The pancreas produces insulin to keep glucose levels in balance.
New Intensive Insulin Program Brings Blood Sugar Control Full-Circle

High blood sugar affects over half of patients undergoing heart or blood vessel surgery, even patients who don’t have diabetes. "Stress hyperglycemia", as this condition is known, results from the flood of stress hormones released by the body during cardiac surgery, cooling of the body by heart-lung bypass machines, post-operative medications and parenteral nutrition. Research has clearly shown that high blood glucose perioperatively can increase the risk of post-operative infections and other complications, so cardiac and vascular surgery patients typically have their sugar monitored and treated closely during and after their procedures.

This knowledge is the foundation for the Hospital Intensive Insulin Program (HIIP), established by Roma Gianchandani, MD, MBBS (below), program director. Established in late 2004 with strong backing by the Surgery department, the program received a Clinical Innovation Fund Award soon after its inception. The HIIP oversees management of blood glucose levels in patients with diabetes and postoperative stress hyperglycemia after cardiac, thoracic and vascular surgery—from their time in intensive care until discharge.

"Glycemic management teams are very desirable entities, and hospitals all over the country are struggling to set them up," says Dr. Gianchandani. "We’re fortunate to have had one here for the last three years."

Comprised of several hard-working faculty and physician assistants who contribute to its success, the HIIP program actively trains health care professionals who provide frontline diabetes care. In addition to caring for patients, the HIIP team has worked with the rest of the University Hospital to establish glucose management programs. The team has helped standardize several inpatient protocols and is currently leading efforts to institute basal-bolus insulin therapy hospital-wide.

A significant shift in hospital blood glucose management has already occurred since the program began. "Since this adds another dimension to patient care and workload, health care providers have performed marvelously. When we first started out, blood glucose levels of 200 mg/dl or above did not raise an eyebrow, while today I’m happy to see that a much lower number will initiate a call to us," says Dr. Gianchandani.

According to scientific literature, blood glucose control leads to shortened hospital stays; the HIIP team has seen that in its own review of the program, too. Glucose control in this complex patient group eliminates the disadvantage that high blood sugars confer on patient outcomes.

Hospital glucose management also provides an opportunity for patients with diabetes undergoing major procedures to re-evaluate and focus on their sugar control, which can lessen the likelihood of future complications. This is being studied by the HIIP team through a new outpatient clinic, which completes the blood glucose management loop. A recent study, presented at the American Diabetes Association’s 2008 Scientific Sessions, found that of 1,400 patients, nearly half had elevated sugar levels after surgery; about 15 percent still needed insulin and other medications to control it when they went home. A follow-up study to look more closely at whether patients with stress-induced hyperglycemia have any underlying glucose abnormalities also is underway.

Dr. Gianchandani believes the HIIP will pave the way for the hospital to acquire Joint Commission certification for inpatient diabetes care. This will mean embedding glucose control in the U-M Health System culture, especially in areas where the data for glycemic management are compelling, she adds.
Systems Biology at the Heart of Michigan Metabolomics and Obesity Center

Obesity is not only common, affecting about one-third of adult men and women in the United States; it’s a complex metabolic condition associated with other serious illnesses, including type 2 diabetes, heart disease, stroke and several types of cancer.

The Michigan Metabolomics and Obesity Center was founded to explore obesity and other metabolic diseases using a “systems biology” approach, that is, from multiple perspectives and at many levels, starting with the molecular level. “Metabolomics” is the study of how molecules resulting from the breakdown of the foods we eat are used and stored by the body—and how these metabolites are influenced by our genetic makeup to cause weight gain, weight loss, disease or health.

“We’re trying to collect a large amount of data on individuals, including clinical measures such as height, weight, blood pressure, glucose, insulin and lipid levels and exercise capacity,” explains Charles Burant, MD, PhD (far lower right), the center’s director and the Dr. Robert C. and Veronica Atkins Professor of Metabolism. The data can then be combined with information about gene expression and with metabolomic and proteomic measurements. Measurements are taken at baseline and after perturbation, such as after eating certain types of foods, limiting calories or taking medications.

“Several computational methods allow us to see how the various components of the system react, and that allows us to better understand which metabolites and metabolic pathways are important in how an individual reacts to the different perturbations,” Dr. Burant says. That knowledge may lead to the discovery of targeted interventions, such as a personalized diet or medication regimen, to ward off metabolic disease.

Funded by the U-M Endowment for the Basic Sciences and the Office of the Dean, the center is already serving as a hub for several dozen researchers from numerous disciplines, departments and schools across the University. “With this type of systems biology approach, no one can investigate these complex interactions alone; no one lab can do everything, and so we have a lot of collaborations already underway with different departments within the Medical School, the College of Engineering, the School of Kinesiology and with the Center for Computational Medicine and Biology,” says Dr. Burant.

One such multidisciplinary collaboration includes research into the role of different types of lipids in the development of diabetes. Dr. Burant and colleagues are discovering that animals fed a diet with fat from lard develop diabetes within three weeks; animals fed an identical diet, only with fat from soy, never develop the disease. “If we can understand why and the pathways involved,” he says, “we might be able to understand the pathways in humans and why certain individuals get diabetes and others don’t.”