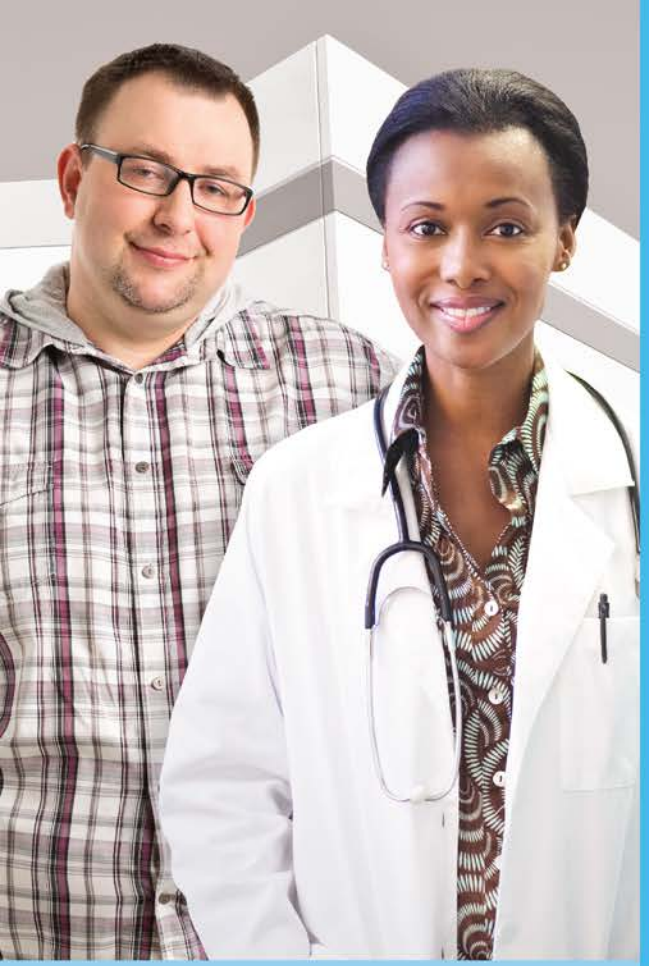


What Is the Disease of Obesity?

