

Making each day the **BEST DAY** possible

Scientists save eyes while saving lives

Snip of DNA spells HOPE





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By Sabrina Soto

The mission of St. Jude Children's Research Hospital is to advance cures, and means of prevention, for pediatric catastrophic diseases through research and treatment.

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BACK TO BASICS

St. Jude staff members help children learn, or re-learn, the art of handwriting.

By Mike O'Kelly

In the age of technology, handwriting is nearly a lost art. Expansive cursive loops and sharp pen strokes are often replaced by fingers flying across keyboards.

For many children at St. Jude Children's Research Hospital, handwriting may also be difficult due to the effects of cancer and its treatment.

One child may have problems clearly seeing a page or gripping a pen. Another may have shaky hands or may need to learn how to write with a non-dominant hand. Staff members in the St. Jude School Program and Rehabilitation Services incorporate handwriting skills into their lessons and sessions.

Occupational therapist Allison Smith works with patients who need a more focused approach.

"Handwriting is still an important activity in our everyday lives, and we want to get these patients back to doing activities that are normal and familiar to them," she says.

Individual attention

St. Jude patients' handwriting sessions recreate the optimal writing experience—a steady chair at a desk with feet flat on the floor.

The approach varies with each patient. A 4-year-old who hasn't had a chance to grasp handwriting fundamentals learns the basics. An older patient begins to write with his left hand after a brain tumor affects his dominant right hand.

Children with limited vision learn to write by using visual cues on special highlighter paper. If children can see shadows and distinguish colors, occupational therapists teach them how to sign their names, even if the patients are not reading and writing in full sentences.

Writing is fun-damental

Instead of 60-minute sessions of handwriting only, patients begin their visits with gross- and fine-motor activities such as picking up small objects with tweezers and clothespins.

"We try to make handwriting fun by starting with coordination activities that get them engaged," Smith says.

The handwriting program also includes booklets, lessons and even keyboarding sessions. The most valuable moments, Smith says, are seeing a child's confidence grow.

"Each patient is different, and there are many different components that can affect a child's ability to write well," Smith says. "Finding the right approach for each patient and seeing improvement is our ultimate goal."

stjude.org/promise 3

St. Jude Super STARRS

Jacklyn Boggs, Hematology, works with Elijah Mayfield during a reading clinic session.

NOLE GISSER

BY KEITH CRABTREE, PhD

The STARR program provides academic assistance for children with sickle cell disease and hemophilia.

For many children, the first day of school is a day of anticipation and nervous excitement. As students riffle through unfamiliar textbooks, inhaling the heady scent of freshly sharpened pencils, they envision the new academic year as a blank page full of possibility.

But for a child whose educational progress has been hampered by frequent medical appointments and hospitalizations, a new school year may evoke feelings of dread.

Children with sickle cell disease and hemophilia often miss more days of school than their healthy classmates. The physical effects of the disease may also result in academic underachievement.

St. Jude Children's Research Hospital staff members are working to ensure that children with these disorders have the reading skills they need for academic success.

A STARR is born

An engaging, talkative third-grader, Elijah Mayfield receives treatment at St. Jude for hemophilia, a rare blood disorder. He is one of 13 children who took part last summer in a Success Through Academics, Resources and Research, or STARR, reading clinic. This St. Jude program is designed to improve reading and comprehension skills for children with sickle cell disease and hemophilia.

"It helped me learn some words that I didn't know yet," says 9-year-old Elijah. "It helped me sound out words."

Elijah's mom, Lucille Mayfield, agrees. "He reads everything," she says. That includes mail, text messages, and, more importantly, school assignments.

'Aha' moments

Many children with sickle cell disease have problems recognizing specific speech sounds. This may negatively affect their ability to use those sounds to process a



teacher's spoken instructions or information in a textbook.

Molly Freeman, an academic coordinator and reading instructor in St. Jude Hematology, worked with a student a few years ago who had difficulty identifying the "aw" and "au" sounds.

Finally, Freeman saw the light bulb go on. The boy slapped his forehead, and, with wide eyes, said, "Nobody ever told me that!"

Proud of his newfound knowledge and accomplishment, the boy began picking out correct sounds without delay.

Ready readers

Children who have completed the St. Jude reading clinic during the past eight years have shown significant gains in reading skills measured before and after eight weeks of instruction. Test scores revealed significant age- and gradelevel improvement.

"This is an incredible effort not only to care for our patients when they're here on our campus, but to support them through the continuum of their care and ensure that they have the skills they need to live the best possible lives," says James R. Downing, MD, St. Jude president and chief executive officer.

Students in the clinic use educational materials that intensify their senses — whisper phones, small mirrors, colored felts — to develop an ability to identify and manipulate speech sounds. As part of that process, children increase their reading comprehension skills.

In addition to the reading clinic, the STARR program's coordinators work with educators at schools ranging from preschool to college to help ensure each patient's academic needs are met. St. Jude staff members also educate teachers about the academic implications of sickle cell disease and hemophilia. And parents learn simple techniques they can use at home to strengthen areas of weakness.

The sky's the limit

Freeman and her colleague Jacklyn Boggs take pride in St. Jude patients' responses to the experience.

"I've had kids who couldn't read a lick," Freeman says, reflecting on her years as a reading instructor. "Now I see them as teens. They can read and they're flourishing. This is wonderful."

With Boggs' guidance, Elijah recently read *Different is Awesome* by Ryan Haack, a book about a young boy with an upper limb difference.

"He did all these amazing things," Elijah says. "He knows how to tie his shoe!"

Without a doubt, Elijah will continue doing amazing things, too. ■

Success Through Academics, Resources and Research

STARR program

For children with sickle cell disease and hemophillia

patients served

clinic visits with parents

school visits by St. Jude staff

5966 follow-up phone calls to parents

bome visits

St. Jude Child Life unites five patients and inspires them to help one another persevere.









ike a stone tossed into still waters, a simple suggestion has created ripples in the lives of five young men undergoing cancer treatment at St. Jude Children's Research Hospital.

It all began with a conversation led by Amanda Brody, one of the hospital's 18 child life specialists.

"I met Amanda after I had limb-sparing surgery on my leg," recalls 22-year-old Seth Bombet. "She suggested that I talk with a new patient who was about to have a similar surgery."

In January 2016, Seth, a long-distance runner and premed student, had learned his lingering leg pain was caused by osteosarcoma, a bone tumor diagnosed in about 400 U.S. children and teens annually. Deferring entry into medical school, Seth traveled to St. Jude for treatment, which would include surgery and chemotherapy.

