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Obesity with Co-Morbid Conditions
DEFINITION

Def: Obesity

The most widely used and accepted metric for identifying obesity is having a BMI greater than 30. Waist circumference is also being recognized as important factors in assessing obesity[vii]. Men with a waist circumference of 40 inches or greater, and women with a waist circumference of 35 inches or greater, are considered obese[xvii].

Def: Obesity and Associated Co-Morbidities

Higher body weights are associated with an increase in mortality from all causes. Obese individuals with co-morbidities are those who are at the highest risk because they tend to have multiple risk factors. Being overweight or obese substantially increases the risk of chronic conditions and illnesses such as hypertension, dyslipidemia, type 2 diabetes, coronary artery disease, stroke, gallbladder disease, osteoarthritis, and sleep apnea and respiratory problems, as well as cancers of the endometrium, breast, prostate, and colon[i].

Background

The prevalence of overweight and obesity is increasing rapidly in the U.S. Sixty-four percent of the U.S. population aged 20 and over is overweight; thirty percent of adults in the U.S. are obese[ii]. Moreover, 15 percent of school age children are overweight[iii] and the proportions are even higher among some ethnic groups[iv]. All in all, an estimated 97 million adults in the United States are overweight or obese. Many of these individuals exhibit pre-diabetes and other co-morbid conditions[v].

The concept of obesity and obesity with associated co-morbidities as manageable, chronic conditions is emerging. Robust epidemiological and scientific evidence clearly demonstrates that obesity should be considered in the context of chronic disease[vi,vii,viii,ix,x]. DM offers a new model of care that shifts treatment toward chronic care and proactively interfaces with other existing chronic illnesses common in obese individuals. By recognizing the central role that obesity plays in the development of these illnesses, better care can result.

Detailed Information

New thinking suggests the need to focus disease management on those who are at highest risk, are already obese and have a cluster of risk factors or co-morbid conditions.

The following Table from the National Heart, Lung and Blood Institute, and the National Institutes of Health presents categories for overweight and obesity. These are presented as both BMI and waist circumference measurements. Associated risk factors are also shown.

Cut-off points are used to identify increased relative risk for the development of obesity-associated risk factors. While imperfect, these cut-off points indicate the need for management of the clinical issues relating to overweight and obesity to reduce risk factors, improve health overall, and reduce resource consumption.

Classification of Overweight and Obesity by BMI, Waist Circumference and Associated Disease Risks

			Disease Risk* Relative to Normal Weight and Waist Circumference	
	BMI (kg/m²)	Obesity Class	Men ≤ 102 cm (≤ 40 in) Women ≤ 88 cm (≤ 35 in)	> 102 cm (> 40 in) > 88 cm (> 35 in)
Underweight	<18.5		—	—
Normal+	18.5 –24.9		—	—
Overweight	25.0 – 29.9		Increased	High
Obesity	30.0 – 34.9	I	High	Very High
	35.0 – 39.9	II	Very High	Very High
Extreme Obesity	≥40	III	Extremely High	Extremely High

Source: National Heart, Lung and Blood Institute, National Institutes of Health

Claims data collection systems however, were not designed to collect information with which to assess obesity levels. This deficiency has hindered DM program development. In the future, other methods of identifying the risk associated with obesity including assessing for signs of insulin resistance, glucose intolerance, a proinflammatory and prothrombotic state. These might include testing for inflammation through the measurement of serum C-reactive protein, a prothrombotic state by measuring serum PAI-1[xvii].

METRICS FOR IDENTIFYING OBESE POPULATIONS

Most often body mass index (BMI) is used to determine overweight and obesity. Waist circumference is another key measure for identifying obese individuals in chronically ill populations. Both BMI and waist circumference have limitations in assessing obesity and risk. Other methods, which are expensive and not generally feasible in the clinic or

home settings include calipers (skin-fold measurement), underwater weighing, and computerized topography.

Body Mass Index (BMI)

Obesity is commonly assessed by using body mass index (BMI), defined as the weight in kilograms divided by the square of the height in meters (kg/m^2). A BMI of over 25 kg/m^2 is defined as overweight, and a BMI of over 30 kg/m^2 as obese. These markers provide common benchmarks for assessment, but the risks of disease in all populations can increase progressively from lower BMI levels[xii].

Limitations of BMI

Simple BMI calculations may be misleading. According to the existing definition and calculation of BMI, anyone with a BMI over 25 would be classified as overweight whether their body is composed of fat or muscle. Athletes, for example, may be considered to be overweight even though they may have very little visceral fat. BMI is an imperfect indicator of risk of disease. People with the same BMI but different amounts of visceral fat face different risks of disease. Furthermore, weight is only one among many risk factors.