Clinical Evaluation

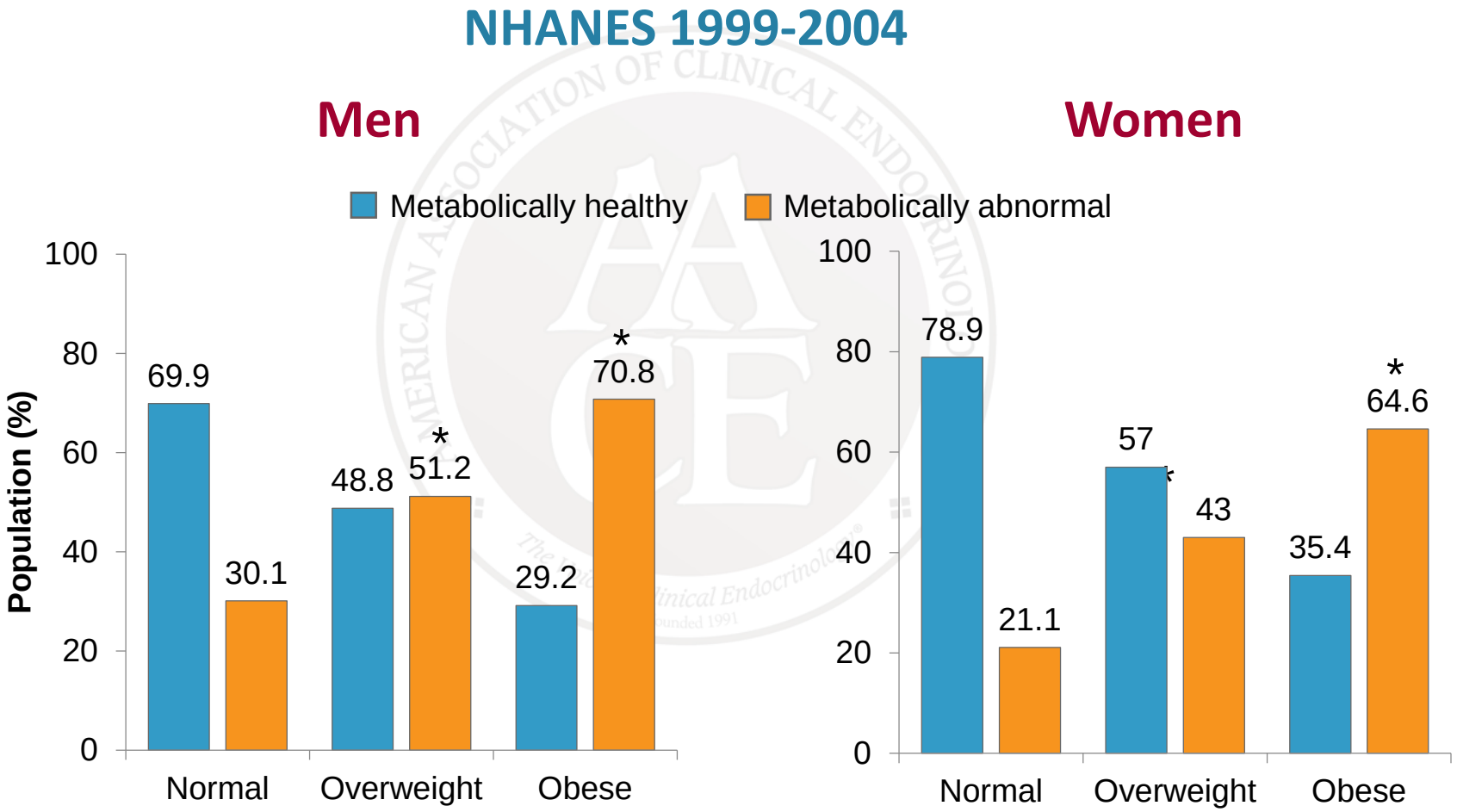
AACE OBESITY RESOURCE CENTER

AACE ONLINE ENDOCRINE ACADEMY

Clinical Evaluation

Pitfalls of the BMI Metric: the Healthy Obese Population

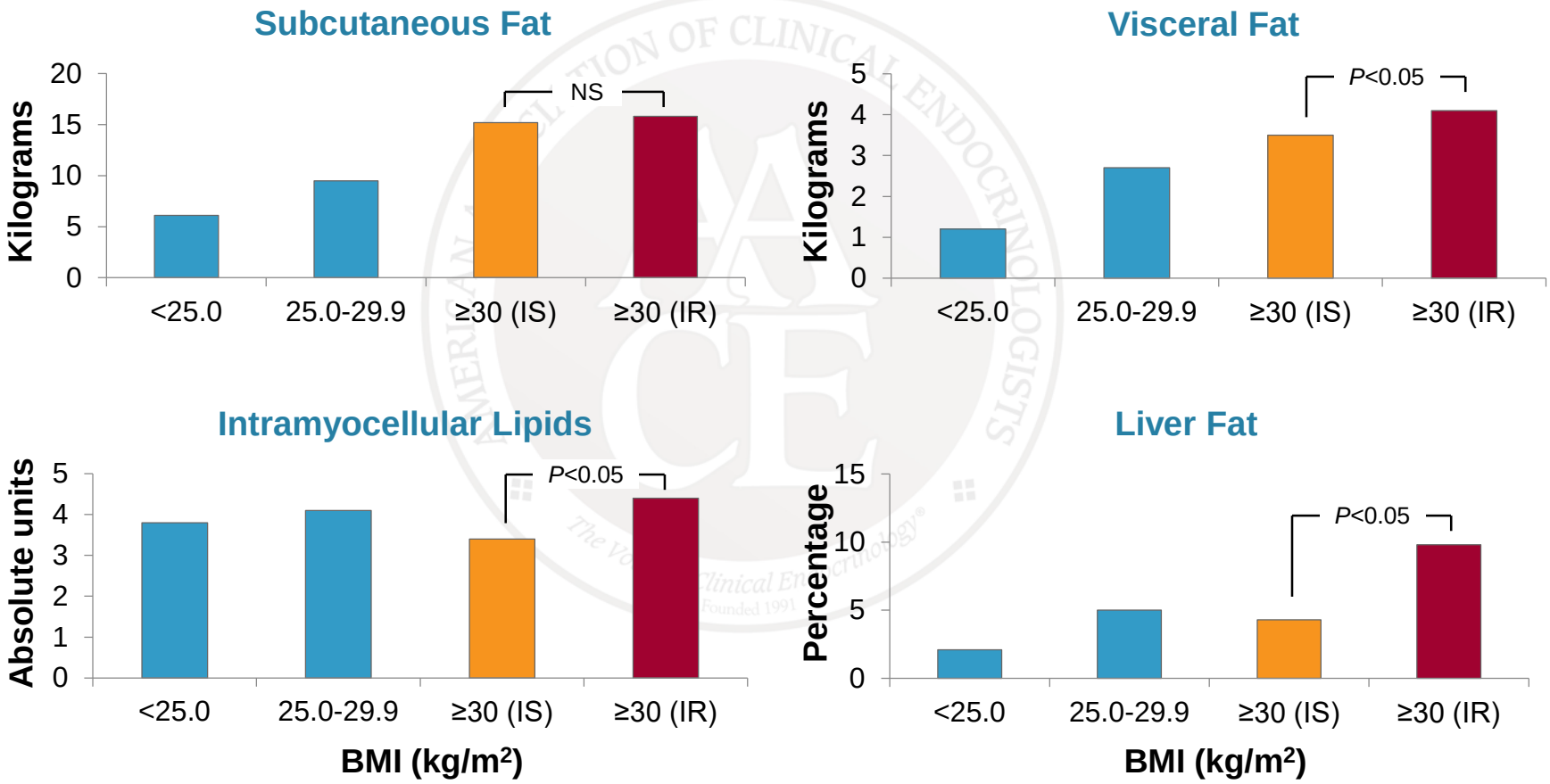
Roughly One Third of Obese Individuals Are Metabolically Healthy



*P<0.001 vs metabolically abnormal, normal weight.

Wildman RP, et al. *Arch Intern Med.* 2008;168:1617-1624.

