Living well with diabetes

U physician-scientists work on treatments and technologies that aim to better manage the disease—or stop it in its tracks

Karly Lewis was devastated to learn that she has type 1 diabetes. The teenager had witnessed her sister’s struggle to keep the disease under control and knew that her own life was about to change.

And it did. First she had to learn how to count carbohydrates, calculate her insulin doses, and give herself injections. Next came an insulin pump. That meant getting acclimated to the technology while answering constant questions from classmates. “It was a very big life change for me,” says Lewis, 17.

Lewis didn’t hesitate when her doctor asked her to participate in research that could eventually help prevent or delay the onset of type 1 diabetes. “I just really wanted to make my diabetes something positive rather than something so negative,” she says. “Maybe I could contribute something good and help find a cure so that another kid doesn’t have to go through this one day.”

Many physician-scientists at the University of Minnesota are hard at work with the same goal: developing treatments and technologies that improve the lives of kids who have diabetes.

People who have type 1 diabetes don’t produce enough insulin, a hormone essential for allowing the body to use sugar (glucose) continued on page 2
as a source of fuel. Sugar in the blood can come from the breakdown of starches or carbohydrates from food or from the body’s own stores. An autoimmune disease, type 1 diabetes prompts the immune system’s T-cells to attack insulin-producing beta cells in the pancreas. Once enough beta cells are destroyed, there is no longer enough insulin to allow the body to use glucose as a fuel source.

Antoinette Moran, M.D., chief of the Department of Pediatrics’ Division of Pediatric Endocrinology, leads the study Lewis joined. It focuses on people newly diagnosed with diabetes because many still have some functioning beta cells. The team is evaluating whether a medication can prevent T-cells from attacking beta cells, or at least slow them down.

“We can’t cure diabetes and bring back beta cells that are already gone, but we’re trying to save the ones that are there,” says Moran. “As long as you have some of your own beta cells, your diabetes is much easier to control and you are at less risk of complication.”

Her other research includes a study funded by the National Institutes of Health that aims to prevent type 1 diabetes in children whose parent or sibling has it. (These kids have a 5 percent chance of developing diabetes as well.) Antibodies appear in the bloodstream before the disease develops, Moran says, serving as a biological cue that it’s emerging.

“We target the immune system with medication to see if we can stop it from progressing to diabetes,” she says.

**Power of the pump**

Today’s insulin pumps represent a huge improvement over multiple-times-daily insulin injections—and the majority of people who have type 1 diabetes now use one. Pediatric endocrinologist Brandon Nathan, M.D., an associate professor at the University, has partnered with Medtronic Inc. to advance pump technology even further.

Currently, users must tell their pumps when and how much insulin to deliver based on their blood sugar and diet. The Medtronic 530G pump uses continuous glucose monitoring to assess current conditions. If glucose levels are too low, it will turn off insulin automatically to prevent dangerous hypoglycemic episodes.

It’s the first pump in the United States to respond to data it collects and alter insulin delivery—called a threshold suspend pump. Although this pump has been on the market for several years for adults, it has not been thoroughly evaluated in children. Nathan’s one-year study evaluates the pump’s effectiveness in kids ages 2 to 15.

Nathan hopes this research leads to a pump that also delivers insulin when glucose levels are too high.

**Diverse support**

Sometimes communication barriers prevent families from optimally managing their kids’ diabetes. Muna Sunni, M.B.B.Ch., an assistant professor at the University, is leading a joint effort between University of Minnesota Masonic
Two years ago if you had asked Charlie Ray what his stomach felt like, he’d say, “Ouchie, ouchie, ouchie, ouchie, ouchie,” cover his stomach with his hands, and frown.

From the day he was born, Charlie struggled with intense abdominal pain. At first, doctors thought food allergies or viruses were to blame. But then, in early 2014, he was diagnosed with chronic pancreatitis. A series of procedures failed to keep him healthy, and his condition deteriorated.

Running short on options, the Ray family, of Omaha, Neb., arrived at University of Minnesota Masonic Children’s Hospital, where pediatric transplant surgeon Srinath Chinnakotla, M.D., recommended a total pancreatectomy and islet auto-transplant (TP-IAT). During the extensive operation, Charlie’s care team removed his pancreas, spleen, duodenum, and gall bladder. Then specialists extracted the pancreas’ insulin-producing islet cells—136,000 of them in Charlie’s case—and implanted them back into his liver in an attempt to prevent diabetes.

