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ENDOCRINOLOGY BOARD REVIEW MANUAL

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The *Hospital Physician Endocrinology Board Review Manual* is a study guide for fellows and practicing physicians preparing for board examinations in endocrinology. Each quarterly manual reviews a topic essential to the current practice of endocrinology.

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Cardiovascular Risk Reduction in Diabetes: Managing the Metabolic Milieu

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Cardiovascular Risk Reduction in Diabetes: Managing the Metabolic Milieu

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INTRODUCTION

Diabetes has become an uncontrolled global epidemic and a burgeoning cause of morbidity and mortality.¹ In the United States, the prevalence of diagnosed diabetes has steadily climbed from 0.9% in 1958 to 4.4% in 2000, with increases occurring across all populations.² An estimated 18.2 million people in the United States had diabetes in 2002.³

The estimated direct costs of diabetes in the United States in 2002 totaled \$91.8 billion, including \$23.2 billion for medical expenditures related to diabetes care, \$24.6 billion for care of diabetes-related chronic complications, and \$44.1 billion for the increased prevalence of associated medical complications.⁴ Cardiovascular disease is the most costly complication of type 2 diabetes, accounting for more than 4 million inpatient days and an excess of lost productivity.⁴

Most patients with type 2 diabetes will die from cardiovascular disease–related causes. Therefore, screening and treatment for cardiovascular risk factors should be a top priority in the management of these patients. The American Diabetes Association (ADA) recommends that individuals with type 2 diabetes receive at least annual screening for dyslipidemia, hypertension, and the presence of micro- or macroalbuminuria.⁵ Further, the ADA recommends tight treatment goals for glycemia, blood pressure, and serum lipid levels (**Table**).⁵ The American Heart Association⁶ and the National Cholesterol Education Program Adult Treatment Panel III⁷ similarly recommend that diabetic patients be considered at high risk for cardiovascular disease and advocate more rigorous lipid and blood pressure targets for primary and secondary prevention of cardiovascular events if screening tests reveal abnormalities.

This manual is the first in a 2-part review examining the cardiovascular risk implications of type 2 diabetes and management strategies that should be applied to prevent or reduce the risk of cardiovascular events. In the first half of the review, a patient with type 2 diabetes and hypertension is used to frame a discussion of the

cardiovascular risk reduction potential of lifestyle interventions, glycemic control, antiplatelet agents, and anti-hypertensive medications.

DIABETES AND CARDIOVASCULAR RISK

Atherosclerotic vascular diseases and their sequelae are the greatest causes of mortality in patients with diabetes, accounting for 65% to 80% of deaths.⁸ Diabetic individuals have a 2- to 4-fold higher overall risk of having a coronary event than the general population,^{9,10} and diabetic autonomic neuropathy complicates the cardiac assessment. Although myocardial events account for most deaths, the entire vascular system is subject to accelerated atherosclerosis. Individuals with diabetes have a relative risk of stroke that is between 1.8 and 6 times higher than that in the general population.¹⁰ Peripheral vascular disease affects 10% to 40% of patients with diabetes and is the leading cause for amputations.¹¹ Inadequate arterial circulation is often compounded by the presence of peripheral neuropathy and is associated with infection.

The more cardiovascular risk factors present in each individual, the greater the risk. The Multiple Risk Factor Intervention Trial (MRFIT) measured cardiovascular mortality in 347,978 men, 5163 of whom had diabetes.¹² This study revealed that the cardiovascular risk associated with diabetes is equal to or greater than the risk in the presence of 2 traditional risk factors. Each additional risk factor increased the risk of cardiovascular death substantially more among diabetic subjects than among nondiabetic subjects.¹² It is now apparent that individuals with diabetes have the same risk of a cardiovascular event as those without diabetes and a history of myocardial infarction (MI); therefore, diabetic patients should be subject to similarly aggressive management.¹³ Type 2 diabetes exacerbates traditional risk factors such as hypercholesterolemia, systolic hypertension, family history of cardiac disease, obesity, and cigarette smoking. Family history and obesity contribute to the insulin resistance that underlies the metabolic syndrome. Multiple studies have demonstrated the efficacy of risk reduction