Characteristics of Metabolically Healthy vs Insulin Resistant Obese



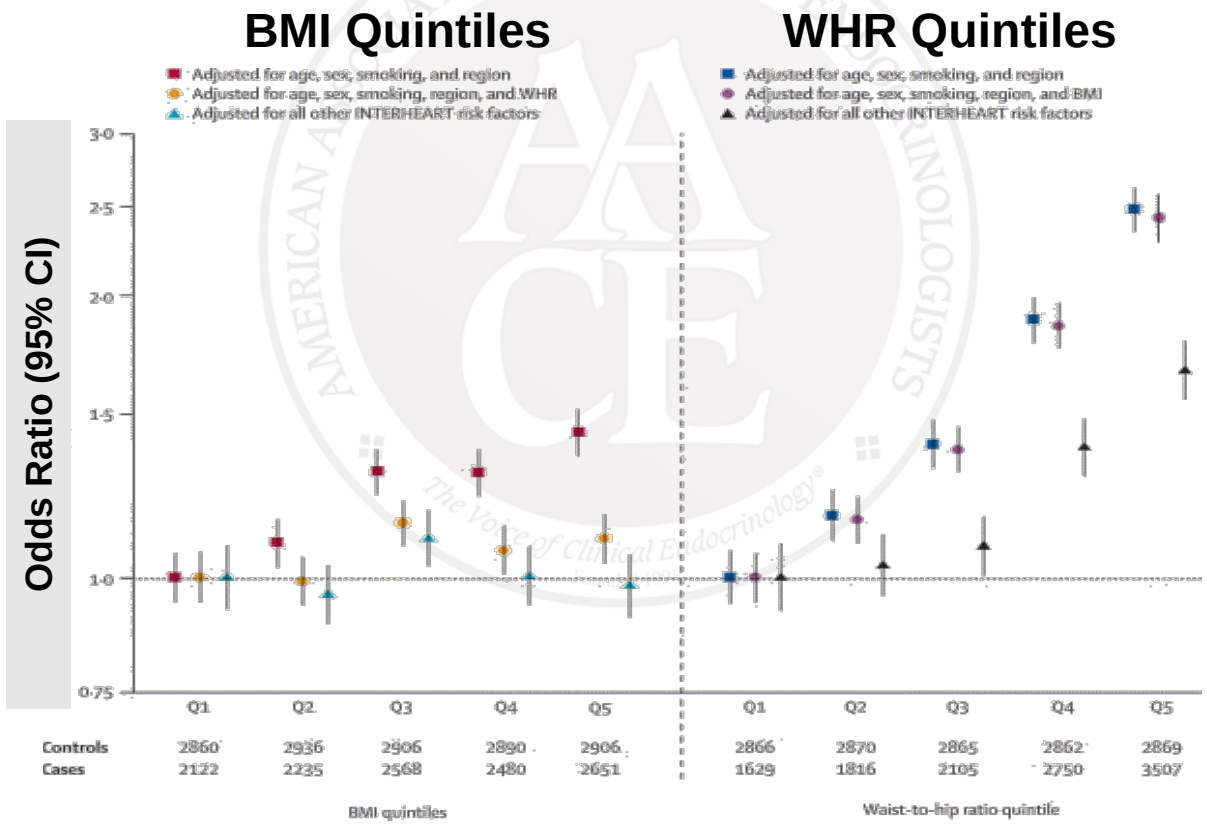
BMI = body mass index; IR = insulin resistant; IS = insulin sensitive; NS = not significant.

Stefan N, et al. *Arch Int Med.* 2008;168:1609-1616.

BMI versus Waist-Hip Ratio as Risk Factors for Myocardial Infarction

Case-Control Study

(N=27,000; 52 countries)

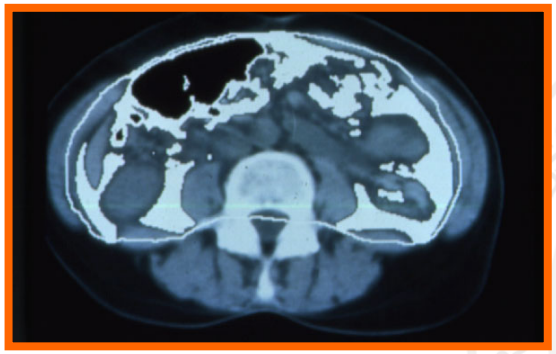


BMI = body mass index; WHR = waist-hip ratio.

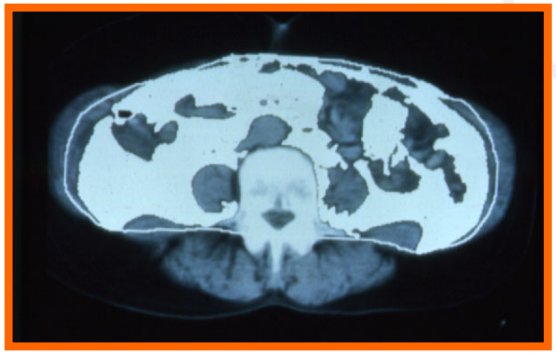
Yusuf S, et al. *Lancet.* 2005;366:1640-1649.

