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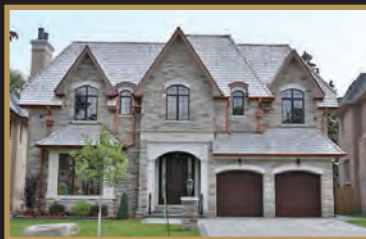
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The outcome of Tiffany's devastating encounter with stroke was unimaginable.

She survived.

Tiffany was 31 and pregnant when she had a life-threatening stroke. While she was in a coma, Sunnybrook's obstetrical team delivered her baby by emergency C-section. Baby Clementine survived only 10 days. Sunnybrook's team of brain sciences experts not only saved Tiffany's life, but helped her keep living. She gradually re-learned to walk and talk. A year later, she is working again and contemplating having a child. Learn more about Sunnybrook's Hurvitz Brain Sciences Program: sunnybrook.ca/brain

Change the outcome.
Heal the future.



WE ARE SUNNYBROOK

faces of our staff and our community



THE VETERAN

A HERO ON SEA AND ON LAND

In the spring of 1942, just shy of 17 years of age and with the help of a phony letter of permission, Don Stewart enlisted in the Royal Canadian Naval Volunteer Reserve.

As a junior seaman and gunner, he spent three years on the defensively equipped merchant ships zigzagging across the ocean, delivering food and supplies during the Second World War.

"Moving across the Atlantic Ocean, at only eight knots, we were sitting ducks for the German U-boats," says Mr. Stewart.

Over a period of three years and 10 trips across the Atlantic, he saw more than 40 Allied ships sink. He took part in the invasion of Italy and then was sent halfway across the world to the Ganges River in India.

While based in Bombay, India, with HMS Braganza, Mr. Stewart's ship was torpedoed near Calcutta (now Kolkata), India. He was taken prisoner for five months by the Japanese in Burma (now Myanmar). It was a time he'd rather forget.

Mistakenly, his parents were notified that their son had died at sea. When Mr. Stewart returned two years later, he completely shocked his father, a policeman who was working at the train station.

"He usually didn't show much emotion, but that day he hugged me long and hard. I will never forget that feeling – there wasn't much talking," recalls Mr. Stewart.

Today, as president of the Veterans & Community Residents Council, his focus is to do all that he can to enrich the lives of the veterans living at Sunnybrook, home to Canada's largest veterans' care facility.

Originally from the Okanagan Valley in British Columbia, Mr. Stewart has been an active member of The Royal Canadian Legion for 69 years. He is the proud father of eight children, 15 grandchildren and three great-grandchildren.

Sally Fur

PHOTOGRAPH BY DOUG NICHOLSON



THE NURSE

A GOLD MEDAL FOR CARING

When the Pan Am/Parapan Am Games came to Toronto this summer, Sunnybrook emergency department nurse Melissa Findlay jumped at the chance to experience a multisport event.

Melissa plays elite-level ringette, a sport that is not included in international multisport events. Using her expertise as a nurse to volunteer at the Pan Am/Parapan Am Games Athletes' Village medical clinic seemed like the next best thing.

"I won't have the opportunity to play my sport at a global event like this, since ringette isn't in the Olympics. I just love sport, and this way I can still soak in the atmosphere and be a part of it," she says.

A ringette player since the age of three, Melissa has played for Team Canada and is currently playing in the National Ringette League, the top league in Canada. She played throughout her nursing studies and continues to dedicate much of her free time to her passion. Earlier this year, she travelled to Fort McMurray, Alta., where her team won the National Championship title.

Juggling ringette tournaments across the country almost every weekend with her work as a nurse at Sunnybrook can be challenging, but Melissa wouldn't have it any other way.

"I thrive on unpredictability," she says. Whether it's on the ice or in the emergency department, "you learn to expect the unexpected. The adrenaline rush from sport is similar to how I feel when I'm able to help a patient. No two days are the same, which I love."

Sybil Millar

THE COGNITIVE NEUROLOGIST

A LOVE OF LEARNING

Finding a balance between the demands of world-class research and patient care in a busy clinic is a challenge that Dr. Benjamin Lam welcomes with open arms.

Originally from Hong Kong, Dr. Lam moved to London, Ont., at the age of four. "Looking back, I think my father was looking for an adventure. I clearly remember telling everyone I was going to live on another planet," says Dr. Lam.

Luckily for Sunnybrook, Dr. Lam landed in the right place. At the age of 16, he was a Sunnybrook student volunteer in the cardiovascular non-invasive lab. As a young "science guy," he was intrigued by electrocardiograms (ECGs) and how to read them.

Today, as a cognitive neurologist, Dr. Lam sees patients in Sunnybrook's Cognitive Neurology Clinic, which treats approximately 250 new patients a year with various types of dementia, including Alzheimer's disease.

With several research projects in progress, Dr. Lam is also a part-time research fellow working with internationally renowned senior scientist, Dr. Sandra Black.

He is currently completing his master's thesis at the Institute of Medical Science on the topic of clinical variation in Alzheimer's disease. "There's been a lot of interest and increasing recognition recently on atypical dementia – how it starts, progresses and, perhaps most importantly, whether it may benefit from different treatment strategies than the more common forms of dementia."

Dr. Lam is inspired by learning about other discoveries. "I read a lot and listen to informative radio such as Ideas on CBC. I've also developed an interest in oenology, the study of wine and winemaking. Science is connected to everything."

Sally Fur



THE LANDSCAPER

SOWING
THE SEEDS
OF HEALING

Rohan Harrison has had his feet firmly planted in nature from the moment he was born. Growing up on a dairy farm in Jamaica, he was inspired to study agriculture as a profession. "I focused on agronomy, which is the study of plants and soil. I tell people, pretty much, that I'm supposed to know how things grow!"

Success was quick to follow Rohan's hard work ethic. He became the farm manager for a large estate and soon after met his wife. The couple moved to Brampton, Ont., in 1991 to be closer to her family.

It was then that Rohan became interested in a burgeoning area of research: the connection between healing and nature. He was eager to find work that would embrace this philosophy and allow him to sow his creative seeds. In 2005, an opportunity to be the team leader for the grounds department at Sunnybrook fit the bill.

Rohan and his team care for 100 acres of land, including 32 acres of grass turf and more than 4,200 trees, day to day. "Landscape is another important member of the health-care team," he says.

That includes a number of healing gardens, with one named in Rohan's honour following his participation in Sunnybrook's episode of *Undercover Boss*. It was in this garden where he experienced a cherished moment.

"I met a woman whose husband had just passed away from cancer. She told me being in nature at that moment was a huge comfort," says Rohan. "Knowing our landscape helped her at that difficult time was my crowning moment."

Monica Matys



PHOTOGRAPHY BY DOUG NICHOLSON

THE PHARMACIST

IT TAKES A VILLAGE

It was July 17, 2002, and more than two decades into her pharmacy career when Anne Karapetsas's life and practice changed forever.

Her teenage daughter came home after work, complaining of an excruciating headache, blurred vision and nausea. After rushing her to hospital, Anne learned that her 15-year-old daughter had a time bomb explode in her head. The time bomb, it turns out, was arteriovenous malformation (AVM), a rare condition which caused blood vessels to weaken and rupture in her brain.

Her daughter clung to life over the next several months. She endured three strokes, multiple surgeries, a coma and a brain infection that left her paralyzed and mute. Anne spent the next year by her daughter's side, watching her try to regain the life she nearly lost.

"As a clinician and pharmacist who spent decades in both acute care and rehabilitation settings, I cared about patients and could empathize with what they're going through," says Anne. "But when I lived it, that's when I truly understood."

Anne admitted to operating in her own silo in the past. She'd work with her pharmacy team and focus solely on medication as other health-care professionals focused on their specialties. But that has since changed.

"I watched a team of occupational therapists, physiotherapists, speech language therapists, nurses and other specialists all work with my daughter to regain her mobility, her voice and her life," says Anne. "That year, I not only got my daughter back, I got a renewed sense of compassion for patients and a greater appreciation for everyone who makes up a health-care team."

Today, Anne works in the Falls Prevention Program at St. John's Rehab as part of a close-knit interprofessional team that helps seniors in the community reduce their risk of falling through exercise, home modifications and medication therapy.

"The role of the pharmacist is changing," says Anne, now 35 years into her career. "We're not just behind the counter anymore. We're in people's homes; we're on the front-lines, making a difference in the lives of patients, and I'm so blessed to be part of it."