In April, he underwent a limb-sparing operation.

In this alternative to amputation, surgeons remove the tumor and diseased tissue and insert a prosthetic bone or graft.

Soon after Seth's arrival at St. Jude, 17-year-old Reese Brown

Their interests were varied: cross-country running, swimming, baseball, rugby, soccer. Some of the young men hailed from small towns; others from large cities. But when they arrived at St. Jude, they found a common bond. From left: Reese Brown, Ellason Flagg III, Seth Bombet, Jalen Nash and Tyler Nelson gather for laughter and conversation.

"I've watched the bond develop between them, and I know how important that is. Each of them has the same diagnosis, but their paths are different. The connection they have helps them support each other." —Amanda Brody

received the same diagnosis. The young baseball player also required a limb-sparing operation. Brody encouraged Reese to meet with Seth.

"I can tell you all I know; your doctors can tell you all they know," Brody explained. "But learning about the surgery from someone who has had it is completely different."

Coping with challenges

As a child life specialist, Brody helps St. Jude patients cope with health care challenges. She and her colleagues offer explanations and education about medical procedures. They provide distractions during inpatient stays. They also help patients create legacy projects and other avenues for self-expression.

In her work with teens, Brody offers a listening ear, emotional support and encouragement. And she facilitates valuable peer interactions among patients like Seth and Reese.

Brody and another child life specialist arranged the initial meeting with the patients and their parents.

"The families had never met before," Brody recalls. "As Reese asked questions and Seth described what surgery would be like, I could see the wheels turning in Reese's mind. It's like he was thinking, 'It's OK for me to ask these questions, and this guy knows what I'm talking about.'"

Meanwhile, the parents were having their own discussion, with questions asked and answered.

"The main message from both Seth and his dad was, 'You're going to get through this. We were worried, too, but it was fine,'" Brody says.

"I think it gave Reese's family hope in a time where they had no idea what to expect," she continues. "That's what I love about my role. While they're here, I can help them through, but the other families can help, as well."

Turning no into yes

At first, he said no.

"I'm not good at meeting new people and talking to people," Reese responded, when Brody proposed that he, in turn, share his insights with new patients. "You've been through this, and they need your help," she replied.

Reese reluctantly agreed, and he says the experience has helped him mature.

"Amanda's changed me. I was shy, but she has pushed me to be the best 'me' that I can be," he says. "She pushes kids out of their comfort zones and roots them on and believes in them. "It's gotten easier and easier for me to help other kids," he continues. "It's an awesome feeling to be able to help somebody, based on what I've been through."

The group grows

When 17-year-old boxer and rugby player Ellason Flagg III arrived at St. Jude, Brody ushered him into the impromptu group.

"We were new to this, and we didn't know what to expect," Ellason's dad says. "By talking with Seth, Reese and their parents, we felt more comfortable. It was good to hear from somebody who had been through it already, because we were kind of scared."

Ellason's main concerns centered around pain and the possibility of losing his leg. The three guys discussed sports and school and other interests.

"I told Ellason that every surgery is different," Reese says. "I said, 'Yours is going to be different than mine, and mine is going to be different than Seth's, but you've got the best doctors you could possibly have. The surgery is easy; it's the physical therapy you're going to have to get through."

Ellason was reassured by the interaction and the information.

"They told me it was going to be all right and that I had to stay strong both mentally and physically," Ellason recalls.

In addition to introducing Ellason to other osteosarcoma patients, Brody encouraged him to express himself by producing a painting for the hospital's Teen Art Show.

"Amanda makes me laugh, makes me feel better, makes me smile," Ellason says.

A new chapter

Unlike most cancer patients, 15-year-old Jalen Nash relied on St. Jude for medical care long before his osteosarcoma diagnosis. He was an active patient in the hospital's sickle cell clinic when his leg began to hurt. Initially, he and his caregivers assumed he was experiencing a pain crisis related to sickle cell disease. When tests revealed bone cancer, he began to prepare for a limb-sparing operation. Part of that preparation involved meeting with Brody and Reese.

"In the beginning you're really scared," Jalen admits. "Reese told me the surgery and the pain wouldn't be as bad as I thought they would. He said I shouldn't worry too much."

Reese says he could empathize with Jalen.



"I could tell we're alike," Reese recalls, "anxious and stressing out. I told him, 'It's just a surgery. It's going to change your life, but it's not the hardest thing you're going to go through.'"

After the operation, Jalen agreed.

"When I got out, I saw Reese, and I said, 'It wasn't that bad; it was better than I could have imagined."

Strength forged through friendship

High school junior Tyler Nelson assumed his knee pain originated during a soccer game—until a scan revealed bone cancer. Soon after his arrival at St. Jude, Tyler met Brody, who was to be his child life specialist.

"Amanda made the transition easier. She made sure I knew what was going to happen before scans or biopsy or surgery. She helped me ease into this situation," he says.

Before Tyler's surgery, Brody also introduced him to other teens with osteosarcoma.

"I mostly asked them about pain," Tyler says. "I also asked them about recovery time, and our parents talked about what to expect. Everybody got along great. It was reassuring to see somebody who's on the other side of the surgery.

"They're all strong dudes," he continues. "We've all got to be strong to put up with this."

Tyler says he is ready to dispense advice to future patients who will undergo limb-sparing surgery.

"I'll tell them to do their PT, listen to their doctors and take it easy after surgery. Don't get cocky and do too much too soon. I'll also tell them not to worry—everything will get better."

Perspective from experience

Now all five young men have entered a new phase of treatment, supporting one another through high-dose chemotherapy. When Seth's disease failed to respond to his initial chemotherapy regimen, the aspiring medical student faced two lung surgeries, as well as a new treatment regimen.

"After his first lung surgery, I visited Seth in the ICU, texted him and talked to him to make sure he was OK," Reese says. "We always keep up with each other."

Recently, Jalen was scheduled for an operation to remove some lung nodules. Seth met with him beforehand to demystify the upcoming surgery and to provide the perspective that comes from experience.

"I believe it's no coincidence that all of these guys came here at the same time," Brody says. "I've watched the bond develop between them, and I know how important that is. Each of them has the same diagnosis, but their paths are different. The connection they have helps them support each other." ■

THE

PROM

CHALLENGE

Teenagers unite to party with a purpose.