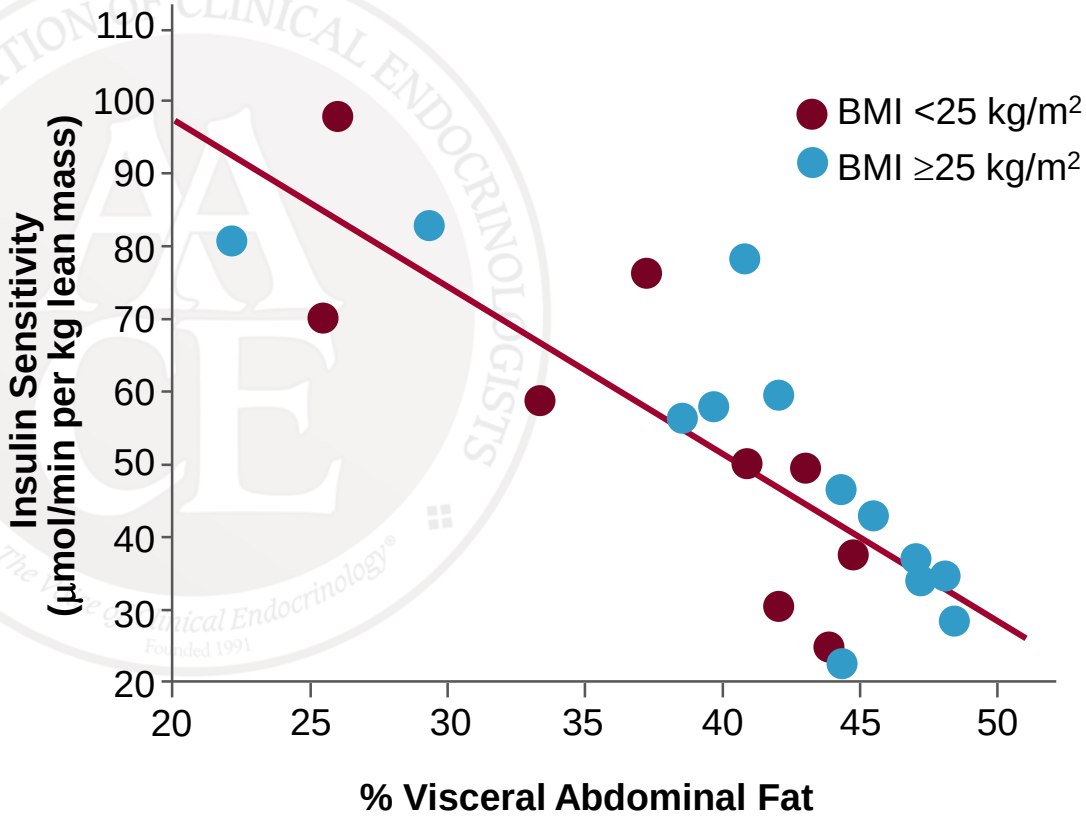
Association Between Visceral Fat and Insulin Resistance

Insulin Sensitive



Insulin Resistant





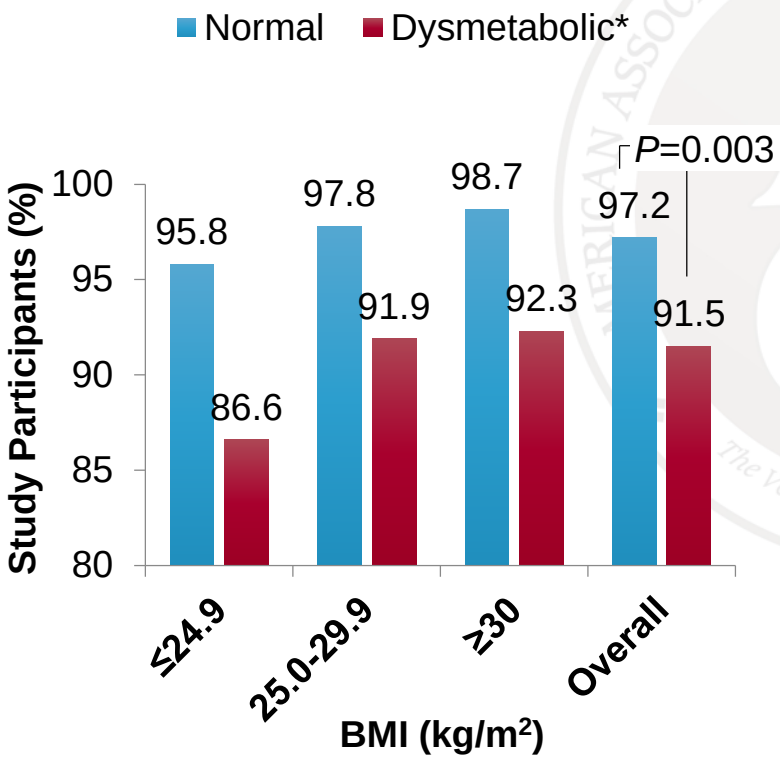
CT scans courtesy of Wilfred Y. Fujimoto, MD.

Carey DG, et al. *Diabetes.* 1996;45:633–638.

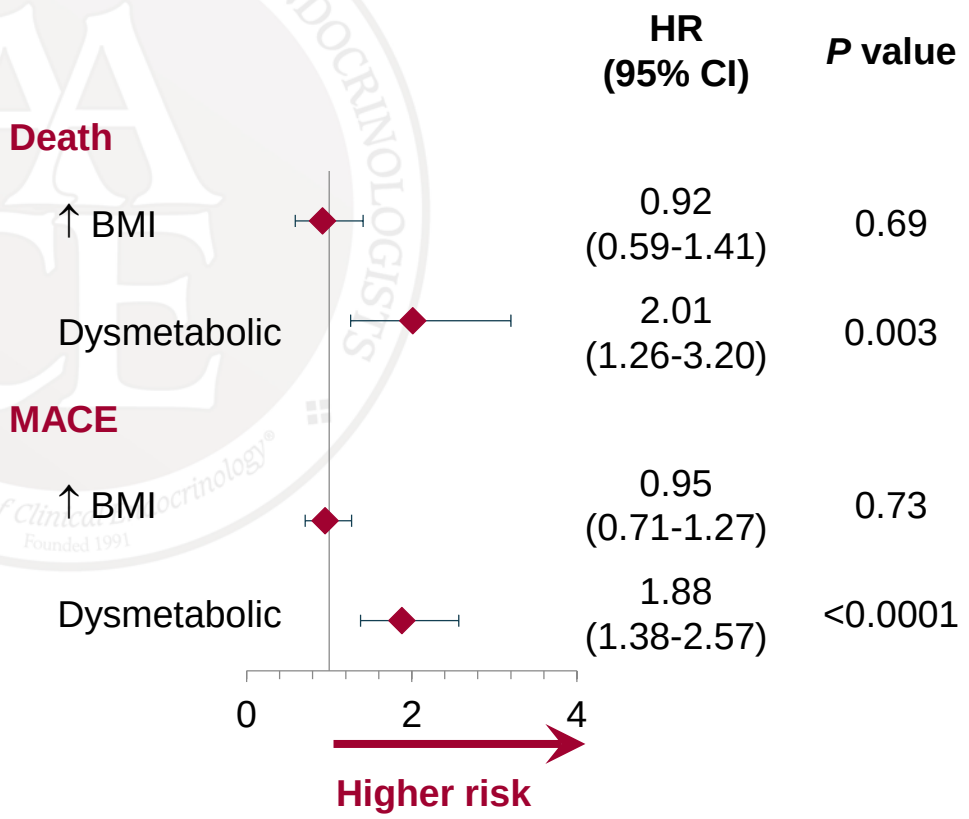
Metabolic Syndrome Is More Important Than Obesity in Terms of Cardiovascular Risk