Katherine Nazimek



THE FOOT SPECIALIST

WALKING IN OTHERS' SHOES

Nicholas Durand, foot specialist at Sunnybrook Centre for Independent Living, spends most of his professional time treating and managing diverse foot conditions at the hospital. He sees everyone from ballerinas to veterans. But two days each week he takes his practice to the community to capture an often-forgotten population.

Nicholas has been caring for homeless and at-risk clients in Toronto for more than a decade.

"Many of these patients suffer from addiction and mental health issues, making access to health care difficult and daunting at times," explains Nicholas. "Living on the street or in marginal housing often leads to neglected foot issues – diabetic or vascular complications and untreated infections."

Patients can walk in to the community health centre and be assessed and treated without the need for appointments, provincial health insurance or formal identification.

His service isn't entirely selfless. Nicholas says working with the homeless makes him a better practitioner for Sunnybrook.

"Anything that expands your experience with different types of both patient and patient conditions will help," he says. "On the streets, you see them at their worst. At Sunnybrook, you'll see the same things, but instead of having to manage them in a difficult environment, you can manage them in an area of excellence, where you have instant contact with the best practitioners around."

Nicholas explains that most people don't realize that the health of their feet is connected to the rest of the body.

"A person may appear absolutely together and healthy, but as soon as they take off their shoes, you see how they're really coping – whether it's a patient on dialysis trying to manage their underlying condition or an athlete who overtrains," says Nicholas.

"It's amazing what issues people will tolerate within the foot or try to self-manage until it is critical before they seek attention. Many things are preventable, and I want to keep people as mobile as possible, regardless of their age, health condition or socio-economic status."

Katherine Nazimek



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PHOTOGRAPH BY DOUG NICHOLSON

ON FRIDAY,
MICHAEL HAD MAJOR
CANCER SURGERY.

ON MONDAY,
HE WENT FOR A
5-KILOMETRE
WALK

Patients experience better quality of life, thanks to less invasive and more targeted approaches in cancer care being pioneered at Sunnybrook

BY MARJO JOHNE

PHOTOGRAPH BY TIM FRASER

Michael Calderone, walking with his wife Caroline, had his colorectal cancer removed without the need for an incision.



The tea came in a little plastic cup, oversteeped and slightly tepid. But it didn't matter to Michael Calderone. He was just happy to be sitting up and sipping tea in his hospital bed, just one hour after undergoing surgery to remove a cancerous growth.

Things could have been very different. Michael and his wife, Caroline, had previously been advised that treating the colorectal cancer in his rectum would require cutting through his abdomen to remove the rectum and surrounding lymph glands. They would also need to create an ostomy pouch – also known as a permanent colostomy bag – to collect his waste.

“And if all was to go well with the surgery and my recovery, I would have to come back later to get the sphincter and colon reattached,” says Michael, a Toronto entrepreneur who runs a wholesale and retail fashion business. “But healing could take months. And there was a chance that reattachment would not be possible, and I would have to live

with a colostomy bag.”

The Calderones then met with Dr. Shady Ashamalla, a surgical oncologist at Sunnybrook's Odette Cancer Centre with expertise in minimally invasive laparoscopic surgery for cancers in the lower gastrointestinal tract. Dr. Ashamalla suggested a “trans-anal minimally invasive” approach which would use tiny instruments in tandem with a laparoscope (tiny video camera) inserted through the anus to remove the cancer.

“There's no incision at all,” explains Dr. Ashamalla, who completed advanced fellowships in both minimally invasive surgery and surgical oncology as part of his training. For this relatively new procedure, which is suitable for removing early stage colorectal cancer and non-cancerous polyps in the rectum, he studied with leading surgeons in the field. “Instead of cutting through the abdomen, we go through a natural opening in the body, cut out and remove the tumour, and patients can go home the same day.”

In Michael's case, he had a small, early stage colorectal cancer low in the rectum that was removable by local excision. By 3 p.m. on the day he had his trans-anal surgery, he got up, held his wife's hand and walked out of the hospital.

“I had the surgery on Friday,” recalls Michael, who must now come to

Sunnybrook every three months for monitoring over the next two years. “On Monday, I went for a five-kilometre walk.”

MINIMALLY INVASIVE

Most treatments to remove and destroy cancer come with physical risk.

To ease the physical burden on patients already dealing with cancer, doctors and scientists at Sunnybrook have continued to advance innovative treatments and approaches that are less invasive than conventional procedures. These approaches zoom in on the cancer while sparing the rest of the body.

Michael's surgery is just one example of minimally invasive cancer treatments offered today at Sunnybrook.

“Minimally invasive treatment is not just a technique, it's a philosophy of care at Sunnybrook,” says Dr. Ashamalla, who is a member of the Odette Gastrointestinal Cancer Care team.

From pharmaceutical agents that target molecular abnormalities specific to pancreatic cancer to using sentinel lymph node biopsy (or the removal of only the first lymph nodes (sentinel nodes) into which a primary tumour drains) to detect metastases in cervical cancer, Sunnybrook is continually expanding its repertoire of procedures that minimize the physical impact on

patients while delivering the same or better outcomes than traditional approaches.

Sunnybrook offers laparoscopic surgeries, where appropriate, for the care of gastrointestinal and some gynecological cancers. These procedures involve a few small incisions with ports placed through the incisions. Using a laparoscope as a visual guide, the surgeons skillfully manoeuvre long, thin surgical instruments to remove tumours without injuring any areas of the body.

“Our goal is to be able to offer procedures that can be done in the least invasive way, but, at the same time, achieve the same oncological effect to remove all the cancer,” says Dr. Ashamalla, head of general surgery at Sunnybrook.

Mary Abbott underwent a laparoscopic colon resection.

“I was diagnosed with colon cancer in January 2013, and it was not early stage – I had almost a full blockage,” says Mary, a lawyer and partner with a large Toronto law firm. “When Dr. Ashamalla said the cancer could be addressed minimally invasively, I was surprised, but definitely relieved at the idea of not having full open abdominal surgery.”

Mary, a mother of two boys aged 12 and nine, went in for her laparoscopic surgery on a Wednesday and went home two days later. While she didn't go back to work for a while, she says she resumed normal activities shortly after the procedure.

“I continued to see my friends and exercise and hang out with my kids,” says Mary, who also received six months of chemotherapy and now comes in for regular checkups to ensure she remains cancer-free. “Because you don't have that pain associated with a larger incision – I probably have four tiny incisions that you can't even notice – you forget that you just had major abdominal surgery, and that really allows you to get back to normal quicker.”

TARGETED APPROACHES

Surgical oncologist, Dr. Paul Karanicolas, and medical oncologist, Dr. Yooj Ko, also of the Odette Cancer Centre Gastrointestinal Cancer Care team, have collaborated to bring to Sunnybrook a first-in-Canada Hepatic Artery Infusion Pump Program. This is a promising approach, still in clinical trial, for patients where colorectal cancer has spread to the liver, with immediate surgery being too risky, and where first-line chemotherapy to reduce tumour number and size is proving unsuccessful



Minimally invasive treatment is “a philosophy of care at Sunnybrook,” says surgeon Dr. Shady Ashamalla.

PHOTOGRAPH BY DOUG NICHOLSON

in order to make liver surgery possible.

Christy Pieroway of Newmarket, Ont., is a 43-year old mother of two and a former globe-trotting sales representative. She is one of a small number of participants in this trial, which researchers hope to offer to more patients.

Diagnosed with colon cancer that had spread to the liver, Christy immediately had surgery in August 2013 at a local hospital to remove the tumour in her colon. She then underwent standard chemotherapy to limit further spread and to shrink the tumours in her liver.

Christy was subsequently referred to Sunnybrook's Odette Cancer Centre for liver surgery. In reviewing her case, the multidisciplinary team that included surgical, medical and radiation oncologists, pathologists, interventional radiologists and oncology nursing, recommended she would be a good candidate for the Hepatic Artery Infusion Pump trial as immediate liver surgery was not possible.

The Hepatic Artery Infusion Pump is a small disc-shaped device that directs anti-cancer drugs into the liver through a catheter inserted into the organ's hepatic, or main, artery. The pump is implanted beneath the skin just above the abdomen. Chemotherapy is infused in the pump at regular intervals, at about two to six weeks apart.

The hepatic artery supplies most of the blood to cancers in the liver, says Dr. Karanicolas. Because of the liver's

ability to clear out toxins, any leftover drugs not delivered to the cancer cells get eliminated, leaving other parts of the body free of the drug and related side-effects.