BMI is calculated the same for adults and children but is interpreted differently for children. The CDC notes that "for children ages 2 – 20 years, BMI is plotted on a growth chart specific for age and gender."[xi]

Although some authors use categories such as "moderately overweight" for those with BMI of 25-30, the National Heart, Lung and Blood Institute (NHLBI) does not designate overweight with such qualifiers. The extreme obesity classification (BMI >40) is a commonly used cut-off for determining qualification for bariatric surgery. However, BMI cut-off points for obesity vary around the world[xii].

Waist Circumference

The National Heart, Lung and Blood Institute, part of the National Institutes of Health, (NIH), has the following definition of waist circumference:

> "[The] presence of excess fat in the abdomen out of proportion to total body fat is an independent predictor of risk factors and morbidity. Waist circumference is positively correlated with abdominal fat content. It provides a clinically acceptable measurement for assessing a patient's abdominal fat content before and during weight loss treatment."[xiii]

Limitations of Waist Circumference

Waist circumference is valuable in assessing risk in the BMI< 35 range and is particularly useful in ethnically diverse groups (Yusuf S, Lancet ref), where waist to hip ratio may be an even better predictor. Waist circumference in individuals with a BMI >35 generally exceeds the cut-off points noted above. The relative risk faced by individuals within a BMI or waist circumference range can be estimated compared to the risk that individual would face at a normal weight or waist size. These relative risk calculations

do not reflect the individual’s absolute risk, which is determined by adding all of his/her risk factors.

RISK PREDICTION

Predicting risk is essential to disease management. The World Health Organization states:

> The prevalence of overweight and obesity is commonly assessed by using body mass index (BMI), defined as the weight in kilograms divided by the square of the height in meters (kg/m^2). A BMI over 25 kg/m^2 is defined as overweight, and a BMI of over 30 kg/m^2 as obese. These markers provide common benchmarks for assessment, but the risks of disease in all populations can increase progressively from lower BMI levels[xiv].

According to the American Obesity Association, “obesity is associated with more than 30 medical conditions, and scientific evidence has established a strong relationship with at least 15 of those conditions.” The American Heart Association also now recognizes obesity as a risk factor for heart attack[xv].

The prevalence of various medical conditions increases with overweight and obesity for men and women as shown in the Tables below in correlation to BMI.

Table 1. Prevalence of Medical Conditions by Body Mass Index (BMI) for Men

Medical Condition	Body Mass Index			
	18.5 to 24.9	25 to 29.9	30 to 34.9	≥ 40
	Prevalence Ratio (%)			
Type 2 Diabetes	2.03	4.93	10.10	10.65
Coronary Heart Disease	8.84	9.60	16.01	13.97
High Blood Pressure	23.47	34.16	48.95	64.53
Osteoarthritis	2.59	4.55	4.66	10.04
Source: NHANES III, 1988 - 1994.				

Table 2. Prevalence of Medical Conditions by Body Mass Index (BMI) for Women

Medical Condition	Body Mass Index			
	18.5 to 24.9	25 to 29.9	30 to 34.9	≥ 40
	Prevalence Ratio (%)			
Type 2 Diabetes	2.38	7.12	7.24	19.89
Coronary Heart Disease	6.87	11.13	12.56	19.22
High Blood Pressure	23.26	38.77	47.95	63.16
Osteoarthritis	5.22	8.51	9.94	17.19
Source: NHANES III, 1988 - 1994.				

Metabolic Syndrome

Overweight and obesity are associated with insulin resistance and the metabolic syndrome. However, the presence of abdominal obesity is more highly correlated with the metabolic risk factors than is an elevated BMI. Therefore, the simple measure of waist circumference is recommended to identify the body weight component of the metabolic syndrome.

Though the existence of Metabolic Syndrome is often debated, there does exist a cluster of cardiovascular risk factors often associated with obesity. According to ATP III criteria[xv, xvi,] Metabolic syndrome can be diagnosed when 3 of the following 5 diagnostic criteria are present: Abdominal obesity, elevated glucose or triglycerides, reduced HDL cholesterol, or hypertension[xiii]. Recent evidence suggests that treating patients once metabolic syndrome has advanced to these diseases may not be cost effective. In a study of adults with metabolic syndrome, researchers found drugs costs were four times higher for these patients than the average annual drug costs for patients without metabolic syndrome. Patient outcomes are also suboptimal in those with metabolic syndrome, but new research suggests that treating the underlying causes of the condition could lead to better outcomes.

TABLE x. ATP III Clinical Identification of the Metabolic Syndrome

Risk Factor	Defining Level
Abdominal obesity, given as waist circumference[*†]	
Men	>102 cm (>40 in)
Women	>88 cm (>35 in)
Triglycerides	≥150 mg/dL
HDL cholesterol	
Men	<40 mg/dL
Women	<50 mg/dL
Blood pressure	≥130/≥85 mm Hg
Fasting glucose	≥110 mg/dL[‡]

Source: Third report of the National Cholesterol Education Program (NCEP) expert panel on detection, evaluation, and treatment of high blood cholesterol in adults (Adult Treatment Panel III). Final report. *Circulation.* 2002; 106: 3143–3421.

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