Women's Ischemia Syndrome Evaluation (WISE) Study

3-Year Survival



3-Year Risk of Death or MACE



*Metabolic syndrome or diabetes.

MACE = major adverse cardiac event (death, nonfatal myocardial infarction, stroke, congestive heart failure).

Kip KE et al. *Circulation.* 2004;109:706-713.

Clinical Evaluation

Complications Assessment

1. Obesity Screening

1. Screen positive for overweight or obesity

   BMI ≥25 kg/m²

   (≥23 kg/m² in some ethnicities)

2. Presence of weight-related disease or complication that could be improved by weight loss therapy

2. Diagnosis: Evaluation

Evaluate Patient

1. Medical history
2. Physical examination
3. Clinical laboratory tests
4. Review of systems, emphasizing weight-related complications
5. Obesity history: graph weight vs age, lifestyle patterns/preferences, previous interventions

Obesity-Focused History

Life Events and Weight Gain

- Recap of patient life events that coincided with weight gain, such as smoking cessation, medication initiation, pregnancy or menopause, job loss, change in marital status, etc

Review of Systems

- Checklist of obesity-related complications

A detailed obesity history enables development of tailored treatment recommendations to address individual patient needs

Diet and Activity

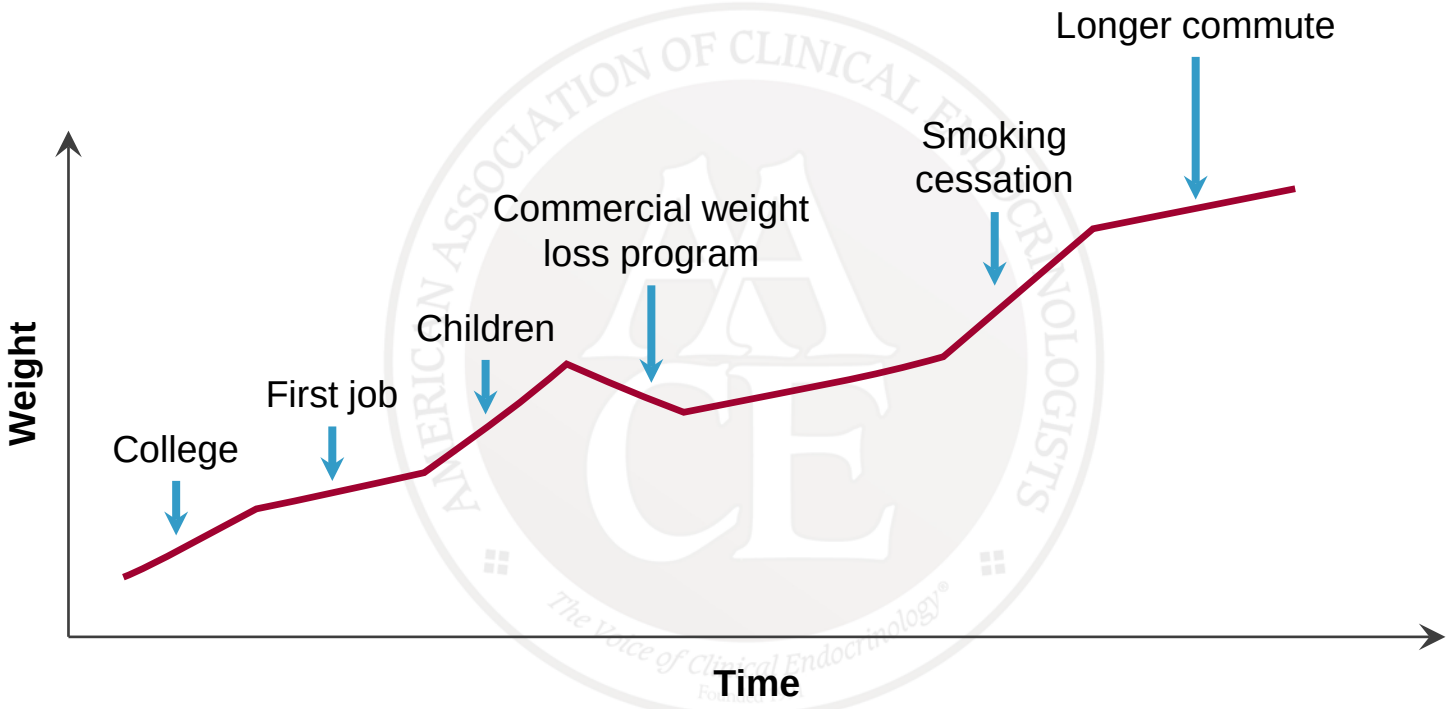
- Extent of daily physical activity
- Sleep habits and difficulties
- Food preferences and frequency/quantity of meals
- Psychological assessment
  - Mood/anxiety disorders, ADD, PTSD
  - Eating disorders

Weight Loss Readiness

- Motivation and social support
- Psychiatric status
- Presence of stressful life circumstances
- Time constraints
- Goals and expectations

Kushner RF. *Circulation*. 2012;126:2870-2877.