“So most of the chemotherapy – about 95 per cent – actually stays in the liver, to treat the tumours,” he says.

The liver-directed chemotherapy via the pump is given in combination with standard intravenous chemotherapy. To date, combined treatments have yielded a positive response of reduced metastases of up to three times, or 75 per cent, greater than standard second-line chemotherapy alone.

Fast-forward to the present: Christy and Drs. Ko and Karanicolas have seen in the latest CAT scans a reduction in the tumours in Christy's liver and, most recently, indications that the cancer is not changing over time.

“We are excited about Christy's prospects, especially now that we are also seeing cancer control,” says Dr. Ko.

“The program requires strong collaboration among a large group of specialists. It offers appropriate patients a more effective and targeted treatment option, and we hope to expand the program,” says Dr. Karanicolas.

“The pump had initial challenges for me, but the results have been encouraging,” says Christy, “and knowing Sunnybrook's team is behind me, helping me all the way, it's renewed our hope for the longer term.”



Michael Calderone was able to leave hospital on the same day he had his cancer surgery.

PHOTOGRAPH BY TIM FRASER



Karen Hwang is back at work as a chiropractor after undergoing endovascular treatment at Sunnybrook.

STROKE OF GENIUS

A groundbreaking clot-removal procedure is saving the lives of stroke victims who were previously hard to treat

By Angela Pirisi

When Karen Hwang turned 40 last fall, she and her best friend, who was also turning 40, decided to celebrate their birthdays by travelling to Athens to run a marathon. Less than two weeks after the avid runner returned home, she collapsed in the shower of her Markham, Ont., home on a Friday evening. Karen's family called 911, and Karen was rushed to a nearby hospital.

At first, the doctors assumed that Karen had slipped and struck her head. "Given my age and history, there was no reason to suspect a stroke," she says. "I was perfectly healthy, with no family history of stroke."

An initial CT scan showed nothing, and her only obvious injury was a badly bruised shin. When Karen regained consciousness the next day, she seemed perfectly fine. But on Sunday morning, a nurse became suspicious when she tried to assist Karen to the bathroom and noticed her right leg and arm were bent, and that she was unable to straighten them. At that point, Karen discovered she could no longer walk.

"My symptoms were bilateral, so I had a lot of weakness on my right side and numbness on my left side, including my mouth and tongue. Luckily, it didn't affect my speech. I had also lost some of the vision in my left eye," says Karen.

A second CT scan followed that morning, and this time revealed a blood clot lodged in the basilar artery, a major

artery that channels blood and oxygen to a number of arteries that branch out into the brain. Karen had an ischemic stroke, a stroke that is the result of a blood clot.

It was Sunday afternoon, and she was rushed to Sunnybrook. When the call came, Dr. David Gladstone, medical director of the Regional Stroke Prevention Clinic, made the diagnosis, co-ordinated her treatment plan and mobilized the Code Stroke team – Karen would undergo emergency surgery to try to remove the clot.

The kind of clot Karen had is challenging to dissolve or manually remove at the best of times, but many hours had already passed since she collapsed. Survival and recovery after an ischemic stroke depend heavily on how quickly the clot can be removed. Typically, the prognosis would be bleak, including a vegetative state and, possibly, even death. But Sunnybrook doctors had an ace up their sleeve – a clot-retrieval procedure known as endovascular treatment (ET).

ET is a minimally invasive procedure that involves the expeditious removal of a blood clot, thereby restoring normal blood flow to the brain. "First we perform a CAT scan to see how much of the brain is savable, locate the blood

clot and decide if we can get up to it and examine collateral blood flow [blood flow in the area surrounding the clot] using advanced imaging," explains Dr. Rick Swartz, medical director of the stroke program at Sunnybrook, who's been leading studies of the technique at Sunnybrook. "Then we put a wire in through the groin and move up into the brain, where we put it into the clot and deploy a stent, which meshes with the clot, then retrieves it."

Researchers at Sunnybrook have been working hard with collaborators around the world to troubleshoot and fine-tune ET techniques, which have been in studies for almost two decades. What has developed is a solution that may drastically change the prognosis for patients with ischemic strokes. An ischemic stroke is caused by a blood clot that cuts off blood flow to some part of the brain. Ischemic strokes make up about 85 per cent of stroke cases.

The ET procedure is being hailed as the most significant breakthrough in stroke treatment in 20 years, since it can greatly reduce disability and risk of death.

Sunnybrook was one of 22 sites worldwide participating in a clinical trial that involved 316 ischemic stroke patients who were randomly assigned to either standard care (a clot-busting drug called tPA, short for tissue plasminogen activator) or standard care, plus the

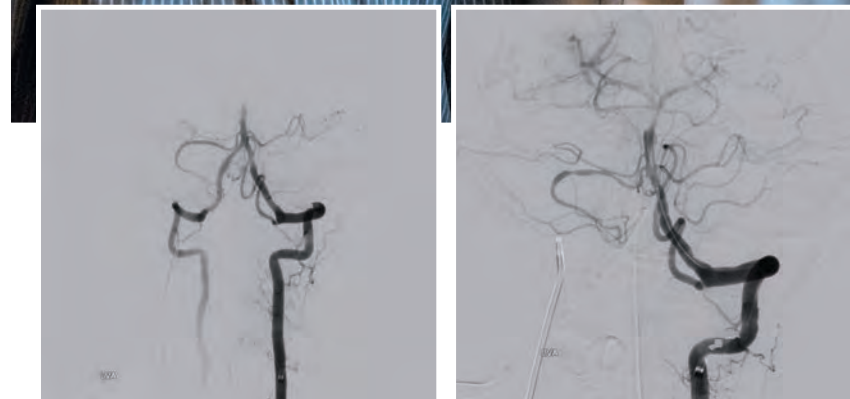
clot-retrieval process. Results, published in *The New England Journal of Medicine* in March 2015, showed that 55 per cent of patients had a positive outcome, compared with 30 per cent for those receiving standard care. Death outcomes were cut in half, from 20 per cent to 10 per cent. In fact, the trial was ended early due to the overwhelming success rate shown in results, says Dr. Swartz, one of the study's co-authors.

An ischemic stroke can be treated with tPA to dissolve clots, but some challenges arise, says Dr. Swartz. A key issue is that tPA needs to be administered to a patient within about 4.5 hours of having a stroke. So people need to quickly recognize stroke symptoms and call 911 right away, but that doesn't always happen. People who take blood thinners aren't eligible for tPA, since the drug is a blood thinner, so it would increase the bleeding risk.

Another potential issue is that tPA may not completely remove large blood clots, so surgeons may still need to manually remove what's left of a partially dissolved clot. Many patients in the clinical trial received both tPA and ET. "tPA works quite well for some patients," says Dr. Swartz. "For this trial, we were looking at the most severe strokes that affect the big blood vessel branches that go into the brain," he says. "These tend to have larger, longer clots, so tPA may dissolve half of the clot, but if the other half is still blocking blood flow, you haven't addressed anything until you get rid of all of it." That's where the ET procedure comes in – to mechanically remove clots that are less responsive to tPA.

ET has a longer window of opportunity than tPA – generally up to six hours and sometimes even longer – but only if the damage hasn't already been done. So people cannot delay getting to the hospital, warns Dr. Swartz: "It means that now people have even more reason to get to the hospital quickly – we have more options for the worst strokes." ET can certainly be an option for patients who aren't candidates for tPA or for whom the clot-busting drug hasn't been completely successful.

Dr. Victor Yang, a neurosurgeon at Sunnybrook who performs the clot-removal procedure and has developed processes to make ET as efficient as



Karen Hwang's basilar artery flow before (left) and after (right) the clot-retrieval procedure. The images were taken with an angiography machine during the procedure in Sunnybrook's angio suite.

possible, says that other options are still available for stroke patients who aren't candidates for ET, but for those who are eligible, the decision is clear. "There are emergency devices available, but this is older technology. The other alternative uses catheter tubes to disrupt and suction the broken-up clot," he says. "It's tedious to use, and it takes a longer time with unpredictable results; the success rate is only about 30 per cent," adds Dr. Yang.

As for ET's breakthrough in stroke treatments, it's not just about the technique, but also about teamwork, says

Dr. Yang. "Technology is just one piece. Stroke treatment is now what we call a 'team sport.' If you have the technology, but it takes hours to assemble a team, the technology will be of no benefit to the patient," he says.