Charlie became the second-youngest patient ever to receive a TP-IAT at University of Minnesota Masonic Children’s Hospital. The procedure was pioneered at the University in the 1970s as an off-shoot of diabetes research, but physicians later realized the value of the procedure for treating chronic pancreatitis as well. “Dr. Chinnakotla cared for Charlie as if he were his own son,” says Megan Ray, Charlie’s mom. “But there’s a whole team of people supporting what he is doing, and that shouldn’t go unnoticed.”

Today “Super Charlie”—as his friends, family, and fans call him—is no longer in pain and doesn’t need insulin injections. The first grader is playing soccer and flag football this fall. “He got his life back after this,” says Megan Ray. “There’s nothing better in the world.”

Read more about Super Charlie at mhealth.org/supercharlie.
U expert focuses on identifying ways to help LGBTQ youth navigate the challenges of adolescence

Abundant research has shown that lesbian, gay, bisexual, transgender, and queer (LGBTQ) youth struggle disproportionately with a host of problems, including substance abuse, bullying, violence, and mental health issues. What’s less clear is which tools and supports are essential for health care providers, teachers, and parents to offer LGBTQ youth.

The University of Minnesota’s Marla Eisenberg, Sc.D., M.P.H., a nationally prominent researcher in this area, is in the midst of an effort to identify resources for LGBTQ youth that promote a healthy and safe adolescence.

“We know the risks, but truly, most of these young people are doing fine,” says Eisenberg, who is director of research in the Medical School’s Division of General Pediatrics and Adolescent Health. “We’re trying to figure out what’s going well and what’s supporting them in healthy ways. And then how can we replicate it? What can we add to places that help people get through adolescence without being derailed by these poor outcomes?”

Funded with $1.7 million from the National Institutes of Health, Eisenberg’s study has several components. First, researchers in Minnesota, Massachusetts, and British Columbia conducted 66 qualitative interviews with LGBTQ teenagers. The teens guided researchers to the places they rely on for support and connection in their communities.

The investigators now are gathering data from hundreds of communities about available resources—from gay-friendly coffee shops and churches to gay-straight alliance groups in schools. Then they will match community “LGBTQ support scores” with student survey data about LGBTQ teens’ health and well-being, which are being collected by government agencies in the three states.

Then Eisenberg’s team will assess whether the availability of resources correlates with better wellness outcomes. “We expect to find that living in environments with certain resources is beneficial for LGBTQ kids,” Eisenberg says.

Ultimately, she hopes to offer ideas to communities for providing more supportive environments for LGBTQ youth.

Save the date
WineFest No. 22
Friday, May 12, and Saturday, May 13, 2017
Benefiting groundbreaking research and innovative care at University of Minnesota Masonic Children’s Hospital
www.thewinefest.org
As a critical care physician at University of Minnesota Masonic Children’s Hospital, Gwen Fischer, M.D., frequently spent hours jerry-rigging adult medical equipment for her pediatric patients. Many medical devices aren’t designed for children, and Fischer was enormously frustrated that she couldn’t treat kids with equipment made just for them.

So she set out to change that. After completing fellowships in pediatric critical care and medical devices at the University, Fischer launched an effort to get more pediatric medical devices to market—and faster. Currently, technology for kids lags about 10 years behind adult devices.

In 2011, Fischer created the Pediatric Device Innovation Consortium (PDIC) at the University. Its physicians, engineers, scientists, and industry members provide inventors with advice and resources to guide them from device development to market.

“People in the academic world have skills for early research and innovation and development, but there is a valley of death between development and getting a product to market,” says Fischer, who directs PDIC and is an assistant professor of pediatrics at the University. “We want to form partnerships between those two groups.”

So far, PDIC has granted $300,000 to six projects. The first $50,000 went to Bob Tranquillo, Ph.D., a Distinguished McKnight University professor and head of the U’s Department of Biomedical Engineering. He and colleague Zeeshan Syedain, Ph.D., are developing tissue-engineered heart valves that could grow with children.

Tranquillo, whose work was also supported by the John and Nancy Lindahl Children’s Heart Research Innovators Fund, won a grant from the National Institutes of Health to create this enormously complicated and sought-after product, which would prevent kids who have congenital heart defects from needing multiple valve-replacement surgeries as their bodies grow. But that grant didn’t cover the vital step of testing whether the tissue-engineered matrix used to make the valve would grow with an animal.

PDIC funding allowed him to test a simple tube of the matrix as an artery replacement. “Without the PDIC grant,” Tranquillo says, “I would have had to cut short some of the other work to know whether the valve has the capability to grow.”

The study paid big dividends; results showing that the tissue-engineered tube can indeed grow were published in the prestigious journal Nature Communications in September.

