

HOSPITAL PHYSICIAN®

CARDIOLOGY BOARD REVIEW MANUAL

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The *Hospital Physician Cardiology Board Review Manual* is a peer-reviewed study guide for fellows and practicing physicians preparing for board examinations in cardiology. Each bi-monthly manual reviews a topic essential to the current practice of cardiology.

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Obesity and the Metabolic Syndrome

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Obesity and the Metabolic Syndrome

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INTRODUCTION

Obesity, a chronic imbalance between energy intake and energy expenditure, has become a major public health issue in the United States. Nearly one third of the American population is considered obese, with approximately 5% considered morbidly obese.^{1,2} A century ago, obesity was considered a rare medical problem, but the prevalence of obesity has increased dramatically in the past 20 years, reaching epidemic proportions among Americans.³ Both men and women among Native Americans, African Americans, and Mexican Americans have an increased prevalence of obesity and metabolic syndrome compared with white Americans. The prevalence of obesity and metabolic syndrome is rapidly increasing among children and adolescents, especially in groups with the lowest level of education. In the United States, the prevalence of overweight children reached approximately 14%, which is 3 times higher than the prevalence observed 40 years ago. A vicious circle of higher birth weight, childhood obesity, metabolic syndrome, and type 2 diabetes mellitus has evolved. Without evidence to support biological evolutions in society, such as genetic or metabolic changes, these trends in increasing obesity are largely due to behavioral and environmental influences. Increases in energy consumption coupled with an increasingly sedentary society have led to marked weight increases in all age-groups.

Obesity is well documented as a contributing factor in diabetes, cardiovascular disease (CVD), hypertension, stroke, cancer, osteoarthritis, asthma, and sleep apnea.⁴ Obesity is estimated to cost the United States \$117 billion each year in direct costs from diagnosis, treatment, and use of health services as well as in indirect costs from lost productivity due to illness or premature death.⁵ Given the serious health consequences of obesity and its economic impact, greater attention must be directed to the prevention, identification, and treatment of overweight and obese conditions.

The third part in a series on the metabolic syndrome, this manual describes the relationship between obesity and the metabolic syndrome, reviews the clinical implications of obesity, identifies contemporary approaches

to prevention and treatment, and presents a case study to illustrate key points.

DEFINING AND MEASURING OBESITY

Measurement of body mass index (BMI) is the most frequently used method to define degree of obesity and quantify health risk. BMI can be calculated based on the height and weight of a person according to the formula:

$$\text{BMI} = \text{Body weight (kg)} / \text{Height (m}^2\text{)}$$

BMI calculators are available on numerous web sites and printed charts. BMI has shown a good correlation with total body fat and is relatively unaffected by height. Overweight is defined as BMI of at least 25 kg/m², obesity as BMI of at least 30 kg/m², and extreme obesity as BMI of at least 40 kg/m² (Table 1).⁶ Epidemiologic data have shown that the vast majority of people with BMI of at least 30 kg/m² do not exercise regularly and have a sedentary lifestyle.⁷ Higher BMI values are also associated with an increased number of comorbidities, such as CVD, hypertension, dyslipidemia, obstructive sleep apnea, insulin resistance and type 2 diabetes mellitus, cholelithiasis, and osteoarthritis.^{5,8,9} Epidemiologic evidence suggests that regional distribution of fat plays a significant role in patients with increased BMI; abdominal obesity (android or male-type obesity) correlates with multiple comorbidities and increased overall mortality compared with gynoid obesity (female-type or gluteo-femoral obesity).¹⁰⁻¹³

Obesity is not a homogenous condition, and additional parameters besides BMI are used to better characterize obese patients. Waist-to-hip circumference ratio (WHR) is a simple and convenient method to estimate the proportion of abdominal obesity,^{14,15} although it does not differentiate between subcutaneous and deep abdominal fat. Fat distribution is important because it mediates detrimental effects on glucose and lipid metabolism.¹⁶⁻¹⁸ Waist circumference measured at the midpoint between the over border of the rib cage and iliac crest has been reported to be more closely correlated with the level of abdominal visceral adipose tissue and associated metabolic