Dr. Swartz emphasizes speed as one key factor that has made ET a real game-changer for stroke treatment. "We've built our system to be faster in responding to stroke patients," says Dr. Swartz. "Candidates for ET can be identified and treated as quickly as possible, thanks to advanced imaging technology. Another factor is that the latest-

PHOTOGRAPHY BY DOUG NICHOLSON



generation devices, known as stent retrievers, are much faster, safer and more effective."

Meanwhile, Dr. Yang has also been designing and developing an app that provides a communication tool for all key members involved. Michael Lu, a process improvement engineer working with the stroke team, wrote the app software. Initially, Lu tracked the team's response time from the stroke event to when the patient shows up in the ER to when they have an intervention.

Now the app keeps an automatic "score board" for the team.

For Karen Hwang, the convergence of technological innovation with the interdisciplinary collaboration and resourcefulness of Sunnybrook's team has made a life-saving – and brain-saving – difference.

"If it weren't for what doctors Yang, Howard and Gladstone did, and the



clockwise from top left: Dr. David Gladstone (left) and Dr. Rick Swartz; Dr. Victor Yang in the OR; and Dr. Yang (foreground), neurosurgeon Dr. Leodante da Costa and radiologist Dr. Peter Howard discussing a stroke patient's brain scans.

speed at which they did it, I would not be here today," says Karen. "My recovery has been remarkable, knowing the consequences of the type of stroke I had."

Karen is now back to work part-time as a chiropractor, steadily regaining her indispensable fine motor skills, including the use of her right hand. She's also slowly working up to running again, and she is planning to participate in a five-kilometre run this fall. "I still feel like I have a long way to go, but things just keep improving each day." 🐾

“If people get too fearful of participating in the innovation process, then Canada will not be the one to innovate, and we’ll be buying expensive technologies from elsewhere in the world.”

Precise guidance

Made-in-Ontario imaging devices seek to redefine the landscape of interventional cardiology

BY ALISA KIM

If a picture is worth a thousand words, then what is the value of one that helps doctors navigate the heart’s delicate terrain to repair lethal conditions?

That’s the million-dollar question Dr. Brian Courtney, a clinician-scientist in the Schulich Heart Research Program at Sunnybrook Research Institute (SRI), is investing his time and energy into answering. Dr. Courtney is compelled to provide better image guidance so that doctors like him can manoeuvre through the heart and its channels with greater safety and precision.

“I love looking after patients and trying to provide them with some solution to the challenges they face. If I were to do clinical work 100 per cent of the time, knowing how many technical challenges we face and how many conditions we’d like to be able to treat better, I’d be a bit frustrated. I studied engineering as my initial profession – I like to go after problems and solve them with technical and other solutions,” he says.

Dr. Courtney has spent much of his career developing devices to improve outcomes of minimally invasive procedures. In 2007, he founded Colibri Technologies to put these tools in the hands of those who mend ailing hearts and vessels.

Colibri’s first product is an ultrasound catheter that makes 3-D pictures inside the heart in real time. It’s used for intracardiac echocardiography, a technique whereby a catheter with an ultrasound probe at the tip is inserted into a leg vein and guided up into the heart. Intracardiac echocardiography is gaining traction in procedures for structural heart disease and arrhythmia, when the heart beats irregularly.

First, a primer on the heart. This fist-shaped pump is divided into four chambers. The left and right atria, which receive and collect

blood, form the upper chambers. The lower chambers, the left and right ventricles, pump blood out of the heart to the rest of the body. An internal wall called the septum divides the right and left sides.

Atrial fibrillation (AF) is when the heart beats abnormally – too fast, too slow or somehow out of sync. It affects about 250,000 Canadians, which makes it the most common heart rhythm problem. It’s caused by an electrical disturbance in the atria.

A prolonged too-fast heartbeat can lead to heart failure when the weakened muscle can’t pump enough blood throughout the body. Atrial fibrillation also increases the risk of stroke five-fold. This is because the atria contract in a chaotic pattern; thus, the heart doesn’t pump effectively, causing blood to pool, which could lead to the fatal ascent of a clot to the brain.

Anti-clotting drugs and medication to control heart rate and rhythm are a first-line strategy for reducing the risk of stroke and symptoms caused by AF. If patients can’t tolerate them, then they might undergo cardiac ablation, a procedure that’s done in Canada several thousand times annually. The aim is to alter the heart muscle that initiates and propagates faulty signals that cause the arrhythmia.

Some electrophysiologists, who are cardiologists specialized in treating such problems, rely on X-ray guidance during ablation procedures, especially if the patient’s anatomy is normal. That often isn’t the case, though, says Dr. Courtney. “That’s one of the reasons why people might have atrial fibrillation, because they have something different about their heart.”

For common heart procedures, including AF ablation, doctors move from the right side to the left by making a small hole in the atrial septum. The left atrium is the trickiest chamber to enter, and where



Dr. Brian Courtney's Colibri Technologies is developing tools for minimally invasive procedures, including an ultrasound catheter that makes 3-D pictures inside the heart.

ultrasound guidance is advantageous, says Dr. Courtney.

Other companies make catheters, but Dr. Courtney's intracardiac catheter is the only one that is forward-viewing and can do 2-D and 3-D imaging.

The device could also transform how catheter-based mitral valve procedures are done. Here, doctors stop leakage of blood from the left ventricle to the left atrium by attaching a clip to the mitral valve to keep it closed. It's guided by a technique called transesophageal echo, which uses ultrasound to see inside the heart, but goes in through the esophagus and requires general anesthesia. Using intracardiac echo instead requires only local anesthesia, a faster, cheaper option.

In addition to providing more anatomical context, the 3-D component of the imaging could help doctors do their work more handily.

"When you're doing these procedures, you have one device that's either burning, sensing or clipping, and you have another catheter that takes pictures. If you have a 3-D catheter, that gives you more flexibility in being able to position your imaging catheter in other locations that are less likely to interfere with the

movement of the catheter that's doing the therapy," says Dr. Courtney.

Welcoming the hybrid age

Colibri's second product, its intravascular catheter, is an innovation that could help cardiologists to better determine the nature and extent of coronary artery disease, narrowing of the coronary arteries that is the leading cause of death worldwide. The device combines two complementary ways of seeing inside blood vessels: ultrasound and optical coherence tomography (OCT).

Intravascular ultrasound can identify attributes such as plaque buildup or calcifications on the artery wall that are difficult to make out on an angiogram, a picture of the coronary arteries made using X-rays and a dye. It's also used to see whether a stent has been placed correctly or to determine the right-sized stent.

Optical coherence tomography, which makes pictures by sending light into tissue and collecting the reflections, is a newer technique that provides higher resolution and better contrast than does ultrasound. Where ultrasound prevails is being able to see deeper into

tissue and looking through blood.

Colibri's intravascular catheter aligns the ultrasound and OCT beams exactly so that they look in the same direction concurrently. The design enables data from both modalities to be matched precisely for a more detailed image inside the vessels.

The device offers hope in detecting "vulnerable" plaque, which is prone to rupturing. If this happens, then a life-threatening clot forms inside the artery, which can lead to a heart attack or stroke. Catching the buildup before it bursts – which can be symptom-less, as was the case for the plaque that caused the death of NBC journalist Tim Russert in 2008 – isn't possible with current diagnostic methods.

Dr. Courtney has presented research on the technology at conferences, which has generated buzz from his colleagues. "It's clear that there's a need. We have a path to get there. It's just a matter of putting the fuel in the tank to get to that point."

Nearing the finish line

Development of the intracardiac catheter is the company's primary focus, says

Dr. Courtney, who began working on the technology seven years ago. In the early stages, he and his team built a prototype and did validation testing and preclinical experiments at SRI.

Since then, Colibri has moved into its own space. Its 25 employees are working to propel the technology from a prototype to a market-ready product. The team has concentrated on image quality and reliability, and making the device sterile and biocompatible. In addition to ensuring safety, the team has miniaturized the catheter and modified the design so it can be manufactured. Colibri will seek regulatory approval for clinical use, with an eye to doing patient studies later in 2015.

While the first two products target applications in cardiology, there are plans to expand into other clinical domains. Colibri has acquired the rights to an ultrasound probe for imaging in the ear that was developed at Dalhousie University in Halifax. The device will become part of a pipeline of products. "The philosophy is to make a company that has a broad technology platform so we can be the best at providing imaging guidance for minimally invasive procedures," says Dr. Courtney.