Clinical Tools: Lifestyle Events–Body Weight Graph



A graph of the coincidence of weight gain with life events can be a useful tool to help identify clinical, behavioral, and psychosocial determinants of obesity.

Kushner RF, et al. *Counseling Overweight Adults*. Chicago: American Dietetic Association; 2009.

2. Diagnosis: Clinical Component

EVALUATE FOR A CHECKLIST OF WEIGHT-RELATED COMPLICATIONS

Patients Present with Overweight or Obesity (Anthropometric Component)	Candidates for Weight Loss Therapy	Patients Present with Weight-Related Disease or Complication (Clinical Component)
Patients present with BMI ≥25 kg/m^2, or ≥23 kg/m^2 in certain ethnicities, and excess adiposity	Evaluate for weight-related complications → / Evaluate for overweight or obesity ←	Prediabetes
		Metabolic Syndrome
		Type 2 Diabetes
		Dyslipidemia
		Hypertension
		Cardiovascular Disease
		Nonalcoholic Fatty Liver Disease
		Polycystic Ovary Syndrome
		Female Infertility
		Male Hypogonadism
		Obstructive Sleep Apnea
		Asthma/Reactive Airway Disease
		Osteoarthritis
		Urinary Stress Incontinence
		Gastroesophageal Reflux Disease
		Depression

2. Diagnosis: Clinical Component

CHECKLIST OF WEIGHT-RELATED COMPLICATIONS: SCREENING AND DIAGNOSES IN PATIENTS WITH OVERWEIGHT/OBESITY

Metabolic Complications

- Prediabetes
- Type 2 Diabetes
- Metabolic Syndrome
- NAFLD/NASH

Cardiovascular Complications

- Dyslipidemia
- Cardiovascular Disease
- Hypertension

Organ-Specific, Hormonal, and Mechanical Complications

- PCOS and Female Infertility
- Osteoarthritis
- Male Hypogonadism
- Urinary Stress Incontinence
- Obstructive Sleep Apnea
- GERD
- Asthma / Respiratory Disease

Psychological Complications

Depression, Anxiety, Binge Eating Disorder, Stigmatization

2. Diagnosis: Clinical Component

CHECKLIST OF WEIGHT-RELATED COMPLICATIONS: SCREENING AND DIAGNOSES IN PATIENTS WITH OVERWEIGHT/OBESITY

Metabolic Complications

Weight-Related Complication	Basis for Screening and/or Diagnosis	Suggested Secondary Testing When Needed To Confirm Diagnosis, Stage Severity, or Guide Therapy
Prediabetes	Fasting glucose; A1C; 2-hour OGTT glucose	If fasting glucose is 100-125 mg/dL, a repeat elevated fasting glucose completes diagnosis of IFG; however, 2-hour OGTT should also be performed to exclude diabetes and IGT. Fasting and 2-hour OGTT should be performed if initial fasting glucose is normal and A1C is elevated, or in high-risk patients based on family history or metabolic syndrome.
Metabolic Syndrome	Waist circumference, blood pressure, fasting glucose, triglycerides, HDL-C	Initial evaluation completes diagnosis; OGTT to test for IGT or diabetes.
Type 2 Diabetes	Fasting glucose; A1C; 2-hour OGTT glucose; symptoms of hyperglycemia	Overtly elevated (i.e., ≥200 mg/dL) or a repeat fasting glucose ≥126 mg/dL completes diagnosis. If fasting glucose and/or A1C is consistent with prediabetes, 2-hour OGTT should be performed to test for diabetes. A1C should be performed to help guide therapy.
NAFLD/NASH	Physical exam; LFTs	Imaging (eg, ultrasound, MRI, elastography) and/or liver biopsy needed to complete diagnosis.

Abbreviations: A1C = glycated hemoglobin; HDL-C = high-density lipoprotein cholesterol; IGT = impaired glucose tolerance; LFTs = liver function tests; MRI = magnetic resonance imaging; OGTT = oral glucose tolerance test

2. Diagnosis: Clinical Component

CHECKLIST OF WEIGHT-RELATED COMPLICATIONS: SCREENING AND DIAGNOSES IN PATIENTS WITH OVERWEIGHT/OBESITY

Cardiovascular Complications

Weight-Related Complication	Basis for Screening and/or Diagnosis	Suggested Secondary Testing When Needed To Confirm Diagnosis, Stage Severity, or Guide Therapy
Dyslipidemia	Lipid panel (total cholesterol, HDL-C, triglycerides, LDL-C, non-HDL-C)	Lipid panel completes diagnosis; lipoprotein subclasses, Apo B-100 may further define risk.
Hypertension	Sitting blood pressure	Repeat elevated blood pressure measurements to complete diagnosis; home blood pressure or ambulatory blood pressure monitoring may help complete testing.
Cardiovascular Disease	Physical exam; ROS; history and medical records	Additional testing based on findings and risk status (eg, ankle-brachial index, stress testing, coronary artery calcium score and the MESA risk score calculator, arteriography, carotid ultrasound)).