Tranquillo says that having an internal grant program is extremely helpful to engineers and scientists, who often struggle to find the early research funding necessary to win bigger grants. This is especially true for pediatric devices, he adds, which has a smaller pool of potential funding to begin with. “PDIC plays a crucial role,” he says.
As part of a six-day, 2,000-mile Giving Tour bus trip across the country, a group from the Steven & Alexandra Cohen Foundation in April stopped to visit University of Minnesota Masonic Children’s Hospital in Minneapolis.

The hospital clearly made an impression. After the tour, the foundation donated $200,000 to its Adopt A Room program. These rooms feature many amenities, including special technology at the bedside for children, comfortable sleeping accommodations for family members, and videoconferencing capabilities to connect to school and home.

The hospital building itself was striking, Alex Cohen explains, from its colorful façade to the whimsical stuffed giraffe riding in the revolving door. A compass in the lobby highlighting the University’s legacy as a “Gateway to Discovery” also impressed her.

But what really hit home for Cohen was the welcoming atmosphere and caring staff.

“I had never been more impressed with a children’s hospital,” she says. “The design of the entire building was a collaboration of doctors, nurses, parents of patients, siblings, and patients themselves. Everything worked together and made perfect sense. This is a very special place for patients and their families.”

In adopting a room at U of M Masonic Children’s Hospital, the Steven & Alexandra Cohen Foundation sought to demonstrate that people can make a difference by giving back in ways big or small—even simply by making a child’s time in the hospital a little bit better.

“We are all capable of making a difference in someone else’s life,” Cohen says.

Learn more about Adopt A Rooms and how you or your organization can become a sponsor at give.umn.edu/childrenshealth/adoptaroom.

Family-centered design at University of Minnesota Masonic Children’s Hospital makes a lasting impression for Connecticut-based foundation’s Giving Tour visitors
A touchdown for teens

With community support, U of M Masonic Children’s Hospital will build Kyle Rudolph’s End Zone as a place for kids and teens to laugh, relax, and socialize

Kyle Rudolph is no stranger to hospitals. The Minnesota Vikings tight end is a frequent visitor at University of Minnesota Masonic Children’s Hospital, greeting patients at their bedsides, signing autographs for families, sponsoring movie nights in the Wilf Family Auditorium, and even hosting fundraisers.

But long before he was a professional football player, Rudolph and his family became very familiar with their local hospital when his younger brother endured surgery and chemotherapy as an infant for neuroblastoma, a type of cancer.

When Rudolph and his wife, Jordan, visited U of M Masonic Children’s Hospital for the first time, they felt an instant connection.

“We fell in love with what they do and what they offer to families and kids who go into these situations that are really tough,” Kyle Rudolph says. “After being here in the community for five years—this is our home now—we wanted to do something special.”

With a lead gift from the Rudolphs, along with support from the larger community, the hospital will build Kyle Rudolph’s End Zone, a 2,500-square-foot space designed to give children and teenagers a place to laugh, relax, engage in healing therapies, and just hang out with other kids who know what it’s like to spend time in the hospital.

Special indeed. “You go in and see these kids who have every reason to be down, and they never are. They are so excited and so energetic,” Rudolph says. “It kind of changes our outlook on life.”

Be part of a winning team and support Kyle Rudolph’s End Zone at crowdfund.umn.edu/EndZone.
When Emerson Hatch first visited Dana Johnson, M.D., Ph.D., at the University of Minnesota Adoption Medicine Clinic, she was almost 2 years old and weighed less than 15 pounds. She'd spent much of her infancy in an overcrowded orphanage in India; she was dehydrated, frail, and thought to have cerebral palsy.

Johnson feared the baby wasn’t thriving. Her very survival was in question. That was unacceptable to Dan and Angie Dove Hatch. What did they need to do to give Emerson her best chance in life?

Daily physical, speech, and occupational therapy at the clinic, he told them. Perhaps for years. “We said, ‘Fine!’ I quit my job that day, and we were at the U five days a week for a long, long time,” Angie says. “Eventually, she was bouncing back, making these goals we didn’t ever think she would meet. Dr. Johnson and his team are amazing. His expertise saved her life.”

Johnson and colleague Judy Eckerle, M.D., the Adoption Medicine Clinic’s director, have been part of many such stories over the years. Celebrating its 30th birthday this year, the pioneering clinic has served about 30,000 families around the globe, including families built through foster care and domestic adoption.

Read more at legacy.umn.edu/stories/all-in-the-family, or make a gift to support the clinic’s work at give.umn.edu/giveto/amc.