PHOTOGRAPH BY NATION WONG

Staying the course

Moving a medical innovation from an idea through to a saleable product takes dedication and time – lots of it. Here, a look at some milestones in Colibri's commercialization pathway of the intracardiac echocardiography (ICE) system.

- '06 **2006:** Idea for the ICE catheter is born.
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- '11 Initial preclinical data are acquired.
- '12 Colibri moves into its head office and R&D facility. The company receives certification for manufacturing.
- '14 Japan Lifeline, a medical equipment company, becomes the sole distributor of the ICE technology system in Japan.

The global market is paying attention: Japan Lifeline, a firm specializing in cardiovascular medical equipment, recently agreed to become the exclusive distributor for Colibri's intracardiac catheter in Japan. The deal gives Colibri a foothold in the world's second-largest medical device market.

The company's dogged pursuit of success is remarkable against the somewhat gloomy backdrop of commercialization of innovations in Canada.

A study by the C.D. Howe Institute shows that per capita patent filings in Canada are declining. Moreover, the country's medical device sector operates at a \$5-billion trade deficit; we buy \$7-billion worth of medical equipment from the rest of the world while selling just \$1.8-billion of our own.

The path to bringing his inventions to market has been bumpy, and the stakes are high, but Dr. Courtney says the cost of sitting on the sidelines is even greater. "If people get too fearful of participating in the innovation process, then Canada will not be the one to innovate, and we'll be buying expensive technologies from elsewhere in the world, or not, and therefore, not treating our patients as effectively."

He's all in. 🍀

This story was originally published in SRI Magazine 2015.

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Nathan Litvinsky, a member of the Dad's Night group, with his daughter Emery, who was born at only 24 weeks.

PHOTOGRAPH BY DOUG NICHOLSON

NEONATAL CARE

PREEMIES, PARENTS *and a* SUPPORTING CAST

Having a baby inside a neonatal intensive care unit is a nerve-racking, life-altering experience. At Sunnybrook, parents who have been through it try to give back to those in need

BY ALEXIS DOBRANOWSKI

When Irma Jules had her son at 24 weeks, she thought she was ready for what was ahead.

But when Nathan suffered a brain bleed just a day later, shock, fear and disbelief set in. Doctors told her he would need to have a shunt put in his brain.

She googled “shunt,” and was overwhelmed by information that amped her fear about the procedure and the possible outcomes. A mom to three other boys, Irma was used to fixing hurts when her children had them. With Nathan, she felt helpless.

“I went home and I cried for the whole day and then I came back to the hospital with a new mentality,” she says. “I will do what it takes to help get my son where he needs to be. If he can’t see, I’ll see for him. If he can’t talk, I’ll talk for him. I spoke to the doctors; they told me he wouldn’t be able to smile at me. It was frightening.”

Peer counsellors *Ophelia Kwakye (left) and Irma Jules (right)* use their experience as NICU mothers to help and support new moms in the unit, like *Lise Ngandu (centre, with baby Abigail)*.



Irma said what helped her most during that time was talking to other women in the Neonatal Intensive Care Unit (NICU). “I talked to every single mom I saw,” she recalls. “In the hall, in the pump room, anywhere I could meet a mom. It used to make me feel better.”

Now Irma – along with fellow NICU graduate mom Ophelia Kwakye – is a peer counsellor in the NICU. Their role is mainly to encourage other women to pump breast milk for their babies in the NICU. But the support goes beyond that.

“Some may not have it in their personality to approach other moms,” Irma says. “We share our stories and facilitate discussion amongst them.”

Irma and Ophelia host a weekly lunch, where women gather to talk about their babies, their experiences and their fears. If anyone isn’t coping well, the pair connects them with other hospital supports.

Ophelia was just 22 weeks pregnant when she was admitted to Sunnybrook. Her son Emmanuel was born at 24 weeks and three days. He weighed just one pound.

“I didn’t want to come downstairs to see him because I was so, so scared. I went the next day to see him, and I went crazy when I went in the room. I saw this big machine with all this big stuff around that I know nothing about, and the baby was inside, so very tiny. My life just changed. I just took it from there.”

Ophelia says one of the people she remembers most from that time was Kate Robson, NICU parent co-ordinator.

“I was always sitting there crying. And Kate would come to me and say, ‘Can I give you a hug?’ She would tell me about her two preemie daughters. And so when she called me about being a peer counsellor, I remembered her telling me those stories, and that’s what helped me most of the time. She had a 25-weeker, too. That kind of gave me hope that my son might survive.”

Ophelia says the opportunity to pump

“I WAS ALWAYS SITTING THERE CRYING. AND KATE WOULD COME TO ME AND SAY, ‘CAN I GIVE YOU A HUG?’”

her breast milk for her baby also gave her hope and purpose. “They told me the breast milk will help fight all the bacteria. So I was just pumping and pumping and pumping.”

In her role as peer counsellor, Ophelia now encourages other moms to do the same. She tells them stories about Emmanuel – now a selfie-taking, dance-loving four-year-old.

Irma’s Nathan is now two years old. He started to walk. And talk. And smile. He had the shunt put in, and Irma now talks to other parents about that experience.

“Talking to other moms helped me so much, so, I figure, if I get the opportunity to do that and help, then I will.”

Dads’ Night in the NICU

Overwhelming. Scary. Joyful. Stressful. Helpless. A rollercoaster.

These words come up over and over again at Sunnybrook’s NICU Dads’ Night, a monthly event that welcomes men with babies inside the Neonatal Intensive Care Unit to share their stories and support each other.

Attendance waxes and wanes each month. On this particular Thursday, five dads gather around the kitchen table in the NICU Family Room. They talk about

baby names, how many weeks along their wives or partners were when the baby came, how scary it was and how they just feel at a total loss for words sometimes. The men erupt in laughter when one dad says there are so many wires in his twins’ room, it’s like they were born into The Matrix. The dads go quiet and gently nod when one says he feels scared to touch his little girl.

“I was scared at first, too,” one agrees.

They talk about how it is hard going back to work.

“It’s really hard to know what to say to people,” one dad says. “It’s hard to be at work at all,” his neighbour adds, to murmurs of agreement from the others.

Nathan Litynsky’s baby girl Emery came at 24 weeks, he tells the group. It’s been really hard on his wife, Jaclyn. But hard on him, too, he says.

“We came here on one of the coldest days of the winter. We watched the snow come. Then it melted. Now there are leaves on the trees and green grass. I’ve been here awhile, guys, and so I will give you some advice. Take it one day at a time. Trust your baby will do the best she can.”

It’s Nathan’s first Dads’ Night.

“It was nice to talk to other dads who get it,” he says afterward. “I have found

it hard to find supports who really understand.”

The evenings are facilitated by Grad Dads Dave Merriman and Zahir Keshavjee. Like other Grad Dads, Dave and Zahir had babies in the NICU, and they now offer support to families who are new to the experience.

Dave has been involved in Dads’ Night since the program’s inception in January 2012. Robson wanted to do something for the fathers, to recognize how important they are in the NICU process – and because they often feel like the “forgotten man,” Dave recalls.

“Fathers play such an important role during this time, but may feel on the outside looking in at times or may be overwhelmed by the sheer magnitude of the occasion,” says Dave, dad to two preemies. “For one night, this gives them the opportunity to relax, hear from other fathers who are facing the same circumstances as they are and also express how they are feeling and coping with the moment. Sometimes it’s simply to provide an audience to listen as they tell how they are feeling and reacting. Other times it’s an excellent exchange of details and information.”

Zahir and his wife, Rishma, had twins in the NICU in 2013. The little boy, Khalil, died five days later. “It was a tough, tough process. I tried to support my wife and her emotions,” says Zahir.

“The NICU is understandably a very female-focused environment. But being a dad inside the NICU has its own stresses and challenges. Dads’ Nights are a space where they can connect with each other and offer each other some support – because it’s hard to know where to find that. Dave and I share our stories, so they know where we are coming from and that they aren’t alone,” he says.

Dave and Zahir see themselves as helpers for an evening, there to listen and support dads during what is a life-altering experience.

“Having had two preemies myself and going through what they are going through, there is almost an immediate bond or understanding that is reached,” Dave says. “I tell the dads that they have now joined a very special fraternity of those who have preemies.”

