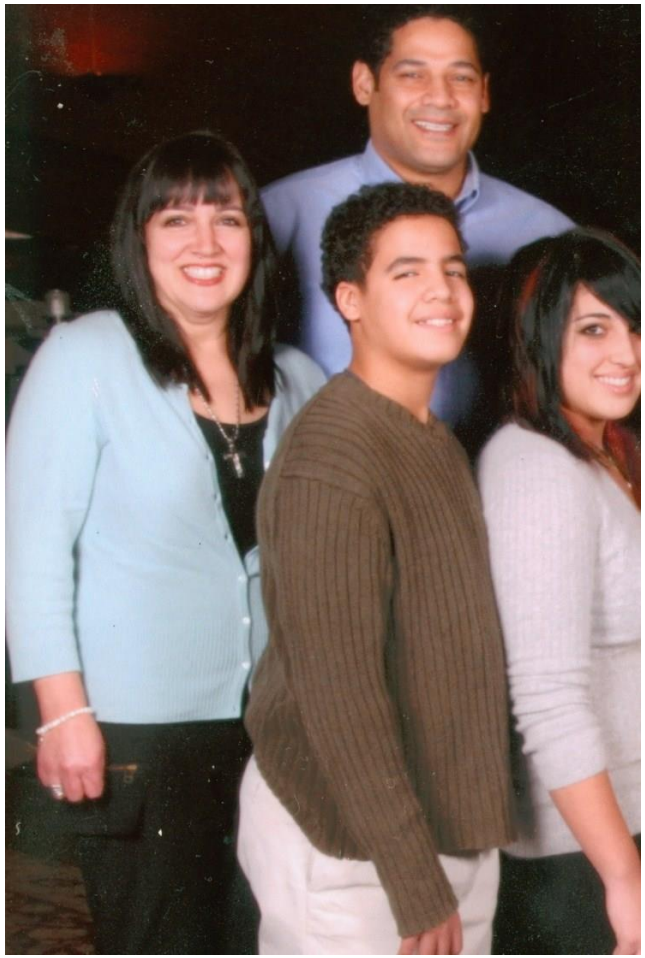
# Risks and Efficacy




- * Endoluminal gastric sleeve, gastric baloon, and vagal stimulator
- VLCD = very low calorie diet.

Jensen MD, J Am Coll Cardiol. 2013;pii:S0735-1097(13) 06030-0.
http://formularyjournal.modernmedicine.com/print/368664.

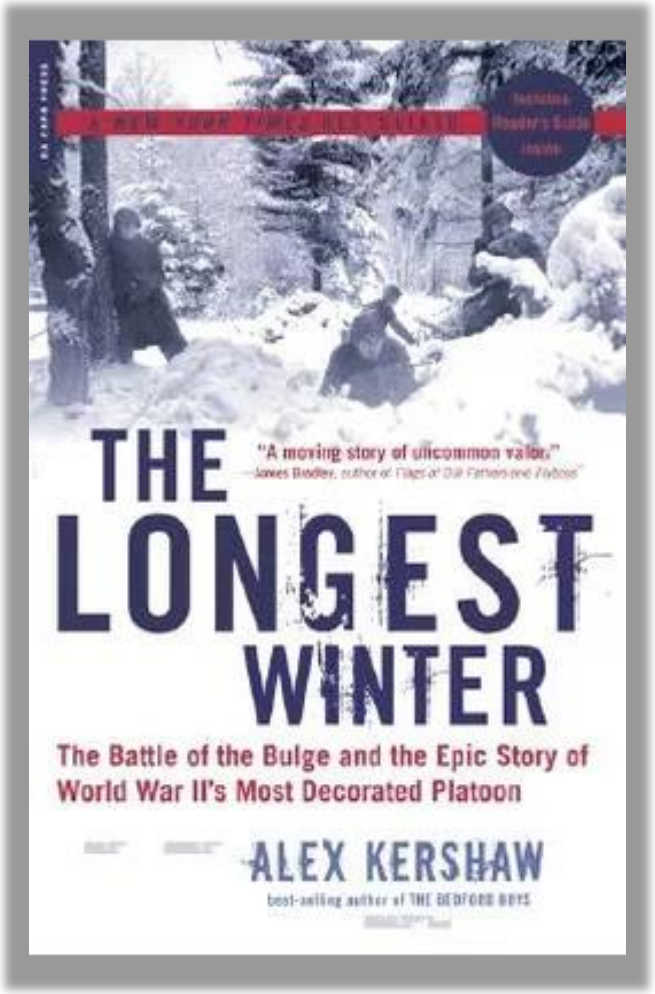
# How Does MNCOME do with BMI 30-35?



