RESULTS *for* LIFE
LAB TESTING: BETTER HEALTH, IMPROVED OUTCOMES

Lab Tests for Diabetes: Saving Lives and Saving Money

Diabetes is a killer.

It can cause blindness, kidney failure, stroke, and premature death. But laboratory tests allow physicians and patients to control diabetes and its deadly effects.

"When I heard I had diabetes, I immediately thought that I was going to lose my eyesight and my toes..."

Laboratory tests have helped change the course of diabetes. It is now a chronic disease that can be prevented, controlled, and managed. With the help of timely testing, patients can maintain normal blood sugar levels and gain, on average:

- ✓ five more years of life
- ✓ eight more years of eyesight, and
- ✓ six more years of freedom from kidney disease.

There are numerous ways in which lab testing preserves health and saves lives.

Detecting: Lab tests identify diabetes and provide physicians with the critical information they need to begin effective treatments.

- ✓ **Blood glucose tests** identify high blood sugar levels that signal diabetes or "pre-diabetes."
- ✓ **Urine tests**, given during routine physicals, identify proteins or glucose that indicate diabetes.

CONTINUED ON PAGE 2

A Virtual Case Study

My Story

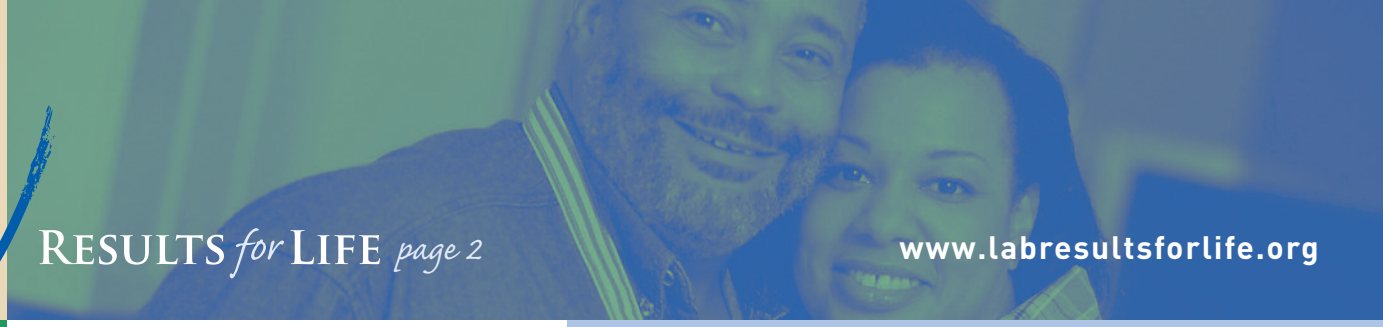
John Connors' experience with diabetes began on a vacation to Florida. Instead of relaxing and enjoying himself, he was concerned about the severe fatigue he was feeling and the constant thirstiness.

Although he thought these might just be new symptoms from his pre-existing case of asthma, he scheduled an appointment with his doctor. His physician ordered a series of laboratory tests—one for blood glucose, others to evaluate his kidney and liver functions. His fasting blood glucose was elevated to 156 and his two-hour glucose tolerance test was over 200.

The verdict was clear. John had diabetes. More specifically, John had Type 2 diabetes, which accounts for 90–95% of all diagnosed cases of the disease. "When I heard I had diabetes, I immediately thought I was going to lose my eyesight and even my toes," said the 51-year-old computer expert. He responded to the diagnosis aggressively, launching into a self-education, self-monitoring, lifestyle-changing blitz. "I wanted to avoid medication, so I ramped up my exercise and carefully portioned my proteins and fats. I tested myself five times a day."

This regimen generated immediate results. When John returned to the doctor, new lab tests showed that his Hemoglobin A1C value had dropped a full percentage point.

CONTINUED ON PAGE 2



"If I could avoid these scary results by paying attention to the lab results and following doctor's orders, I was more than happy to do it."

CONTINUED FROM PAGE 1

- ✓ **Insulin tests** tell whether the body is producing and using insulin appropriately.

This information is critical for physicians to prescribe dietary changes, exercise, oral medications, or insulin to fit the patient's exact condition. With these tests, more Americans are avoiding the complications and dangers of diabetes.

Monitoring: When an individual has diabetes, testing is critical to ensure that blood glucose levels are in a safe and appropriate range.

- ✓ **Hemoglobin A1c tests** tell physicians the average blood glucose levels over the preceding three months. This lets patients and doctors know that treatments are working.

Managing: Diabetes is the catalyst for a wide range of health problems. Lab tests alert physicians to the complications that can accompany diabetes so that action can be taken to prevent or control them.

- ✓ **Cholesterol tests** identify early signs of cardiovascular disease—enabling treatment to reduce the chances of heart attack or stroke.
- ✓ **Kidney tests** can prevent or delay kidney failure by enabling physicians to begin early treatment for diabetic kidney disease.
- ✓ **Liver tests** can, among other benefits, help detect whether medications often used to treat diabetes, such as cholesterol-lowering drugs, are causing serious liver damage.