By John Juettner

When the students at Freedom High School in South Riding, Virginia, attended their prom last year, they were intent on doing more than creating special memories. They were joining the fight against childhood cancer.

At the beginning of the 2015–16 school year, Freedom High had four students being treated for cancer. Aware of St. Jude Children's Research Hospital's leadership in the research and treatment of childhood cancer, Freedom High turned their prom into a fundraiser for the hospital—even though none of the students with cancer were St. Jude patients.

Led by the junior class student council, which organizes the prom, the students saved money on renting a hotel ballroom by creating their own glamour in the school's gymnasium. Local businesses donated food and services for the event, allowing the cost of a prom ticket to be donated to St. Jude. There was also a silent auction.

By the end of the last dance, Freedom High had raised \$48,000 to support St. Jude.

"We learn a lot from our students from how quickly they are willing to do things that are a little bit different for good reasons and just causes," says Doug Fulton, Freedom High School's principal.

After the successful event, Freedom High's prom committee traveled to Memphis to tour the hospital.

"One of the strong messages St. Jude showed us was one of hope and resilience, which I wanted to incorporate into our next prom," says senior Bobby Doherty, who was part of last year's prom committee. "How resilient those kids were! It was a very hopeful and positive atmosphere."

This year, Freedom High is taking the St. Jude Prom Challenge to continue

their support for the hospital. Through the challenge, students fundraise for St. Jude to party with a purpose.

Doherty hopes the prom fundraiser carries on after he graduates.

"I'd like to see the students realize they can take part in something that is greater than themselves," he says, "and make the world a better place simply by participating in the prom."

To learn more

about the Prom Challenge,

visit stjude.org/promchallenge.

Cancel of opportunity

A gift of property supports the hospital's Genomes for Kids clinical trial.

By Kerry Healy

Tony and Claire Karnas' gift of property is helping St. Jude Children's Research Hospital discover the origins of childhood cancer and seek new cures through their support of a clinical trial called Genomes for Kids.

Tony, a retired Naval officer, and Claire, a retired teacher, acquired land near Williamsburg, Virginia, to build a retirement home and to be near their daughter.

"We thought our daughter would settle in the area, and it seemed like a good idea to retire there. But after college, her plans changed," Tony says.

Meanwhile, the couple chose another retirement location, and the question of what to do with the Virginia property became a dilemma. Approximately 10 years earlier, the couple had begun supporting St. Jude.

"Cancer is a very big concern for our family," Claire says. "My grandmother and mother had cancer. I have two daughters and seven grandchildren, and four of my granddaughters have cancer on both sides of their family. The prospect of them inheriting the disease is very concerning."

Proceeds from the gift of land are helping to support the St. Jude Genomes for Kids clinical trial, and the couple will get a tax deduction for the land's fair market value.

"The concept of donating the land to St. Jude seemed like a wonderful solution," Tony says. Claire adds that it was done "in gratitude for the healthy children in our lives."



The family has visited St. Jude on several occasions.

"We have seen how the children are cared for and toured the research facilities," Claire says. "They think of everything, from school to helping siblings. St. Jude is always thinking and moving forward."

The proceeds from Tony and Claire's property are creating opportunities for children battling cancer and other lifethreatening diseases by supporting the hospital's research.

"We are very thankful and humbled that we are able to help St. Jude further its lifesaving mission," Claire says. ■

To make a gift of property or other assets to St. Jude, call (800) 910-3188 or email *giftplanning@stjude.org*.



A CHEMO COMBO PIONEERED AT ST. JUDE RETAINS A HIGH CURE RATE FOR RETINOBLASTOMA WHILE PRESERVING USABLE VISION AND LOWERING FUTURE CANCER RISK.

By Maureen Salamon

Like most 1-year-olds, Alissa Galindo loves flipping through board books, cruising along furniture and playing with her older siblings. But Alissa's life has already veered sharply from the typical because of her battle with retinoblastoma, a rare eye cancer that affected the center of vision in her left eye and some peripheral vision in her right.

Alissa was diagnosed at 3 months old, after photos revealed the cancer's telltale white glow in her eyes. She and her family came directly to St. Jude Children's Research Hospital for a tripledrug chemotherapy regimen. Pioneered at St. Jude, the drug combo not only offers a high cure rate, but ups the odds Alissa will have usable eyesight that will carry her into old age.

Affecting the light-sensing tissue at the back of the eye, retinoblastoma strikes about 250 to 300 infants and young children in the U.S. each year. Many, like Alissa, carry a mutation in their *RB1* gene that predisposes them to the cancer.

"The doctors feel she can see really well, and I know she can because she picks up small objects," says Alissa's mom, Megan Blair. "I don't know if it's perfect vision, but she does see."

Drug swap offers advantages

Alissa's parents leapt at the chance for their child to receive the St. Jude three-drug chemotherapy regimen for retinoblastoma. St. Jude now substitutes the drug topotecan for another called etoposide. This change has lowered children's risk of developing treatmentrelated leukemia.

In the *Journal of Clinical Oncology*, St. Jude scientists recently described a 10-year follow-up study that outlined the advantage of topotecan use. The research showed for the first time that using topotecan as a first-line drug, along with vincristine and carboplatin, was superior to placing etoposide in the mix.

The drug switch sustained high cure rates for retinoblastoma. Those cure rates exceed 95 percent in the U.S. for children like Alissa, who have advanced disease that is still confined to the eyes; all patients survived on the St. Jude study. The newer triple-drug therapy was also more successful than standard chemotherapy at helping survivors retain measurable vision. Eighteen of the 24 children who completed therapy had near-normal vision in at least one eye after treatment.

To Megan and her husband, Daniel Galindo, these benefits clearly outweighed a minor downside of topotecan's use. The

PETER BARTA

study required more chemotherapy cycles, and topotecan can trigger more shortterm side effects than etoposide. These side effects include low blood cell counts, diarrhea, rash and fever. But since Alissa's *RB1* gene mutation also confers a higher risk of later cancers, cutting the odds of treatment-related leukemia was crucial.

Envisioning optimal treatment

Given retinoblastoma's impressive cure rate, St. Jude researchers have turned their focus to making treatment safer and preserving sight.

More than a decade ago, Michael Dyer, PhD, chair of St. Jude Developmental Neurobiology, began lab research that laid the foundation for the recent clinical trial. Topotecan had shown promising results in treating other solid tumors, including brain cancer. This encouraged the study's senior authors, Carlos Rodriguez-Galindo, MD, Global Pediatric Medicine chair, and Matthew Wilson, MD, of Surgery, to work with Dyer and his team to explore whether it might be a better choice than etoposide for retinoblastoma patients.