“These little miracles are very special, and I hope the Dads’ Night program has made the fathers feel special in some small way,” he says. “Our message is quite strong and clear that dads matter, too, and play a vitally important part in the birth and care of their new child.”

PHOTOGRAPHY BY DOUG NICHOLSON



SPECIAL CARS GET NICU GRADS MOVING

Kaitlyn Chiaramida was just over four months pregnant when her water broke.

She spent two nerve-racking months at Sunnybrook, hoping and praying her baby wouldn’t come yet. Her baby daughter Audrina was born at 29 weeks, weighing two pounds, 13 ounces.

“We spent two more weeks at Sunnybrook, then got transferred to our home hospital,” Kaitlyn says. “Every day, there were machines coming off of her; she was doing really well.”

However, the doctors told Kaitlyn and her partner, Vinnie, soon after that Audrina has cerebral palsy. “I was devastated,” Kaitlyn recalls. “I felt like I did something wrong. I felt better when I learned it was something that was out of my control.”

Cerebral palsy (CP) is a diagnosis that describes a brain injury early in childhood that affects how a child’s muscles receive input from their brain and results in difficulties with movement. This potentially impacts the child’s ability to move, sit, walk, talk, eat, draw or play the way other children do, says Laura Cooper, an occupational therapist at the follow-up clinic at Sunnybrook’s Neonatal Intensive Care Unit (NICU).

“Children with motor difficulties such as CP have less opportunity to move and explore their environment compared to same-age peers without motor delays,” Cooper says. “This can reduce their opportunities for learning, language and social development.”

When Kaitlyn was approached about participating in a study that might aid in

Audrina’s mobility, she says she jumped at the chance.

“Audrina has a cousin around the same age, who has started to crawl around, and we see Audrina look at her moving as though she wants to as well, but she can’t,” Kaitlyn says. “When Laura explained they would give us this little car, and Audrina will be able to move around all by herself, we had to get involved. We would do anything for her.”

The modified cars project, based on the Go Baby Go project by a team at the University of Delaware, provides babies with mobility issues the opportunity to move and explore their environment in a fun and age-appropriate way. Cooper, along with University of Toronto (U of T) occupational therapy students Mallory Owen and Stefanie Radia-Bramwell, and Deb Cameron, assistant professor at U of T, take small plastic cars and “soup” them up to fit the baby, as well as rig a button that the baby can press to make the car move.

“The car gives the child a chance to sit upright. There’s a child-friendly seat and support that’s modified to fit them,” Cooper says.

The parents set the goals for the use of the cars. Audrina’s goals were independent mobility, increased use of her hands and enjoyment.

“It definitely helped open up her hands and fingers, and to feel stuff,” Kaitlyn says. “Before she would sit with her hands clenched. Having the button and knowing she could touch it to move, there’s been a huge improvement with her hands since we started using the car.”

And, perhaps most importantly, Audrina loves it.

“It gives her freedom,” Kaitlyn says. She lights up when we ask her if she wants to go in her car. She even says ‘car’. She’s definitely more into going than stopping!”



BIOMARKERS

Hearts and minds

Why do people with bipolar disorder have high rates of early heart disease and other problems? The Centre for Youth Bipolar Disorder is searching for clues in proteins found in patients' blood

BY ALLISON DUNFIELD

John remembers the onset of his bipolar disorder clearly. He began to lose interest in all of the sports and activities he once loved, including tennis and badminton, the summer he was 16 years old.

"It got to the point where I stayed in bed all day."

Following that were the manic episodes, like days-long road trips with friends during which "I would do a lot of things I wouldn't normally do, a lot of risky behaviour." When he returned, he would be unable to recall what had happened during the trips.

The highs and lows worsened until they culminated in December 2013 with a suicide attempt. John, then 18, was admitted to acute care at Sunnybrook and was treated by Dr. Benjamin Goldstein, who diagnosed him with bipolar disorder. Dr. Gold-

stein, director of the Centre for Youth Bipolar Disorder at Sunnybrook and an award-winning researcher into the condition, has since enrolled John in a five-year study he is conducting to "learn whether specific markers in the blood can help us better understand, and predict, the course of symptoms among adolescents with bipolar disorder." It may also guide future treatment of young people like John, he says.

Bipolar disorder (BD), which is characterized by repeated episodes of mania and depression, affects 2 to 5 per cent of teens and adults. While risk of suicide in patients is high, the leading cause of death is actually heart disease. The study, funded by the Canadian Institutes of Health Research, will also look at how the biomarkers in the blood and blood vessel functioning might be related to future heart disease in adolescents and adults with the condition.

"The fact is, people with bipolar [disorder] have high rates of heart disease. And they develop this extremely prematurely, 10 to 20 years earlier than expected," says Dr. Goldstein. "The question is, 'Why?' And my career is dedicated to answering that question."

Recent research has shown that those with the disorder experience upsurges or decreases in certain types of proteins in the blood, such as those related to inflammation during bipolar episodes. Dr. Goldstein and his team predict that the spikes or dips in these proteins, along with increased inflammation over many years, can lead to a host of diseases, such as heart disease, obesity and arthritis.

Mapping out the biology of people who are in phases of mania or depression will also allow doctors to predict the course of the illness, he says.

"Right now, we have to wait for fully manifested symptoms to evolve and present themselves. It's a little like saying we're going to figure out heart disease by waiting for you to walk in having a heart attack. We want to preempt that."

To conduct the study, currently in its third year, Dr. Goldstein and his team of researchers will recruit teenagers with bipolar disorder, as well as a comparison group of teenagers without major psychiatric disorders. The testing consists of blood draws and fingertip probe tests. The youth with bipolar disorder

are required to return for tests at regular intervals, both during times of stable mood and times of bipolar episodes, over a period of two years. The blood draw is used to check for levels of specific proteins in the blood (see sidebar).

The fingertip probe test, also called peripheral arterial tonometry, meanwhile, is done via a non-invasive clip placed on the index fingers. It measures the pulse-to-pulse blood volume several minutes before and then after a blood pressure cuff is used to prevent blood flow for five minutes. Dr. Goldstein's team is looking at the extent to which the blood vessels dilate after blood flow is resumed with the cuff. Increased pulse volume in the fingertip reflects dilation, which, in turn, reflects blood vessel function.

"A sluggish or minimal increase in pulse volume is a marker of potential future cardiovascular risk. This blood vessel function is, in part, related to acute circumstances, including mood episodes," says Dr. Goldstein.

It makes sense to study the biology of otherwise healthy teens because as many as two-thirds of patients first develop the condition between the ages of 13 and 19, says Dr. Goldstein. If researchers were able to identify those who have biomarkers in their blood now, it would help physicians guide preventative treatment when the disease is less entrenched.

While the illness has been studied fairly extensively in adults via cross-sectional studies, Dr. Goldstein notes, there are few studies that follow people over time, especially in teens. "There is a real dearth of information on this topic in youth."

Current treatments for teens with bipolar disorder are not preventative, but, rather, treat the symptoms of mania and depression. They include drugs, therapy and lifestyle changes. Drugs include mood stabilizers (such as lithium), anti-convulsants and anti-psychotics, says psychiatrist Dr. Anthony Levitt, chief of the Hurvitz Brain Sciences Program at Sunnybrook.

But psychiatrists have to be extremely careful in selecting medication for those with bipolar disorder, the psychiatrist adds, because most can cause side effects, including weight gain. "If weight goes up significantly, now you are at risk for other kinds of metabolic disturbances, including diabetes, hypoglycemia

and heart disease", he says.

Another key component is cognitive behavioural therapy, Dr. Levitt says. "In youth, if you have bipolar [disorder], you need help dealing with intense emotions."

This has been especially true for John. "It helps, definitely, when you are able to talk to the therapist. You can actually work out what is causing your mood, why you are feeling that way." He is also taking a mood stabilizer and an anti-psychotic, which have worked extremely well. John has been symptom-free for seven months.

Exercise, eating well and getting enough sleep are also crucial to successfully treating bipolar youths, says Dr. Levitt. John, for his part, is now vigilant about regular bedtimes. He does three workouts per week and he's back on the tennis courts.

"Exercise and healthy living are enhancing blood flow to the brains in those with bipolar illness, so we know that can be 'brain-protective' for young people with the disorder," says Dr. Levitt.

Moving forward, the big push is to identify risk factors for the development of the condition. He continues, "If we can accurately identify risk factors, we know who's going to develop it. [It would be helpful to] also recognize some of the vascular dangers of the disorder – we know they exist, but we need to recognize them early – so that people live longer, healthier lives."