Abbreviations: Apo B = ; HDL-C = high-density lipoprotein cholesterol; LDL-C = low-density lipoprotein cholesterol; MESA = ; ROS = review of symptoms

2. Diagnosis: Clinical Component

CHECKLIST OF WEIGHT-RELATED COMPLICATIONS: SCREENING AND DIAGNOSES IN PATIENTS WITH OVERWEIGHT/OBESITY

Organ-Specific, Hormonal, and Mechanical Complications

Weight-Related Complication	Basis for Screening and/or Diagnosis	Suggested Secondary Testing When Needed To Confirm Diagnosis, Stage Severity, or Guide Therapy
PCOS and Female Infertility	Physical exam, ROS, menstrual and reproductive history	Hormonal testing (eg, androgen levels, SHBG, LH/FSH, estradiol), ovulation testing, imaging of ovaries, may be needed to complete diagnosis.
Male Hypogonadism	Physical exam, ROS	Hormonal testing (total and free testosterone, SHBG, LH/FSH, prolactin) as needed to complete diagnosis.
Obstructive Sleep Apnea	Physical exam, neck circumference, ROS	Polysomnography needed to complete diagnosis.
Asthma / Respiratory Disease	Physical exam, ROS	Chest x-ray and spirometry study may be needed to complete diagnosis.
Osteoarthritis	Physical exam, ROS	Radiographic imaging may be needed to complete diagnosis.
Urinary Stress Incontinence	Physical exam, ROS	Urine culture, urodynamic testing may be needed to complete diagnosis.
GERD	Physical exam, ROS	Endoscopy, esophageal motility study may be needed to complete diagnosis.

Abbreviations: GERD = gastroesophageal reflux disease; LH/FSG = ; PCOS = polycystic ovarian syndrome; ROS = review of symptoms; SHBG = sex hormone binding globulin

2. Diagnosis: Clinical Component

CHECKLIST OF WEIGHT-RELATED COMPLICATIONS: SCREENING AND DIAGNOSES IN PATIENTS WITH OVERWEIGHT/OBESITY

Psychological Complications

Weight-Related Complication	Basis for Screening and/or Diagnosis	Suggested Secondary Testing When Needed To Confirm Diagnosis, Stage Severity, or Guide Therapy
Depression, Anxiety, Binge Eating Disorder, Stigmatization	History, ROS	Screening/diagnostic evaluation or questionnaires based on criteria in Diagnostic and Statistical Manual of Mental Disorders; referral to clinical psychologist or psychiatrist.

Abbreviations: ROS = review of symptoms

2. Diagnostic Categories

BASED ON BMI + SCREENING FOR WEIGHT-RELATED COMPLICATIONS

NORMAL WEIGHT	STAGE 0	STAGE 1	STAGE 2
No obesity	No complications	One or more mild-to-moderate complications or may be treated effectively with moderate weight loss	At least one severe complication or requires more aggressive weight loss for effective treatment
BMI <25 <23 IN CERTAIN ETHNICITIES	**BMI 25–29.9** OVERWEIGHT **BMI ≥30** OBESITY	**BMI ≥25**	**BMI ≥25**

Edmonton Obesity Staging System

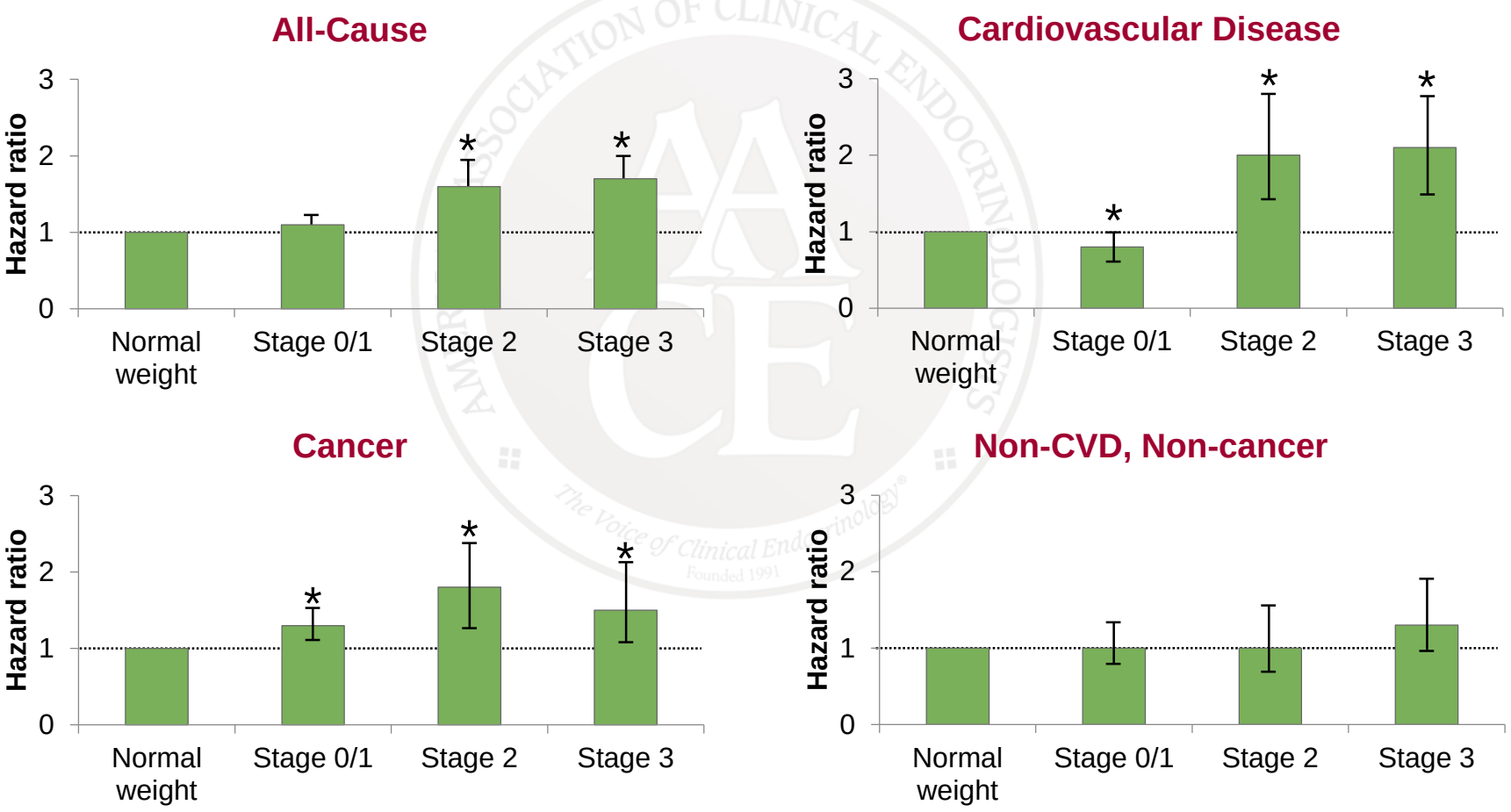
Stage	Severity	Characteristics
0		No obesity-related risk factors, physical symptoms, psychopathology, or functional limitations
1	Mild	BP ≥130/85 mmHg or ≥125/75 mmHg with T2D FPG 100-124 mg/dL Total cholesterol 200-240 mg/dL; triglycerides 150-199 mg/dL; HDL-C <60 mg/dL Shortness of breath during physical activity
2	Moderate	Diagnosed/treated hypertension; untreated BP ≥140/90 mmHg or ≥130/80 with T2D T2D or untreated FPG ≥125 mg/dL Diagnosed hypercholesterolemia; untreated total cholesterol ≥240 mg/dL, triglycerides ≥200 mg/dL, HDL-C <40 mg/dL Gout, depression, fatigue, urinary leakage, low back pain, joint stiffness Reported emotional outlook of "generally sad" or "fair" self-reported health
3	Severe	Chest pain, MI, calf pain during exercise, stroke, shortness of breath when sitting or sleeping, cardiomegaly Psychological/psychiatric counseling Reported emotional outlook of "often depressed" or "poor" self-reported health

