

# 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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## Metabolic Syndrome: Overview and Current Guidelines

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# Metabolic Syndrome: Overview and Current Guidelines

Julian Halcox, MA, MD, MRCP, and Arshed A. Quyyumi, MD, FRCP

## INTRODUCTION

The cluster of risk factors for atherosclerosis that constitute the metabolic syndrome was first recognized in 1983. In 1988, Reaven introduced the term *syndrome X* to highlight insulin resistance as a common denominator for the dyslipidemia, elevated blood pressure, and impaired glucose tolerance in the context of abdominal obesity that characterize this syndrome. Other notable features of the syndrome include a proinflammatory state, microalbuminuria, and hypercoagulability. Although other terms have been used to describe this cluster of risk factors, *metabolic syndrome* is now the accepted term.

Up to 50 million people in the United States are believed to have the metabolic syndrome and are thus at increased risk of developing atherosclerotic disease. Because of this high prevalence and in order to increase awareness of the syndrome among practicing physicians, several expert bodies (eg, the World Health Organization [WHO] and the American Association of Clinical Endocrinologists [AACE]) have published diagnostic criteria for the metabolic syndrome. The criteria developed in the National Cholesterol Education Program's Adult Treatment Panel III report (ATP III) are the most widely used in US clinical practice.<sup>1</sup>

The purpose of this manual, the first in a series on the metabolic syndrome, is to provide the reader with an understanding of how to recognize patients with and at risk for developing the metabolic syndrome and to review current strategies for treatment of these individuals. We present a typical case of a patient presenting with the metabolic syndrome to illustrate several key issues in the management of this condition.

## COMPONENTS OF METABOLIC SYNDROME AND CARDIOVASCULAR RISK

ATP III considers risk of atherosclerotic disease according to underlying, major, and emerging risk factors.<sup>1</sup> Underlying risk factors for coronary heart disease (CHD) in-

clude (abdominal) obesity, an atherogenic diet, and physical inactivity. Major risk factors for CHD include aging, tobacco use, increased serum concentration of low-density lipoprotein (LDL) cholesterol, low serum concentration of high-density lipoprotein (HDL) cholesterol, high blood pressure, and a history of premature CHD in a first-degree relative (male < 55 years, female < 65 years). Emerging risk factors include hypertriglyceridemia, small, dense LDL particles, insulin resistance with glucose intolerance, inflammation, and a prothrombotic state.

These risk factors are comprised in the 6 central components of the metabolic syndrome ATP III identified as relevant to clinical development of CHD:

1. **Abdominal obesity.** This is characterized clinically as increased waist circumference; abdominal or visceral obesity is the form of obesity most strongly associated with metabolic syndrome and risk of CHD.
2. **Atherogenic dyslipidemia.** This is characterized in routine lipoprotein analysis by raised triglycerides and low concentrations of HDL cholesterol. Further detailed analysis often reveals other abnormalities, including small, dense LDL particles, small HDL particles, increased levels of apolipoprotein B, and increased remnant lipoproteins, all of which have independent atherogenic potential.
3. **Increased blood pressure.** Obesity is an important predisposing factor for hypertension, particularly in those with insulin resistance. Although hypertension is multifactorial in origin and other causes should be considered in patients with metabolic syndrome, increased blood pressure should be considered as a principal component of this syndrome.
4. **Insulin resistance with glucose intolerance.** The majority of patients with metabolic syndrome exhibit evidence of insulin resistance, typically characterized by glucose intolerance. Despite the strong association between insulin resistance, glucose intolerance, and other metabolic risk factors, mechanisms underlying the link to CHD risk factors are uncertain, and the associated constellation of risk factors may drive atherogenesis to a greater extent than impaired insulin signaling and glucose intolerance per se. When