Dr. Neal Westreich, who co-heads the hospital's Adolescent Inpatient Psychiatry department, says that, up to this point, doctors are unable to use a blood test to diagnose depression, bipolar disorder or other psychological disorders. He says that the study of biomarkers "could help us make, in a more scientific way, the diagnosis."

But he cautions that doctors likely won't simplify it to the point where "x" biological issue causes bipolar disorder. "I think it's going to be more complicated than that," says Dr. Westreich.

"In many ways, it is no different than any other biological illness. Take diabetes, for example. I would argue that it is a biological, social, psychological illness. It is dependent on lifestyle and compliance and stressors and, of course, biology."

For his part, John is optimistic about his future. He is taking hospitality man-

agement at George Brown College this fall and hopes to become a restaurant or hotel manager. He sees taking part in research, such as Dr. Goldstein's, as critically important – not only for his future, but also for all bipolar teens.

"It would be great for them to have that data that could treat other patients."

Dr. Westreich agrees. "The bottom line is, any research we have in terms of understanding what could prevent the illness, what causes the illness and how we can mitigate it with the least amount of side-effects is welcome, necessary and could change the quality of life of so many people in Canada." 📧

John's name has been changed to protect confidentiality.

ON THE HUNT FOR BIOMARKERS

Dr. Goldstein's team at the Centre for Youth Bipolar Disorder at Sunnybrook will be studying the blood samples of teens with bipolar disorder and healthy teens.

They are looking to see, among other things, whether their blood contains several proteins, including:

- Brain-derived neurotrophic factor (decreases during acute depression or mania), which assists in the growth, maturation and maintenance of nerve cells. It's found in the brain and the blood.
- C-reactive protein (rises during episodes), which is a protein produced by the liver that indicates an increase in inflammation in the body. Higher levels of C-reactive protein can be a biomarker for future disease risk, including heart disease.
- Interleukin-6 (marker of increased inflammation), which is a protein found in blood plasma that is produced during inflammatory phases in the body. It is also released into the bloodstream after a muscle contracts.
- TNF (tumour necrosis factor)-alpha (marker of increased inflammation), which is a protein that appears during an acute phase of inflammation. •



Tiffany Scholl, featured in the magazine a year ago, and with her baby Mars just days after his birth in July.



PHOTOGRAPHY BY TIM FRASER (TIFFANY SCHOLL)

FIFTH ANNIVERSARY

Where are they now?

BY MARLENE HABIB

Sunnybrook Magazine, which celebrates its fifth anniversary with this edition, is only possible because of our inspiring patients and their stories of perseverance and strength.

The magazine has had the privilege of profiling many of these patients over the past five years. To commemorate the anniversary, we're looking back at five of the most dramatic stories we've featured, updating readers on how each patient is doing today – as a testament to the impact they've had on both their own families and the staff at Sunnybrook.

Tiffany Scholl

Fall 2014 issue

Tiffany Scholl has come a long way since going through the darkest time in her life. In June 2013, Tiffany awoke from a coma to learn that her baby girl, Clementine, had died. Just a few days previously the Toronto hairdresser underwent an emergency cesarean at Sunnybrook after she suffered a massive stroke.

Just two years ago, doctors at Sunnybrook, one of Ontario's regional stroke centres, saved her life from a brain hemorrhage that left her unconscious two-thirds of the way into her first pregnancy.

But on July 14 of this year, Tiffany and her husband Mario de Lima became proud parents of a healthy baby boy. At seven pounds, six ounces, Mars Clemente de Lima – named partly in honour of the daughter the couple lost – was born by cesarean section. "He is so cute, and we are having so much fun," Tiffany says. Doctors were especially cautious when Tiffany learned she was expecting again in late 2014, because her stroke was linked to two pregnancy complications: HELLP syndrome,

which causes thinning of the blood, and eclampsia, a life-threatening pregnancy complication that causes some pregnant women to develop seizures and/or fall into a coma.

After the clot caused a hemorrhage within the left side of Tiffany's brain, she, indeed, had a seizure before becoming unconscious. After Tiffany's surgery, she had problems with memory, speaking and comprehension, and right arm and leg paralysis. She spent four months in rehab, including two months at Sunnybrook to relearn walking and talking.

It took a multidisciplinary approach by Sunnybrook, also a leader in post-stroke psychiatric symptoms, to help Tiffany recover and get her back to her outgoing, positive self.

She still has some memory problems and tends to lose her train of thought, and the right side of her body "is 40 per

cent of what a normal body feels." But not long after her recovery, she was going on walks and runs, and back to participating in sports.

"A person who would meet her now would never know she had a stroke ... doctors are amazed at how quickly she recovered," says Mario.

"One of the first questions I had for doctors while I was recovering was, 'How long do I have to wait to have a baby?'" she says.

"I was so close to having a baby – I got to hold her in my arms," she adds about daughter Clementine, who only survived 10 days. "They told me I had to wait about a year and a half" to have another baby, Tiffany says. She became pregnant about a month and a half after getting the medical green light.

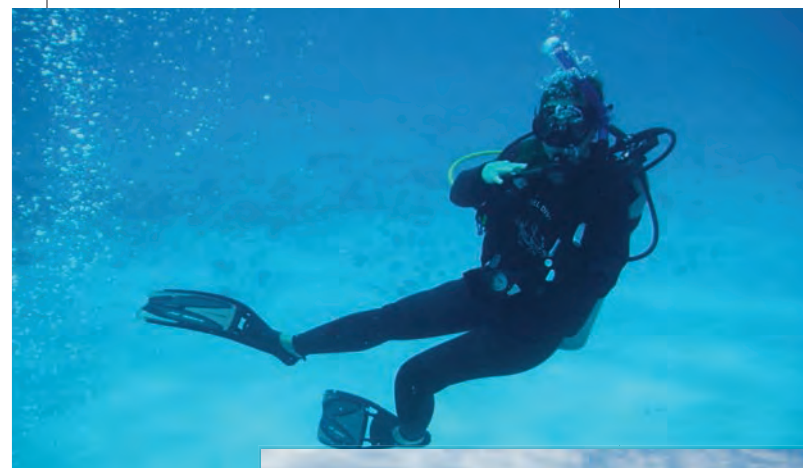
Tiffany is even thinking of going back to school: "Spending six months in the hospitals, I just love the nurses, and I thought becoming one would be so much fun."

below left:

Despite a horrific shark attack, covered in our fall 2012 issue, Nicole Moore has fearlessly returned to the ocean to scuba dive.

below right:

Stan Rosenberger, featured two years ago in the magazine.



Nicole Moore

Fall 2012 issue

Nicole Moore nearly lost her life in a shark attack in Mexico in January 2011, but the nurse, athlete and mother of two has come out

of that near brush with death with a renewed zest for life and a determination to encourage others to persevere through life's challenges.

Nicole became a patient in Sunnybrook's Trauma Unit a week after a shark tore away part of her left leg, and after the same shark, or possibly another, latched on to her left arm while she was vacationing in Cancun.

She underwent surgery in Cancun, but was flown to Toronto and had two lengthy emergency surgeries at Sunnybrook after plastic surgeons

found her wounds were contaminated. The procedures saved her life, but her arm was amputated above the elbow, and she was left with part of her leg missing. She remained in hospital for two months before going to St. John's Rehab, now part of Sunnybrook, to rebuild her life.

Over the next four years, Nicole returned several times to Sunnybrook to undergo reconstructive leg surgeries, the last in February 2015. She hopes to eventually use an arm prosthetic.

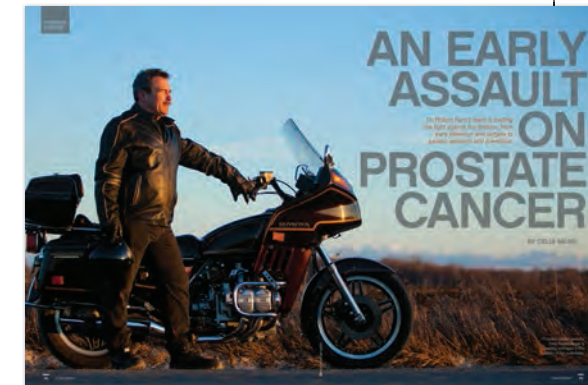
"I'm now more appreciative of life and have more patience, and my children are remarkably sensitive to life and the preciousness of it," says Nicole, now 42. Her daughters are now 10 and 11 years old.

