



Convergence of Diabetes & Cardiovascular Disease

Background

In the United States, an estimated 80 million adults (approximately 33% of the population) have one or more types of cardiovascular disease (CVD) and 23.6 million people (approximately 8% of the population) have diabetes. Another 57 million have pre-diabetes - they have blood glucose levels that are higher than normal but not yet high enough to be diagnosed as diabetes.

Having both CVD and diabetes is a very common and particularly deadly combination. These two diseases share a multitude of risk factors, including: high blood pressure, high LDL (bad) cholesterol, low HDL (good) cholesterol, high triglycerides, smoking, obesity, lack of physical activity and poorly controlled blood glucose. Adults with diabetes are 2 to 4 times as likely to die from heart disease compared to adults without diabetes. In addition, heart disease and stroke account for nearly two-thirds of all deaths in people with diabetes.

While the risk of dying from heart disease has been decreasing for several decades in the United States, there has been much less of a decline among men with both CVD and diabetes. As for women with both CVD and diabetes, the risk of dying from heart disease has actually increased 23% over the past 30 years! Unfortunately, the situation is not getting better anytime soon as the proportion of individuals in the U.S. with diabetes — known as disease prevalence — has increased by 13.5%.

Crossroads of Diabetes and CVD

When you eat food, the body breaks down all of the sugars and starches into glucose, the basic fuel for all body cells. The hormone insulin, produced by the pancreas, helps convert sugar and other food into energy and helps glucose get into our bodies' cells.

In people with diabetes, either the body does not produce enough insulin or the cells ignore the insulin signal (referred to as insulin resistance). When cells do not take up blood glucose as they should, it stays in the blood. As a result, cells become starved for energy and the high levels of blood glucose can result in damage to the heart, eyes, kidneys, and nerves. To make matters worse, diabetes contributes to plaque (fatty deposits) that lines blood vessels resulting in narrowing or obstruction of blood vessels and eventually conditions such as

heart disease, peripheral artery disease, and carotid artery disease and ultimately heart attack and stroke.

The good news: type 2 diabetes, the most common type, is highly preventable because it is associated with many risk factors that can be changed. Indeed, at the crossroads of CVD and diabetes are a number of risk factors that interact in ways that make an already bad situation even worse – and many of these risk factors are influenced by lifestyle choices that could be modified to reduce the risk of both diseases.

These major risk factors include:

- **Overweight/obesity** — Like it or not, carrying too much weight can create a whole host of problems — everything from weak knees and a bad back to CVD and diabetes. If the excess weight is most evident in the stomach area (as opposed to the hips), this creates additional problems because of the amount of body fat that is being stored in tissues. An adult is considered obese if his or her body mass index (BMI), which is calculated using height and weight, is 30 or higher. (Use the CardioSmart BMI calculator to determine your BMI.) Obesity is strongly related to insulin resistance.
- **Physical inactivity** — Besides contributing to being overweight or obese, lack of activity in and of itself multiplies your risk of developing CVD or diabetes. Conversely, increasing physical activity helps keep systems in balance, strengthens muscle — including heart muscle — and can increase high-density lipoprotein cholesterol (HDL), the so-called “good” cholesterol. Just how serious a risk factor is inactivity? In terms of how much it increases risk, it’s comparable to high blood cholesterol, high blood pressure, or cigarette smoking. To put it in actual numbers, the World Health Organization estimates that physical inactivity causes 20% of all CVD, 22% of coronary heart disease, and about 1.9 million deaths every year worldwide.
- **High blood pressure (hypertension)** — Worldwide, this is one of the most important preventable causes of premature death. Even a blood pressure at the top end of normal increases risk. In 2003–2004, 75% of adults with self-reported diabetes had blood pressure greater than or equal to 130/80 mm Hg (less than 120/80 is considered normal) or were already taking medications to treat hypertension. (Visit the CardioSmart High Blood Pressure Condition Center to find out more and to help track your own blood pressure.)
- **Abnormal cholesterol levels** — In the United States, 105 million people have cholesterol levels that are a cardiovascular risk. High cholesterol causes about one-third of all cardiovascular disease worldwide. Risk of

both diabetes and CVD increases when HDL is less than 35 mg/dl, low-density lipoprotein cholesterol (LDL) is greater than 100 mg/dl (and most clinicians think LDL should be no higher than 70 mg/dl), or triglycerides are higher than 250 mg/dl.

- **Metabolic syndrome** — This combination of medical disorders (impaired glucose intolerance, central obesity, elevated triglycerides, lowered HDL, and high blood pressure) increases the risk of CVD as well as diabetes. An estimated 76 million in the U.S. have metabolic syndrome, which comes to about one-third of all men and women.
- **Age** — The only major risk factor for CVD and diabetes that can't be modified is age. As one grows older, one's risk of developing either diabetes or CVD increases. However, targeting all the modifiable risk factors will greatly reduce overall risk and limit the effects of this one risk factor that can't be modified.