Dyer praised the constant dialogue between lab and clinic that helped shape efforts on both sides and speed the timeline for testing the new triple-drug option with St. Jude patients.

"Retinoblastoma is a success story in terms of childhood cancer and survival rates," says Dyer, who identified an effective dose of topotecan in the lab before the clinical trial was launched. "But one of the things I really came to appreciate at St. Jude is thinking beyond survival and thinking about quality of life for kids. In this case, it's very direct and very clear—it's about saving vision."

Avoiding surgery and radiation

Dyer's sentiment is shared by lead study author Rachel Brennan, MD, of St. Jude Oncology. When topotecan was substituted for etoposide, fewer retinoblastoma patients required the surgical removal of an eye or the use of external beam radiation to stop the tumor from worsening. To provide further consolidation, Wilson used focal therapy with extreme heat or cold to target any lingering tumor cells.

The trial's success is measured in the number of eyes saved and how well they function. More than 75 percent of eyes with advanced disease were saved with treatment that included topotecan. That compares to reports from prior research of 30 to 60 percent saved when etoposide was used—treatment that often included radiation.

Avoiding radiation and surgery are both key goals, but for different reasons. Radiation can damage surrounding bone and

tissue and even trigger secondary cancers. Meanwhile, surgery becomes an option if nothing else seems to control tumor growth or spread. But prosthetics, while realistic-looking, "aren't the native eye and have no potential for vision," Brennan explains.

Perhaps most striking, Dyer and Brennan say, is 75 percent of St. Jude patients finished the topotecan-combo treatment with measurable vision.

"Our No. 1 goal is still patient survival, but we need to take it one step further—to save eyes. And not just save an eye, but save an eye with vision," Brennan says.

Sound science

Evaluating the results of their work demands Dyer and Brennan to take both a short- and long-term view. The pair say they hope other pediatric cancer programs won't shy away from

Oncologist Rachel Brennan, MD, and surgeon Matthew Wilson, MD, discuss an upcoming surgical procedure for a child with retinoblastoma. using topotecan as standard treatment for retinoblastoma. At some hospitals, treatment includes pumping a highly toxic chemotherapy drug known as melphalan directly into the small vessels surrounding the eyes, an approach not advocated at St. Jude.

The three-drug combo substituting topotecan for etoposide has already become the standard treatment at St. Jude, which Dyer notes is one of the few institutions able to run clinical trials for retinoblastoma.

"By having all this data and infrastructure, it becomes the gold standard," he says. "It's not an anecdotal report with one patient here or there doing better. It's a well-designed clinical trial with all the appropriate benchmarks. Since other centers are having frustrations with melphalan, I think the timing is actually good for seeing this sort of a transition."

Brennan says the St. Jude research is especially valuable because its 10year follow-up period "evaluates a longterm cure with long-term vision that impacts patients through the lifespan."

She adds that delayed gratification

is important in retinoblastoma.

"You have to be mindful of the footprint you make on the lives of these children, and the only way to do that is to follow them closely," she says. "That's why we've carefully followed these patients and tracked every outcome."

Global goals

But even as they celebrate their recent victories in retinoblastoma outcomes, St. Jude researchers have already cast wider nets. In developing nations, for example, many children still die of retinoblastoma, with published research indicating survival rates average from 40 to 79 percent in lower- and middleincome countries. Dyer and Brennan would like to extend St. Jude resources to these children to bring their outcomes more in line with the U.S.

"I'm hoping over the next several years to bring this therapy globally through our international outreach efforts," Dyer says. "I want to extend this beyond the U.S. to around the world because the vast majority of retinoblastoma patients are in less-developed countries." Brennan agrees and calls the new St. Jude research "a good first step." But she'd also like to identify targeted therapies that will work just as well against retinoblastoma but with lower toxicity than conventional chemotherapy, further reducing side effects.

"I'm not losing sight of what we've done, but I know the story's not over yet," she says, noting that much will be revealed in another decade, after the children who've undergone topotecan therapy grow older.

"With the vision we've been able to provide for them and the emphasis we have on the whole patient, I hope they know they don't have to be limited," Brennan remarks. "You hear about the patient who's a gymnast or a wide receiver, or see the child in clinic who had awful disease in both eyes, but who is picking up ladybugs off the sidewalk or riding a bike.

"These children have figured out how to be amazing," she continues. "I'm interested to see in another 10 years what these survivors are doing with their lives and their vision."

Watch video: stjude.org/brennantopotecan-video



Snip of DNA Spells Hope

By Maureen Salamon

St. Jude scientists use gene editing in quest to help children with sickle cell disease.

When it's time for St. Jude Children's Research Hospital patients with sickle cell disease to transition to adult care, Mitchell Weiss, MD, PhD, relishes the moment when he shakes each one's hand during a heart-warming sendoff. But Weiss, chair of St. Jude Hematology, says he and his department colleagues would like to tweak that ceremony just a bit and send them off cured.

The key to realizing that goal may lie in "tweaking" patients' DNA. In the lab, St. Jude scientists have shown that a geneediting technique called CRISPR may prompt sickle cell patients' misshapen and dysfunctional red blood cells to become healthier. Ordinarily, these sickle-shaped cells clog circulation, causing severe pain, recurrent strokes and organ damage.

The new, proof-of-principle research adds CRISPR gene editing to an expanding list of gene therapies pioneered at

St. Jude to ease the devastating effects of sickle cell disease. The life-threatening inherited disorder affects about 100,000 Americans, including 900 being treated at St. Jude.

"These kids suffer a lot. There are treatments, but none are optimal, and cures are possible but hard to come by," Weiss explains. "It's frustrating to feel like you're doing the best you can, but it's not enough. It would really feel good to be able to do something to fix this terrible disease."

Longtime gene therapy leader

St. Jude has long been at the forefront of gene therapy efforts, which date back to the 1980s when hematologist Arthur Nienhuis, MD, became the hospital's CEO. A pioneer in the field of gene therapy, Nienhuis paved the way for advances in the field. The hospital now offers promising therapies for patients with certain forms of hemophilia and severe combined immunodeficiency disease using viral vectors that replace the defective gene product.