BP = blood pressure; FPG = fasting plasma glucose; HDL-C = high-density lipoprotein cholesterol; MI = myocardial infarction; T2D = type 2 diabetes.

Kuk JL, et al. *Appl Physiol Nutr Metab*. 2011;36:570-576.

Edmonton Obesity Staging System Status and Risk of Death

Cause of Death



*P<0.05 vs normal weight.

Kuk JL, et al. *Appl Physiol Nutr Metab*. 2011;36:570-576.

AACE Obesity Staging

Diagnosis	Anthropometric component	Clinical component	Prevention and/or Treatment
Normal	BMI < 25		Primary
Overweight	BMI 25-29.9	No obesity-related complications	Secondary
Obesity Stage 0	BMI ≥30	No obesity-related complications	Secondary
Obesity Stage 1	BMI ≥25	Presence of one or more mild to moderate obesity-related complications	Tertiary
Obesity Stage 2	BMI ≥25	Presence of one or more severe obesity- related complications	Tertiary

BMI = body mass index, in kg/m^2.

Garvey TW, et al. *Endocr Pract*. 2014;20:977-989.

Staging for Cardiometabolic Disease

ATP III Risk Factors Evaluated

- Waist circumference
- Blood pressure
- HDL-C
- Triglycerides
- Fasting glucose

	Criteria
Stage 0	No risk factors
Stage 1	1 or 2 risk factors
Stage 2	• Metabolic syndrome • Prediabetes • Type 2 diabetes

Garvey TW, et al. *Endocr Pract*. 2014;20:977-989.

Evaluation of Dyslipidemia Severity

Risk level	**Moderate** Diabetes but no other major risk and/or age <40 years	**High** Diabetes + major CVD risk (hypertension, family history, low HDL-C, smoking) or CVD
Targets		
LDL-C, mg/dL	<100	<70
Non–HDL-C, mg/dL	<130	<100
TG, mg/dL	<150	<150
TC/HDL-C	<3.5	<3.0
ApoB, mg/dL	<90	<80
LDL-P, nmol/L	<1200	<1000

Garber AJ et al. *Endocr Pract*. 2016;22:84-113.

CVD Risk Factors: AACE Targets

Risk Factor	Recommended Goal
Weight	Reduce by 5% to 10%; avoid weight gain
Lipids	
LDL-C, mg/dL	<70 very high risk; <100 all other risk categories
Non-HDL-C, mg/dL	<100 very high risk; <130 all other risk categories
Triglycerides, mg/dL	<150
TC/HDL-C ratio	<3.0 very high risk; <3.5 all other risk categories
ApoB, mg/dL	<80 very high risk; <90 high risk
LDL particles	<1000 very high risk; <1200 high risk
Blood pressure	
Systolic, mm Hg	~130
Diastolic, mm Hg	~80
Blood glucose	
FPG, mg/dL	<100
2-hour OGTT, mg/dL	<140
Anticoagulant therapy	Use aspirin for primary and secondary prevention of CVD events

FPG = fasting plasma glucose; OGTT = oral glucose tolerance test.

Garber AJ, et al. *Endocr Pract*. 2008;14:933-946; Handelsman Y, et al. *Endocr Pract*. 2015;21(suppl 1):1-87; Jellinger PS, et al. *Endocr Pract*. 2012;18(suppl 1):1-78.

Summary

- Clinical evaluation of obese patients should include a complete history and physical examination
- Comorbidities and obesity complications should also be assessed
- Treatment plans should be designed according to severity of comorbidities and complications as well as body mass index