Diabetes & Cardiovascular Disease Initiative

Although most patients with diabetes receive ongoing treatment from their primary care physician, many also see diabetes specialists (some are called diabetologists) for specific problems and questions. However, given the propensity of people with CVD to also have diabetes or be at much greater risk for diabetes, experts have concluded that cardiologists should be more involved in the care of individuals with diabetes and the care of individual patients with diabetes who also have CVD.

To that end, the American College of Cardiology has launched the Convergence of Type 2 Diabetes & Cardiovascular Disease Initiative to educate cardiologists and patients about how these two diseases intertwine and how they can be treated together to reduce the risk of death and the incidence of cardiovascular events, such as heart attack, stroke, and heart failure. Much of this care focuses on lifestyle management but also on specialized medical management to treat both diseases in complementary fashion.

The Initiative has developed the **ABCDEF's** of risk reduction that encompasses both Diabetes and CVD:

A — A1c and Aspirin

A1c Target: Hemoglobin is one of the main workhorses in your blood. A protein molecule in red blood cells, it carries oxygen from the lungs to tissues throughout the body, returning carbon dioxide back to the lungs. Hemoglobin is created in bone marrow and lives for about 3 months before it is broken down and replaced

by new hemoglobin. Hemoglobin also picks up hitchhikers in the form of glucose molecules. The more glucose in the bloodstream, the more this key source of energy will attach to hemoglobin, transforming it into glycated hemoglobin. The HbA1c test measures the amount of glucose in your blood by essentially counting how much glucose is attached to hemoglobin over time. It represents a long term measure of blood glucose control. **The goal is an HbA1c below 7%.** This level of HbA1c helps prevent microvascular disease and may impact CVD risk as well.

Aspirin: Aspirin is recommended for patients with diabetes who are over the age of 40 years or those who have known heart disease or have had a prior heart attack or stroke. Talk to your health care provider about whether you should be taking a daily aspirin..

B — Blood Pressure Control

The goal blood pressure for patients with diabetes is 130/80 mm Hg, which is lower than the target for the typical heart disease patient (140/80 mm Hg). However, there are other types of problems, such as chronic kidney disease or heart failure, where the lower target is also recommended.

People with diabetes should see their health care provider on a regular basis to have their blood pressure monitored. Purchasing a blood pressure monitor is also a way to monitor your blood pressure at home.. .

If medication is required to lower blood pressure, first-line therapy – that is, the first drug of choice for treating hypertension – is usually an angiotensin-converting enzyme (ACE) inhibitor or angiotensin receptor blocker for individuals who are ACE intolerant. Some thiazide diuretics and beta-blockers, both commonly used for treating CVD, may actually increase the risk of diabetes.

C — Cholesterol Management and Cigarette Smoking

Cholesterol Management: While there are numerous fats or lipids in the blood, the one that is most critical in terms of diabetes and CVD risk is LDL. This is the bad cholesterol and every adult should know their LDL level. Guidelines today suggest aggressive therapy to achieve a level of 70 mg/dl or lower for individuals with diabetes and/or CVD.

Statins are the drug of choice to lower cholesterol, and they have been studied extensively in individuals with and without heart disease and with varying levels of LDL cholesterol. Recently, the Justification for the Use of Statins in Primary Prevention: an Intervention Trial Evaluating Rosuvastatin (JUPITER) study found that Rosuvastatin therapy significantly reduced the risk of cardiovascular events,

like heart attack and stroke, in individuals without CVD and low-to-moderate LDL levels but elevated levels of a marker of inflammation known as C-reactive protein.

Cigarette Smoking: Cigarette smoking greatly increases the risk of CVD. Ask your health care provider about strategies for smoking cessation which can include nicotine replacement and medication. Also ask them to recommend a smoking cessation program.

D — Diabetes and Pre-Diabetes Management

It is recommended that patients with diabetes encompass comprehensive lifestyle modifications to help them maintain their diabetes under good control and reduce their risk of suffering a major cardiovascular event such as a heart attack or stroke. Healthy food choices, weight reduction, regular physical activity, and smoking cessation are key lifestyle modifications to help you control your diabetes. If you are a diabetic, make sure to see your health care provider on a regular basis for management of your medications and monitoring of your HbA1C. If you have prediabetes, you can encompass the same lifestyle modifications listed above to prevent the development of diabetes and reduce your risk of CVD.

E — Exercise

Moderately intense aerobic activities, such as walking, jogging, or cycling is important as a risk reducing strategy for both CVD and diabetes. The reason such activities are considered aerobic is that they use large muscle groups, increase your heart rate, and improve your body's oxygen consumption. Walking is a great exercise and you can do it pretty much anywhere. Ideally, aerobic activity should be done at a moderately intense level; you do not have to endure highly intense levels of activity to achieve the benefits of exercise. A 30-minute brisk walk once every day will go a long way towards improving your health.

If you cannot handle 30 minutes a day from the start, work with your health care provider to create a program and routine that will work for you. Few people, including the young and athletic, can run a marathon right out of the gate; for most of us, working up our aerobic endurance takes some time.