THANKS TO LAB RESULTS, and the treatments based upon them, more patients are now living with diabetes, not dying from it.

MY STORY CONTINUED FROM PAGE 1

This indicated his blood sugar was better controlled and his risk of complications, such as eye, kidney, or nerve disease, had been reduced by 40 percent or more. Then, John experienced some unforeseen changes to his lifestyle. A new work assignment required him to spend over three months at a client's worksite, living in hotels the entire time.

"My new routine went out the window," he said. "I started eating all the bad stuff, cut back on my exercise and began to gain weight. My glucose and triglyceride levels shot up again."

A subsequent visit to the doctor led to a serious talk between John and his physician. Based on his current lab results, John would have to take medication to control his glucose, triglycerides and blood pressure and be diligent about monitoring his health. The consequences of not doing so might include blindness, stroke or losing his toes. He would need regular lab tests to help monitor his condition, including tests that check cholesterol level, kidney function, and proper liver performance.

"My doc really got my attention," said John. "If I could avoid these scary results by paying attention to the lab results and following doctor's orders, I was more than happy to do it."

Today, when work takes John away from home, he stays in residence-type hotels with kitchen facilities and goes grocery shopping for healthy foods. He makes time to exercise. And, John said, "for my lab tests, I go online to find a clinical lab near my client. I can zip into the lab and, no matter where it is located, they send the results to my doctor at home in plenty of time for my next checkup."

John Conners is not a real person, but the facts and information presented here depict accurately the role of lab tests in diabetes and the circumstances faced by many patients.

COSTS OF DIABETES IN THE U.S., 2002

Direct medical costs	$92 billion
Indirect costs (disability, work loss, premature death)	$40 billion
Total Direct and Indirect costs	$132 billion
Annual Health Costs	
Average for a person with diabetes	$13,243
Average for a person without diabetes	$2,560

Source: Centers for Disease Control and Prevention, 2006; American Diabetes Association, 2003

A Tale of Two Brothers: A Virtual Case Study

Call them Dan and Dave. Identical twins. They did everything together—sports, college, even the Army. And both were always in good health. In their mid-thirties, that changed. Dave started feeling very tired and started losing weight. Dan had blurred vision, as well as fatigue. So they decided to see their doctors. The results they got were identical: diabetes. Their doctors told each of them to get exercise, manage their diet, and monitor their blood sugar. Both were also told to get follow-up lab tests because diabetes often leads to kidney, eye, and cardiovascular problems. Here's how Dave and Dan dealt with diabetes.

		Years 1–5	Year 6	Year 10	Year 15	Year 20
Dave	Health Effects	Exercises, maintains healthy diet, monitors glucose level. Visits physician for kidney, liver, urine tests.	Continues exercise, healthy diet. Continues monitoring glucose levels and sees physician regularly for kidney, liver, urine tests.	Continues daily glucose monitoring. Maintains careful diet, exercise. Because glucose is above acceptable level, doctor prescribes oral diabetes medication.	Continues careful management through diet and exercise. Visits physician regularly for diabetes tests. Continues oral medication. Doctor finds reduction in blood glucose reading, adjusts medication	Visits physician for regular diabetes tests, which shows modest increase in blood pressure but all other tests okay. Continues careful diet and exercise.
	Costs	Costs of diabetes controlled without medication = $1,684 per year		Costs of diabetes controlled with oral medication = $1,852 per year	Reduction in blood glucose level = $685–$950 savings per year	
Dan	Health Effects	Exercises and maintains healthy diet for 6 months, but then stops. Discontinues glucose monitoring after one month. Fails to get kidney and eye tests.	Feels shortness of breath, dizziness. Goes to emergency room. Lab tests show high blood glucose and early kidney disease. Doctor prescribes medications to control diabetes, lower cholesterol, and slow kidney disease. Takes medication for two months, but then stops. Fails to exercise or manage diet.	Collapses at work, rushed to hospital. Doctors diagnose heart attack; perform bypass surgery to open blocked arteries. Lab tests also show high blood glucose, high blood pressure, and elevated LDL cholesterol, as well as further kidney deterioration. Doctor prescribes cholesterol- and blood-pressure-reducing medication. Takes medications sporadically, continues high-fat diet.	Visits doctor because sore on foot refuses to heal. Tests show nerve damage in the leg and failing kidneys, and peripheral artery disease. Undergoes leg artery bypass surgery because of dangerous blockage. Physician increases medications for cholesterol and blood pressure and increases kidney medication to reduce swelling in feet.	Goes onto dialysis because kidneys fail. Undergoes amputation of right leg below the knee because nerve damage prevents leg sores from healing.
	Costs			Heart attack = $27,630, plus $2,185 per year	Peripheral artery disease = $5,955 per year	Dialysis = $53,659 per year Amputation = $26,894 plus $1,739 per year

Sources on Costs: O'Brien, Diabetes Care, 1998; Brandle, Diabetes Care, 2003; Margolis, Journal of Managed Care Pharmacy, 2005; Testa, Journal of American Medical Association, 1998; American Diabetes Association, Diabetes Care, 2003.

Controlling Diabetes Starts with the Information Provided by Lab Tests...