Weiss says the CRISPR gene-editing technique may ultimately work better in sickle cell and related blood disorders such as beta-thalassemia because it modifies the patient's own DNA to



correct the disease. In patients' bloodforming stem cells, scientists use a tool to snip the DNA at a specific location to mimic mutations found in a genetic condition called hereditary persistence of fetal hemoglobin (HPFH).

In this harmless, naturally occurring condition, patients' levels of fetal hemoglobin are elevated, making them resist sickle cell symptoms. Fetal and adult hemoglobin are two different forms of the essential oxygen-carrying molecule in red blood cells, and adult hemoglobin typically takes hold after birth. By editing genes in sickle cell or beta-thalassemia patients, scientists can reverse this "switching" process, which enables fetal hemoglobin's benefits to persist, thus curing the patient.

"If you recreate the HPFH mutation, you can inhibit the switching and keep fetal hemoglobin levels high, alleviating symptoms of the disease, even though the patient still carries the mutation," Weiss says. "Right now, for technical reasons, it's easier to use CRISPR to destroy a gene or genetically control an element in bloodforming cells than it is to change a mutated gene into a normal one."

Safety is the priority

The St. Jude gene-editing work is especially valuable because sickle cell patients often face recurring pain, organ damage and early death despite improved therapies. The only potential cure, a bone marrow transplant, comes with major risks, including donor cell rejection, infertility from chemotherapy, or death from complications.

While CRISPR is currently considered the simplest, most precise method of gene editing, the technique is several years away from being used in patients. First, scientists don't yet know how many cells need to be altered to result in enduring health benefits. Perhaps more importantly, researchers also need to determine if gene editing might create other, "off-target" mutations that might sicken patients.

"You could create mutations that aren't the ones you want," Weiss says. "You have to make sure you're not going to cause the patient a problem."

GENE EDITING in blood-forming cells from sickle cell patients



A new gene-editing technique helps adult blood-forming cells in the lab stay healthy by producing fetal hemoglobin.

High hopes for 'amazing technology'

CRISPR gene editing in sickle cell research manages to avoid the controversy elsewhere surrounding the technique's proposed use to edit germline or reproductive cells—changes that could be passed from generation to generation. In sickle cell disease and other blood disorders, only patients' somatic, or non-reproductive, cells are altered.

Weiss and his colleagues, including student Elizabeth Traxler of St. Jude Hematology, recently published an article on their research in the journal *Nature Medicine.* Weiss enthusiastically embraces gene editing for its ease in the lab, but cautions that its clinical benefits must still be proven.

"It's an amazing technology. It's changing the way we work in the lab," he says. "It's always fun to have an experiment work and even more fun when down the road the result might have a clinical application."

"Nature has dealt sickle cell patients a bad hand," Weiss continues. "If they could leave here cured, we would all feel good."

St. Jude infuses new energy into the term "quality of life."

1

The

OPD

Radalla

by Elizabeth Jane Walker

PHOTOS BY PETER B



Emma Sarfity gives a hug to Justin Baker, MD, chief of the Quality of Life and Palliative Care Division. "I don't think you can truly understand what they do until you've experienced it," Emma says, "but the relief they bring sometimes is amazing."

Imagine having a team at your beck and call whose sole purpose is to ensure that every day is your best day. At St. Jude Children's Research Hospital, Justin Baker, MD, leads such a group. To 20-year-old Emma Sarfity, Baker and his colleagues have attained heroic stature.

"I tend to think of Dr. Baker as Superman," Emma says with a smile, "because he swoops in and fixes everything." After undergoing a bone marrow transplant last spring,

Emma struggled with pain, exhaustion and depression. "It was a really hard time," she says. "Mentally, emotionally and physically, I was just tired. To drag yourself out of bed is a lot when you're going through that kind of experience. Then Dr. Baker came onto the scene. He told me, 'Everything is going to be OK,' and within the hour, things started to get better."

Baker, chief of the St. Jude Quality of Life and Palliative Care Division, heads the hospital's Quality of Life for All (QoLA) team. The 10 members of this multidisciplinary group worked with Emma and her medical and psychosocial teams to create a holistic, individualized plan for her.

"We're able to emphasize patients' quality of life while they're going through the rigorous battle of fighting cancer," Baker says. "By working diligently to make every day the best day it could possibly be, you improve the patient's outlook. That, in turn, can improve survival."

The other 23 hours

Initially, Emma was taken aback by the prospect of meeting with Baker and his colleagues.

"I was a little confused that they thought I needed to talk to someone about the quality of my life," she explains. "But right off the bat they were so helpful."

Emma shared several issues that had caused distress, but that she had been hesitant to share with her medical team. Those issues included high pain levels and gastrointestinal problems. A debilitating fatigue caused her to dread the brief, daily trips from her St. Jude housing facility to the hospital.

"I hadn't wanted to bother the head of bone marrow transplant with problems that might seem small to him. These were normal side effects. But to me, those symptoms were kind of the end of the world," she says. "My regular doctor would see me for maybe an hour. But now I had a team whose only concern was the other 23 hours of my day. That's really special."

The QoLA team worked with members of Emma's medical team to increase her pain medications. Baker arranged an appointment with a gastroenterologist and even accompanied Emma to the checkup. The St. Jude QoLA team also arranged for a nurse and physical therapist to travel to Emma's Target House apartment so she only had to visit the hospital twice a week.

"When they intervened, it was like a miracle," Emma says. "So much was lifted off my shoulders."

"We have become the go-to place for integrating palliative care into pediatric oncology."

JUSTIN BAKER, MD Quality of Life and Palliative Care Division chief

Boosting survival rates

The QoLA team has as their program's mascot a cheerful koala bear. In the past few years, the number of children, teens and young adults served by the group has exceeded 1,000. In the near future, Quality of Life experts will be embedded into each of the hospital's clinics, and their services will be extended to every patient from the moment of arrival at St. Jude.

"That's quite different from other institutions throughout the U.S.," Baker says. "We want this to be part of routine cancer care—a component of their daily care plan—from the point of diagnosis forward."

Symptoms, psychosocial issues, care coordination and even communication and decision-making will be addressed by experts in palliative care.

"We're taking the excellent care that our kids already receive, and we're adding an additional layer to further improve outcomes," Baker says.

"At St. Jude, our survival rates are high, but how do you take it to the next level? I think it's through these incremental advances—focusing on making every day be the best day it can possibly be," Baker continues. "While patients are going through these battles, we work with them so that their outlook can remain positive, their family unit can remain as intact as possible. And their psychosocial, emotional and symptom concerns are addressed as key priorities."