You also should be encouraged to increase your overall daily activities, whether that is using stairs instead of elevators at your work place or doing more work around the house or garden. In addition, experts recommend resistance training, too — such as lifting light weights — 2 days a week.

The bottom line: Getting in shape isn't about big bulky muscle nor is it an unrealistic goal to turn yourself into an athlete or a top model; it's an overall level of increased activity that helps you lose weight, improve cholesterol levels (exercise raises the level of HDL, your "good" cholesterol), and a lot more. Plus, it may reduce your dependence on medication for diabetes and CVD.

F — Food Choices

Every time you open your mouth to eat, you are making a conscious choice about how you fuel your body. The recommendations about food are not dramatically new, and you probably know many of them already. Eat less food (reduce portion sizes) and make sure the food you do eat isn't overly high in calories. Limit your intake of saturated and trans fats as well as cholesterol. Concentrate on a personal menu that features fish, lean meats, non-fat or low-fat dairy products, fruit, vegetables, fibers, and nuts. The fats you do consume should be mostly poly- or mono-unsaturated fats, which are found in salmon, trout, herring, avocados, olives, walnuts and liquid vegetable oils such as soybean, corn, safflower, canola, olive, and sunflower.

If this was easy, most of us wouldn't need to be reminded what foods are better for us. But there is an abundance of good food choices available once you know what you're looking for. And remember: improving your daily menu is even more important if you have diabetes, especially because you have to be aware of how foods affect your blood glucose level. Having it run too low (hypoglycemia) can produce just as harmful complications as having it too high (hyperglycemia). Usually, individuals with diabetes will meet with a dietician to help them create personal food plans. These should be based on individual needs as well as personal likes and dislikes or food choices that may already be in place (e.g., vegetarianism, Kosher foods, or plans that are designed to promote weight loss).

What about food choices based on their glycemic index rank? This is a measure of the effect that carbohydrates have on glucose level and it's a popular theory. However, there is controversy over the utility of such an index particularly for people with diabetes given the variability among patients as well as among food, where even the level of ripeness can influence whether a foodstuff is considered high or low on the glycemic index. An overall individual plan will likely provide greater benefit for individuals with diabetes than popular calorie or carbohydrate counting programs.

Guidelines:

[No authors listed] American Diabetes Association. Standards of medical care in diabetes--2009. *Diabetes Care* 2009;32[Suppl 1]:S13-61.

Brunzell JD, Davidson M, Furberg CD, et al. Lipoprotein management in patients with cardiometabolic risk: consensus conference report from the American Diabetes Association and the American College of Cardiology Foundation. *J Am Coll Cardiol* 2008;51:1512-24.

Calonge N, Petitti DB, DeWitt TG, et al. Screening for type 2 diabetes mellitus in adults: U.S. Preventive Services Task Force recommendation statement. *Ann Intern Med* 2008;148:846-54.

Resources:

American Diabetes Association — Diabetes and Cardiovascular Disease: <http://www.diabetes.org/diabetes-statistics/heart-disease.jsp>

National Diabetes Information Clearinghouse — Prevent Diabetes Problems: http://diabetes.niddk.nih.gov/dm/pubs/complications_heart/index.htm

National Diabetes Education Program: <http://ndep.nih.gov/>

National Heart, Lung, and Blood Institute. The practical guide to the identification, evaluation and treatment of overweight and obesity in adults. Available at: www.nhlbi.nih.gov/guidelines/obesity/prctgd_b.pdf Accessed March 18, 2009.

References:

Watkins PJ. Cardiovascular disease, hypertension, and lipids. *BMJ* 2003;326:874-6.

Mackay J and Mensah G (eds). 2004. *Atlas of Heart Disease and Stroke*. Geneva: World Health Organization.

Centers for Disease Control and Prevention. National diabetes fact sheet: general information and national estimates on diabetes in the United States, 2007. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 2008.

Centers for Disease Control and Prevention, National Center for Health Statistics, Health, United States, 2007.

American Heart Association. 2009 Heart and Stroke Statistical Update. Dallas, Tex: American Heart Association; 2009.

Jakicic JM, Jaramillo SA, Bakasubramanyam A, et al. Effect of a lifestyle intervention on change in cardiorespiratory fitness in adults with type 2 diabetes:

results from the Look AHEAD Study. *Int J Obes (Lond)* 2009; [Epub ahead of print].

Look AHEAD Research Group, Bray G, Gregg E, Haffner S, et al. Baseline characteristics of the randomised cohort from the Look AHEAD (Action for Health in Diabetes) study. *Diab Vasc Dis Res* 2006;3:202-15.

Ridker PM, Danielson E, Fonseca FA, et al.; Jupiter Study Group. Rosuvastatin to prevent vascular events in men and women with elevated C-reactive protein. *N Engl J Med* 2008;359:2195-207.

Williamson DA, Rejeski J, Lang W, Van Dorsten B, Frabricatore AN, Toledo K; Look AHEAD Research Group. Impact of a weight management program on health-related quality of life in overweight adults with type 2 diabetes. *Arch Intern Med* 2009;169:163-71.