Lab Tests

	Blood Glucose Tests	Cholesterol Tests	Kidney Tests
Information from Tests	Information from blood glucose tests enables patients to lower their glucose levels through medication, diet, and exercise. Lowering blood glucose reduces the risk of... ✓ Eye disease by 78% ✓ Kidney disease by 50% ✓ Nerve disease by 60%	Information from cholesterol tests helps patients manage cholesterol through diet, exercise, and medication. Better control of cholesterol can reduce... ✓ Cardiovascular complications by 20–50%. Complications include heart attack, stroke	Information from kidney tests alerts physicians and patients to potential kidney problems. Medications can reduce risk of... ✓ Kidney disease by 24%
Tests Include	**Fasting Glucose:** Performed after the patient has fasted for at least 8 hours. Blood is drawn from a vein in the arm, rather than the finger. **Glucose Tolerance:** Evaluates how a patient's blood sugar rises and returns to normal levels after the patient drinks 8 ounces of a sweetened liquid. **Hemoglobin A1c test:** Evaluates the average level of blood glucose during the preceding 2–3 months. The test is used to help patients and physicians monitor the glucose control over a period of time.	**Total Cholesterol test:** Evaluates total cholesterol levels, including LDL and HDL **LDL-Cholesterol test:** Evaluates the amount of LDL in the blood. LDL is considered "bad cholesterol" because it leaves fatty deposits on the walls of arteries. **HDL-Cholesterol test:** Evaluates the amount of HDL in the blood. HDL is considered "good cholesterol" because it carries away excess cholesterol.	**Creatinine test:** Evaluates kidney function by measuring the amount of a waste product called creatinine that is in the blood or urine. **Blood Urea Nitrogen test:** Evaluates kidney function by measuring the amount of a waste product called urea that is in the blood. **Estimated Glomerular Filtration Rate test:** Evaluates kidney function by estimating how well the kidneys are filtering waste from the blood.

Sources:

"The Prevention or Delay of Type 2 Diabetes," American Diabetes Association and National Institute of Diabetes, Digestive, and Kidney Diseases, Diabetes Care, Vol. 25, No. 4, April, 2002.

Diabetes Statistics, American Diabetes Association, accessed online at: www.diabetes.org/about-diabetes.jsp on January 3, 2007.

"ABC of Arterial and Venous Disease: Vascular Complications of Diabetes," British Medical Journal, 2000, Vol. 320, 1062–1066.

"Effects of Ramipril on Cardiovascular and Microvascular Outcomes in People with Diabetes Mellitus: Results of the HOPE study and MICRO-HOPE Substudy," The Lancet, 2000, Vol. 355, 253–259.

"Redefining Diabetes Control," Diabetes & Cardiovascular Review, a publication of the American Diabetes Association and the American College of Cardiology, Issue 1, 2002.

"The Value of Diagnostics, Innovation, Adoption and Diffusion into Health Care," The Lewin Group, Inc., July 2005.

The State of Health Care Quality 2006, National Committee for Quality Assurance, Washington, DC, 2006.

Technology Assessment: Point of Care Testing of Hemoglobin A1c, Final Report. This report is based on research conducted by the Duke Evidence-based Practice Center, under contract to the Agency for Healthcare Research and Quality, August 30, 2005.

Institute for Clinical Systems Improvement (CSI). "Management of Type 2 Diabetes Mellitus," Nov 2005. [Guideline summary published by National Guideline Clearinghouse, accessed at www.guideline.gov/summary/summary.aspx?doc_id=10228]

"Diabetes: Disabling, Deadly, and On the Rise, 2006," Centers for Disease Control and Prevention, U.S. Department of Health and Human Services, 2006.

Lab Tests Online, "Diabetes," at www.labtestsonline.org.

Testa, MA, et.al., "Health Economic Benefits and Quality of Life During Improved Glycemic Control in Patients with Type 2 Diabetes Mellitus," Journal of the American Medical Association, Volume 280, Number 17, November 4, 1998.

O'Brien, JA, et.al., "Direct Medical Costs of Complications Resulting from Type 2 Diabetes in the U.S.," Diabetes Care, Volume 21, Number 7, July, 1998.

Wagner, EW, et.al., "Effect of Improved Glycemic Control on Health Care Costs and Utilization," Journal of the American Medical Association, Volume 285, Number 2, January 10, 2001.

Brandle, M, et.al., "The Direct Medical Cost of Type 2 Diabetes," Diabetes Care, Volume 26, Number 8, August 2003.

McCulloch, DK, "Patient Information: Diabetes Mellitus, Type 2", UpToDate, 2007, Waltham, MA.

American Diabetes Association, "Economic Costs of Diabetes in the U.S., 2002," Diabetes Care, Volume 26, Number 3, March, 2003.

Margolis, J, et.al., "Health Care Resources and Costs for Treating Peripheral Artery Disease in a Managed Care Population: Results from Analysis of Administrative Claims Data," Journal of Managed Care Pharmacy, Volume 11, Number 9, November/December, 2005.

Prepared by Polidāis LLC
www.polidais.com