The comforts of home

Four years ago, St. Jude partnered with community palliative care providers to offer the QoLA Kids Homebased Care Program. Patients served by the QoLA team can now receive much of their routine care in their homes or housing facilities through this program. Nurses draw lab samples, while social workers may sit at the kitchen table to discuss concerns. A child life specialist provides fun and educational activities. A spiritual care provider offers a nuanced layer of support.

"If you can think of something that would make your day better," Baker tells families, "you call us and we will work to get 'er done."

Often, teen patients dislike early-morning clinic visits. A teenager who has been texting or tweeting until 3 a.m. may not relish the prospect of arriving at the hospital for a 7 a.m. blood draw and then waiting a couple of hours for lab results. The QoLA Team can go into housing and obtain that sample, enabling the patient to grab a few more hours of sleep.

Many patients long for the sense of normalcy that comes from attending school with their friends. The



"When they intervened, it was like a miracle. So much was lifted off my shoulders."

- EMMA SARFITY

St. Jude team can go into the school to adjust pain pumps, obtain lab samples or conduct assessments related to physical activity.

"That way, we don't disrupt the thing that's most important to the child on that particular day," Baker explains.

Many patients served by the QoLA Team live outside



Ten-year-old **Damaya Smith** checks in with members of her Quality of Life team (from left) Lisa Clark, PhD, Katie Parker, RN, and nurse practitioner Lizzie Barnwell.

> the Memphis area. For these children, St. Jude staff identify health care professionals in the area who can perform the requested tasks. About 100 St. Jude patients in the U.S. and around the globe are currently receiving these kinds of home-based services.

> "We are also on call 24/7 to these families to answer questions and offer assistance," Baker says.

Multi-faceted service

In addition to its home-based offerings, the St. Jude QoLA team offers clinical trials that look at ways to improve the quality of life of children with life-threatening diseases. These studies explore topics ranging from communications and ethics to symptom control and end-of-life planning. To share their findings, Baker and his colleagues have published more than 100 manuscripts and book chapters and provided nearly 300 national and international workshops and lectures.

"We have become the go-to place for integrating palliative care into pediatric oncology," Baker says. "Nationally, there has been a cultural shift from avoiding the topic to finding ways to integrate it in such a way that it comes out of the pores of the institution."

Twenty-four bereaved St. Jude parents have undergone training to offer high-quality educational sessions for the hospital's clinicians. St. Jude nurses receive 25 hours of palliative care training, which includes extensive input from these parents. The parent educators also participate in training all clinical fellows and serve as panelists for bereavement sessions at the hospital's annual Day of Remembrance. This event provides seminars, panel discussions and a sense of closure to St. Jude families who have recently lost children.

Psychologist Lisa Clark, director of Bereavement Services, creates proactive bereavement care plans, pairing bereaved parent mentors with families who are faced with imminent loss. Clark also identifies local resources to assist bereaved parents when they return home, and she provides resource guides tailored to individual families. A series of videos created by bereaved St. Jude parents addresses many of the issues encountered by those who have experienced loss.

Graduation rate rises

In the last couple of years, about 30 percent of patients in the Quality of Life program have become "graduates" who have successfully completed therapy.

"That's the greatest experience we have with our patients and families," Baker says. "And that number is increasing every single year."

Emma says her chief regret is she didn't call upon Baker and his colleagues sooner.

"I don't think you can truly understand what they do until you've experienced it," she says, "but the relief they bring sometimes is amazing." ■

PROTOCION FROM INFORTION

HOTOS BY ANN-MARGARET HEDGES

THERE'S 'CLEAN,' AND THEN THERE'S 'ST. JUDE CLEAN.' LEARN SOME OF THE TACTICS ST. JUDE USES TO KEEP INFECTION RATES LOW.

By Elizabeth Jane Walker

more than a quarter of a century, Tracy Davis has done his part to foster the mission of St. Jude Children's Research Hospital by ensuring the facility is spotless. There's "clean," and then there's "St. Jude clean." Davis is an expert on that distinction.

For the past couple of years, two new assistants have helped him wage war on germs. These hard workers are lean, mean cleaning machines. They're robots.

By emitting ultraviolet light, the robots provide an additional layer of germ-killing disinfection for patient rooms, Surgical Services, ICU and other areas. After a room has been deep-cleaned with traditional methods, Davis and his colleagues bring in one of the robots. The UV light kills germs by breaking down their DNA. Research has shown UV light can reduce infections by multi-drug–resistant organisms by more than a third.



Tracy Davis of St. Jude **Environmental Services** oversees a robot named Troy as it cleans a patient room. The robot's UV light kills germs by breaking down their DNA. Research has shown that UV light can reduce infections by multidrug-resistant organisms by more than a third.

"In Environmental Services, we do a great job of cleaning," Davis says. "But the UV light gives us an additional level that's needed for our immunosuppressed kids. It also gives parents a sense of confidence in knowing we're doing a great job for their children."

The robots are only one of many techniques that provides a cloak of security around the hospital's vulnerable patients. At

St. Jude. infection prevention is everyone's business.

Extra layer of protection

Nearly every child at St. Jude has a fragile immune system and a high risk of acquiring infections.

WE REVIEW THE AIR OUR PATIENTS BREATHE. THE FOOD THEY EAT. THE WATER THEY DRINK. EVERY POSSIBLE SOURCE OF EXPOSURE.

of exposure."

- Hana Hakim. MD

Medical Director, St. Jude Infection Prevention and Control

"That's why it's critical not just to follow minimal requirements, but to take steps above and beyond to provide another layer of protection around our patients," explains Hana Hakim, MD, medical director of St. Jude Infection Prevention and Control.

She heads a multidisciplinary team that works to prevent infections.

"We work with all departments to minimize and reduce infection

on campus knows infection

From ordinary to extraordinary

Even hospital construction projects take infection control into account.

risk," Hakim says. "We review the air our patients breathe.

The food they eat. The water they drink. Every possible source

Infection prevention is top of mind for employees and families

Dust poses a severe risk, because it can contain a common mold called Aspergillus. If inhaled by a child with a weak immune system, this fungus can cause a dangerous lung disease. During renovations or maintenance activities, employees erect special

alike. Each day, campus visitors and family members are screened to ensure they are healthy before they stroll the hospital's corridors. At entrances to patient-care areas, gusts of wind blow air

outward so that bacteria, viruses and other disease-causing organisms cannot drift into the facility. And hand-washing has been elevated to an art. Everyone prevention is not just importantit's a matter of life and death.