Down from 167 to 134 pounds with maintenance of weight loss over 5 years

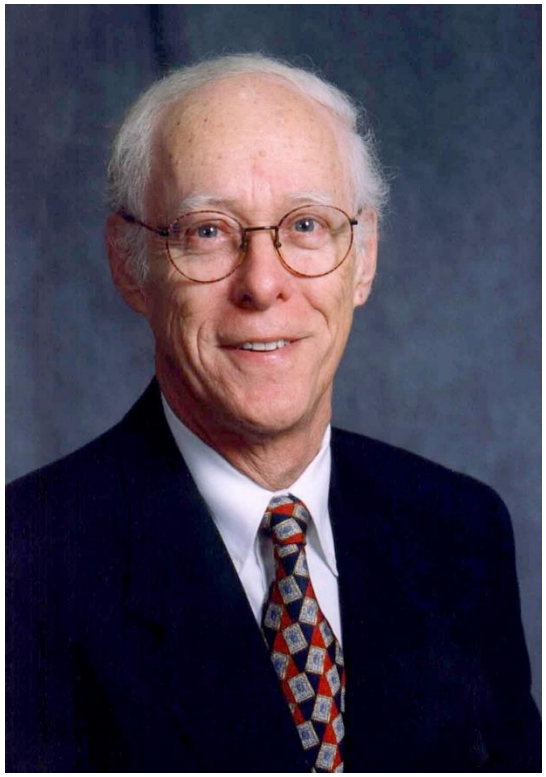
-- EASY!!!!

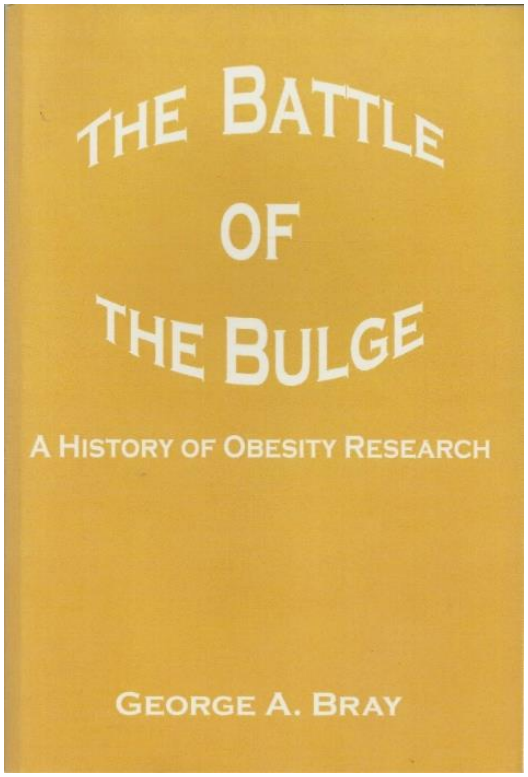
# The Battle of the Bulge




Dec 16, 1944 – Jan 25, 1945

# The Battle of the Bulge






George A Bray

# Bariatric Endocrinology

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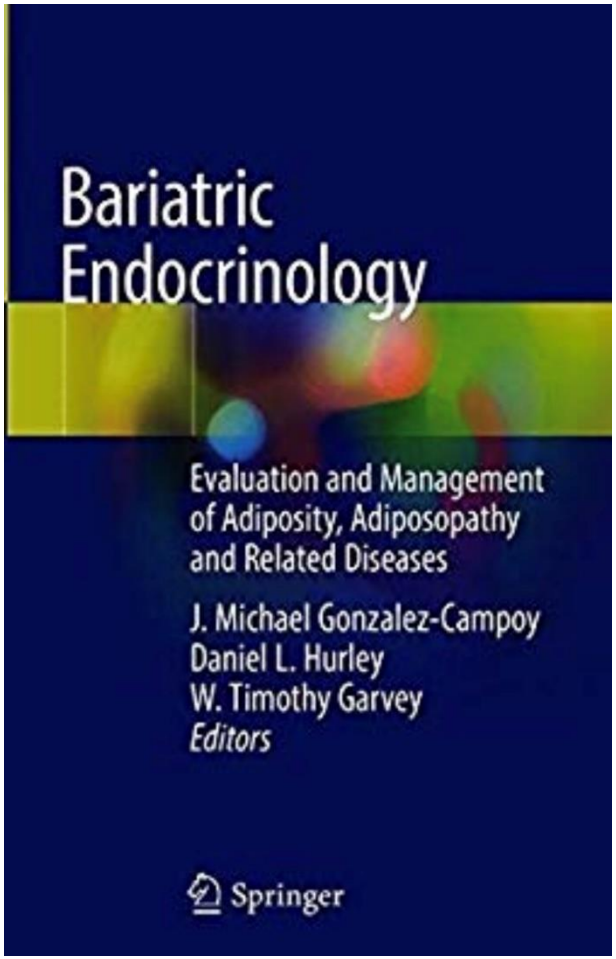
# Bariatric Endocrinology




Springer.com

# Summary

- Patients with overweight or obesity should have a thorough initial evaluation, and periodic risk re-stratification.
- Comorbidities and obesity complications, including adiposopathy, should be identified and treated.
- Treatment plans should be individualized, and designed according to severity of comorbidities and complications, as well as body mass index