Hana Hakim, MD, and Craig Gilliam head efforts to provide a cloak of security around St. Jude patients, most of whom have fragile immune systems.

dust barriers. Workers also sprinkle water on construction sites to keep dust from blowing across campus. During construction of the Kay Research and Care Center, special exterior elevators enabled dusty construction workers to travel to their work spaces without walking through the hospital.

"For us, these practices are standard, but for other places they might be extraordinary," says Craig Gilliam, director of St. Jude Infection Prevention and Control. "For instance, before we opened our newest building, we conducted fungal air counts. We wouldn't occupy a floor until we had achieved two acceptable readings a week apart. The state didn't require us to do that. It's just what we thought we ought to do.

"We can't afford to let a child develop an infection because we didn't make the extra effort," he continues. "At St. Jude, we don't consider that to be an extra effort."

The hospital and its housing facilities employ techniques such as positive air pressure and HEPA filters to provide

■ FOR US, THESE PRACTICES ARE STANDARD, BUT FOR OTHER PLACES THEY MIGHT BE EXTRAORDINARY.

– Craig Gilliam

Director, St. Jude Infection Prevention and Control

optimum air quality for patients. Gilliam says the provision of housing is another important component of infection prevention.

"By providing housing for patients, we make sure that when they leave the hospital they return to a safe environment where they're not exposed to pathogens," he says.

The cocoon effect

In addition to providing influenza vaccinations for employees, St. Jude vaccinates patients' parents and siblings.

"Most institutions don't provide this protection for family members," Hakim says, "but we feel it's important to have a cocoon effect. If all the people around a patient are vaccinated, they won't get the illness and transmit it to the child."

During a regional measles outbreak last year, the hospital's Occupational Health staff checked the immune status of everyone on campus and vaccinated those who did not already have protection against the disease. Each visitor and family member is greeted and screened for illness before entering the bone marrow transplant unit and other inpatient areas.

"It's really important that we screen them," Gilliam says. "A patient who gets a cold could develop respiratory distress or even require a ventilator."

Applause for hand-washing

Hand-washing is serious business at St. Jude. Employees and families are educated about the role of hand hygiene in preventing infections. Each inpatient room is equipped with a sink just outside the door, so that hands can be washed at each entrance and exit. Observers monitor hand-hygiene compliance for staff, families and visitors, providing reports that are then used to further education and promotion.

Staff members sometimes use UV light monitors when teaching families about hand-hygiene techniques.

"You may think you're washing your hands well, but this can show the areas you missed," Gilliam explains. "It's a simple way to emphasize the importance of thorough hand-washing."

Studying the microbiome

Hakim and her colleagues are planning a new study to analyze the microbes living in the hospital and to learn how those

> microbes are shared among people in that environment. The researchers hope to use details gleaned from this project to create new approaches for preventing infections.

Before the Kay Research and Care Center opened in the fall, staff members obtained a baseline sample of the microbiome of floors, walls and

other surfaces throughout the new patient-care floors. In 2017, the scientists plan to collect samples from patients, staff and family members in those areas.

"There's never been a comprehensive analysis like this," Hakim says. "Past studies have looked at culturing one particular organism rather than doing molecular testing and understanding all the microbes living in the environment. I'm excited, because I think we're going to learn a lot from this study."

Cleanliness saves lives

As a handler of the St. Jude robots, Davis says he derives a deep satisfaction from knowing his infection-control activities may help save young lives.

"No matter what I'm going through, no matter what's going on in my life, it's nothing compared to what these kids are going through," Davis says.

"Those babies are the reason we're here."

highlights

New treatment possibilities for a high-risk leukemia



Charles Mullighan, MBBS, MD (left), and Zhaohui Gu, PhD

Overall, survival rates are high for acute lymphoblastic leukemia (ALL). But sometimes therapies still fall short. For about 30 percent of ALL cases, the genetic basis remains unknown.

St. Jude scientists led an international team that found a promising lead on precision medicine for patients with a newly identified, high-risk form of ALL.

In studying genetic material from more than 1,700 ALL patients, researchers found that about 5 percent had rearrangement of a gene called *MEF2D*. Patients with this change tended to be older than most ALL patients and less likely to survive.

The scientists also figured out how the rearrangement helped fuel the leukemia.

The insight led them to the drug panobinostat. In the lab, the drug halted growth of human tumor cells with the *MEF2D* rearrangement. The drug is already being used to treat other types of leukemia. This study suggested it might act in a more precise, targeted way against cells with the *MEF2D* change.

"Further testing is underway to see if drugs like this one, either alone or in combination with chemotherapy, offer a new approach for these patients," said Charles Mullighan, MD, MBBS, of Pathology.

The research appeared in Nature Communications.

Mobile health app to help sickle cell patients

St. Jude is partnering with five other institutions to develop a mobile app to help sickle cell patients in Memphis and surrounding communities improve their access and adherence to hydroxyurea treatment.

St. Jude pioneered the use of hydroxyurea to reduce the complications of sickle cell disease in children and young adults. The drug works by enhancing the production of fetal hemoglobin, a healthy form of the essential oxygen-carrying molecule in red blood cells.

"While we have made good progress using hydroxyurea to help children and younger adults look after their disease, much remains to be done to slow the progress of sickle cell as older teenagers transition to adult life," said Jane Hankins, MD, of Hematology. The team developing the app includes staff from St. Jude, the University of Memphis, Methodist University Hospital, Baptist Memorial Hospital, Vanderbilt University and the Sickle Cell Foundation of Tennessee.



Jane Hankins, MD, and patients Khristen and Kaitlyn Bridges

Researchers uncover genetic hallmarks of ALL subtype



James R. Downing, MD (from left), Jinghui Zhang, PhD, and Charles Mullighan, MBBS, MD

Researchers from the St. Jude – Washington University Pediatric Cancer Genome Project and the Children's Oncology Group have identified the genetic changes that underpin a subtype of the most common cancer found in children.

This form of B-precursor acute lymphoblastic leukemia (B-ALL) features genetic changes to two transcription factors known as DUX4 and ERG, proteins that closely control the activities of other crucial genes in human blood cells. In B-ALL, immature white blood cells known as B cell lymphoblasts multiply and accumulate in the blood and bone marrow.

"Our work is motivated by a lack of information on the genetic basis of many B-ALL cases," said Charles Mullighan, MBBS, MD, of Pathology. "We discovered a distinct gene pattern in blood samples from some patients in our study and wanted to determine the underlying molecular events behind this signal."

Scientists hope the discovery will lead to new diagnostic tests for patients.

The findings were published in the journal Nature Genetics.

Researchers reveal genomic landscape of CBF-AML

An international team of scientists has completed a detailed map of the genomic landscape for core-binding factor acute myeloid leukemia (CBF-AML).

CBF-AML accounts for about 30 percent of pediatric AML and 15 percent of adult cases.

Researchers from the St. Jude – Washington University Pediatric Cancer Genome Project revealed differences in the mutations that contribute to the diversity of CBF-AML.

"We set out to understand the genetic variations that contribute to the development of CBF-AML using wholeexome and whole-genome sequencing," said Jeffery Klco, MD, PhD, of Pathology. "Our goal was to define a detailed mutational landscape to understand better the genetic changes that contribute to disease."



Jeffrey Klco, MD, PhD (left) and Xiang Chen, PhD

Scientists sequenced samples from 87 children and 78 adults and found a similar mutational landscape in both groups. In 17 cases, full genome sequences were obtained. Whole-exome sequencing was carried out on the remaining 148 samples.

The findings appeared in the journal Nature Genetics.

Chemo drug impairs multitasking for some survivors

The chemotherapy drug methotrexate has played a key role in the high survival rate for acute lymphoblastic leukemia. But St. Jude researchers have found that long-term survivors exposed to high levels of the drug were more likely to struggle with skills like mental flexibility, planning and organization. These skills are needed to multitask and get things done.

Higher blood levels of the drug were also linked to changes in brain function and structure. The changes took place in parts of the brain that affect skills such as reasoning and mental flexibility.

"As childhood cancer survivorship has grown, so has research to understand and reduce the side effects patients experience during and sometimes long after treatment," said Kevin Krull, PhD, of Epidemiology and Cancer Control.

"This study is the first to show a clear effect between methotrexate concentrations in patients' blood during treatment and executive functioning in survivors," he said. "The information will help scientists design ways to reduce that risk."

The study included survivors treated between 2000 and 2010 who received chemo to the fluid around their brains and spines. This therapy was designed to prevent cancer from coming back in the central nervous system.

The research appeared in the Journal of Clinical Oncology.



Kevin Krull, PhD (left), and Yin Ting Cheung, PhD

Patient safety benefits when hospitals provide feedback



(Left to right) Chris Spencer, Jonathan Burlison, PhD; Lori Christion; and James Hoffman, PharmD

Voluntary reporting of errors and patient safety events by hospital staff provides a key source of information for improving patient care. A St. Jude analysis suggests that to increase reporting, hospitals should focus on informing staff about how their previous reports have helped enhance patient safety.

"Identifying patient safety opportunities is a fundamental first step to preventing harm and improving patient care, which is why hospitals promote patient safety event reporting," said James Hoffman, PharmD, the hospital's chief patient safety officer. Patient safety events include mistakes with the potential to harm patients, even if no one is injured.

The data analyzed by Hoffman and his colleagues came from a survey of 223,412 health care professionals working in 7,816 departments or units at 967 hospitals.

The research appeared in the *Journal of Patient Safety*.

PERSPECTIVE

What's Really Important?

A focus on family makes St. Jude extra special. By Sabrina Soto

JUSTIN VENEI



Sabrina Soto joins St. Jude patients (from left) Sydney Mitchell and Rachel Needham in an arts-and-crafts event at Target House.

There's nothing I love more in this universe than my baby girl, Olivia. Soon after her birth about a year ago, we discovered she had a medical issue, and the doctor told us she needed an ultrasound. When I walked into the children's hospital in Los Angeles, I was so worried.

As I entered the building, other parents were walking in, too. I thought, "I could walk out of here with really bad news."

Fortunately, we got a good report that day. But not every parent has that experience. That's why St. Jude Children's Research Hospital is so important.

Several years ago, my mom and I were excited to host a Mother's Day activity at Target House, one of the hospital's housing facilities. We had fun doing arts and crafts with the kids while their moms got beauty treatments.

During that visit, I witnessed firsthand how the hospital helps families. It reminded me of the time, many years ago, when my grandmother had a stroke. Instead of being by her side, everybody was worrying about details. Her insurance had to be taken care of. Where was she going to stay? Who was going to take care of her? That's the last thing my family wanted to think about. We didn't want to worry about paperwork. We wanted to concentrate on our time with her.

St. Jude takes much of that worry away. Having a sick child is stressful enough without having to figure out how you're going to afford the medical bills—and the travel and housing and food. St. Jude allows families to focus on what's most important: their children.

It takes private donations in order for the hospital to run, and I really can't imagine a better cause than St. Jude.

I always say, "Give whatever you can afford." I know people who spend \$5 every day on a cup of coffee. Even if you can only give \$5, it would still make a difference. But if you'd visit the hospital and see what a difference St. Jude makes to the children and their parents, you'd give everything. ■

I always say, "Give whatever you can afford." I know people who spend \$5 every day on a cup of coffee.

TV personality and lifestyle expert Sabrina Soto is a designer, consultant, bargain hunter and, most importantly, a mom.

Her future starts with your legacy.



"St. Jude is doing an excellent job, and it only makes sense to get on board. Supporting St. Jude makes all the sense in the world."

Laurence Gersky

St. Jude patient Emily, medulloblastoma

Give a gift that gives back.

Receive regular, fixed payments for life, and see the impact you are making on our lifesaving work with a St. Jude Charitable Gift Annuity (CGA). A St. Jude CGA could help you supplement your income, save on taxes and give the gift of a lifetime to help save the lives of children like Emily, battling cancer and other life-threatening illnesses.

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501 St. Jude Place Memphis, TN 38105 Non-Profit Org. U.S. POSTAGE PAID St. Jude Children's Research Hospital

Already a winner

As he laced up his running shoes and donned a St. Jude Hero singlet before the 2016 St. Jude Memphis Marathon, James Eversull knew he was already victorious. Eversull's race began in 1964, when he and his terrified parents passed through the doors of St. Jude Children's Research Hospital. As a participant in the revolutionary "Total Therapy" regimen, Eversull was one of the first children to be cured of acute lymphoblastic leukemia. Now 53 years old, he supports the hospital through participation in the St. Jude LIFE long-term follow-up study as well as through running marathons and speaking on behalf of St. Jude.



Finding cures. Saving children.