In 2013, Nicole returned to nursing at an Orangeville, Ont., hospital in a supervisory role because of her injuries.

She has also become a professional motivational speaker, and her story is the subject of a new book, due out in October, titled *Shark Assault: An Amazing Story of Survival*, written by Peter Jennings and Nicole Moore and published by Dundurn Press.

Every summer since her recovery, Nicole has been among hundreds of participants tackling the Warrior Dash – a 5.5-kilometre obstacle course that takes participants through wooded lakes, mud-filled back roads and daring heights at an Ontario resort. "I do it for myself and to show people no matter what obstacles are in the way, you can find a way to overcome it," she says.

Not one to let a shark have the last word, Nicole has also returned to scuba diving, maintaining "a deep passion and respect for the ocean and the life within it – a healthy fear, you could say, but respect nonetheless."



Stan Rosenberger

Spring 2013 issue

You could say avid motorcyclist Stan Rosenberger left cancer in the dust after he underwent a seamless prostatectomy at Sunnybrook within days of being diagnosed with prostate cancer at age 48 in mid-2011.

Over the last four years, the Bradford, Ont., resident has taken on a new job, gone on long motorcycle rides with his buddies and purchased a

second “hog” motorcycle. In July 2013, just a few weeks after his story was first profiled in *Sunnybrook Magazine*, Stan went on a five-day hike from Skagway, Ala., back into Canada with his daughter, Alisha, and her husband.

Now 53, Stan has been married three decades to Cathy, a school principal in Vaughan, Ont. They also have a 25-year-old son, Michael.

Thankfully, Stan says, he now has “no health issues.”

Stan was referred by his family physician to Dr. Robert Nam, head of genitourinary cancer care at Sunnybrook’s Odette Cancer Centre, after a random prostate-specific antigen (PSA) test he was given, while his wife was getting blood work at their general practitioner’s office, produced troubling results.

Dr. Nam ordered a biopsy, and Stan was diagnosed with an aggressive form of prostate cancer – even though he had no symptoms and wasn’t feeling ill. He later learned he’s genetically predisposed to prostate cancer, as two uncles on his mother’s side had the disease.

Within days of Stan’s diagnosis, Dr. Nam performed delicate nerve-sparing surgery to remove his prostate and surrounding tissues. “I was really grateful for Dr. Nam’s approach – he did amazing surgery,” Stan says. “He was able to save a lot of the nerves in the prostate, so I could still be sexually active, which is a huge thing.”

About a year and a half after Stan’s prostatectomy, the self-employed heating and air-conditioning contractor sold his business to two of his workers, then took on a job as a fuel safety inspector for the Technical Standards and Safety Authority (TSSA).

Adventure, he says, is still in his blood. He and a group of his motorcycling buddies are planning a special trip in about two years to Europe, where they’ll have motorcycles waiting for them to go on a 10-day riding tour through the Swiss Alps and several countries.

Stan’s advice to other men who may think they’re too macho to have prostate problems? “Everybody’s worried about that proverbial finger in your bum, but get checked, guys, and get the blood [PSA] test.”



below:
Stan Rosenberger with his daughter, Alisha, on vacation.

right:
Myla Mendoza Lopez and her family at Walt Disney World in April 2015, and her story in the magazine in 2013.



Myla Mendoza Lopez

Fall 2013 issue

Myla Mendoza Lopez and her family experienced the trip of a lifetime – to Walt Disney World in Orlando, Fla. – in April 2015, about a month before her twin girls celebrated their second birthdays.

Myla, her husband, Joel, a lab technician, their twins and her 20-year-old daughter Christina from a previous marriage are living life to the fullest – more than two years after Myla survived a brain clot and swelling of the brain, just before her pregnancy due date.

“A week before that [stroke] happened, I saw the ob-gyn and everything was fine, but pre-eclampsia can happen at any time – it can kick in just like that,” Myla, who turned 44 this year, now recalls. “Because of my age, I was high risk, and, secondly, I had a twin pregnancy – so two risk factors.”

Myla went to bed with a headache the night her husband called 911. She was taken to a local hospital, where a doctor did a scan and doubted whether she could recover. She was rushed to Sunnybrook, where Dr. Leo da Costa quickly assem-

bled a 14-member team, including obstetricians, neurologists, anesthesiologists and two teams of three for the twins, to deal with the delicate situation.

Myla first underwent a craniotomy (removal of a piece of the skull) to reduce pressure on her brain, and the obstetrics team then performed a cesarean section. Twins Jamie, weighing just under six pounds, and Samantha, at just under five pounds, were immediately ventilated and sent to the Neonatal Intensive Care Unit (NICU).

It took three days for Myla to wake up from the surgery. Her memory wasn’t affected, and within three weeks she was able to return home, undergoing follow-up skull surgery in November 2013, with little downtime.

In May 2014, about a year after the twins were born, Myla went back to work as an administrative assistant at a Toronto hospital.

“My health is very good,” the Vaughan resident says. “I’ve been taking the kids to swimming lessons every Sunday and I’ve been working out – on my treadmill, doing DVD workouts. I’m back to a normal life.”

Delaney Janhunnen

Fall 2013 issue

Gardening, reading, trying new recipes and catching more of the travel bug are on the to-do list these days of 44-year-old Delaney Janhunnen, a mother of three who has faced breast cancer twice.

At just 36 years old, Delaney was first diagnosed with cancer in her right breast and in her liver. She underwent a mastectomy and had ongoing drug therapy, eliminating the cancer for about two and a half years.

In 2007, Delaney was diagnosed with cancer a second time, this time in the left breast. She learned from a friend about a clinical trial led by Sunnybrook’s Dr. Sunil Verma at the Odette Cancer Centre. The international study tested a new treatment for breast cancer called T-DM1 – a combination of the targeted drug therapy Herceptin with the chemotherapy drug DM1.

The drug worked to kill Delaney’s cancer cells, without harming her normal cells. She experienced minimal side-effects like hair loss and fatigue.

Since Delaney’s participation in the T-DM1 randomized clinical trial, the results have been published in the prestigious *New England Journal of Medicine*, and this hybrid drug therapy has been approved for use with these patients in Canada and the United States.

below:
A happy Janhunnen family portrait, and the story of Jan’s innovative cancer treatment from 2013.

With no detectable cancer today, Delaney still gets a 30-minute infusion of T-DM1 every three weeks at a Kitchener, Ont., hospital.

But most of her time is spent working two days a week as an educational assistant in a junior kindergarten classroom, planning time with her husband of 18 years, Paul, and their children (15, 13 and 10 years old), as well as indulging in her hobbies.

“I’m feeling great, working a bit and running after the kids,” says Delaney. “I don’t cling to the fact that I’ve beaten cancer. I go one day at a time, each day knowing God will direct my future.”

Her advice for others battling cancer: “Consider all your options and look at trials, which was a great option for me. You never know what’s going to come down the pipeline.”





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PROSTATE CANCER

The game-changer

Sunnybrook's Dr. Laurence Klotz started a worldwide debate on how best to treat low-risk prostate cancer – and won it

BY KATIE ROOK

On a good day, Dr. Laurence Klotz hits the club early to play tennis before heading to his office at Sunnybrook. "I feel better if I have some outlet like that," he says. "It's a great thing to be able to play a game and then go to work."

Dr. Klotz, a uro-oncologist and surgeon, has had a lot of good days lately, and, as reflected in the results of numerous studies he's led, so have many of his patients. Outcomes for men with low-risk prostate cancer, who are managed according to an approach Dr. Klotz helped develop, have shown impressive survival rates.

A 2015 *Journal of Clinical Oncology*-published study led by Dr. Klotz followed 993 Canadian men over a

16-year period. It found that among those managed with Active Surveillance with Selective Delayed Intervention, the 15-year prostate cancer survival is 95 per cent, with two-thirds of patients avoiding treatment entirely.

In active surveillance, men who have prostate-specific antigen levels and other factors that characterize their cancer as low-risk can avoid overtreatment by being closely monitored and with the option to intervene with selective and definitive treatment, should risk levels increase over time.

The approach, developed in partnership with radiation oncologists, Dr. Cyril Danjoux and Dr. Richard Choo, was revolutionary. It was not immediately embraced by the medical community

because it challenged the prevailing view that all forms of prostate cancer warrant immediate and aggressive treatment.

"Overdiagnosis is a malady of modern medicine," Dr. Klotz says. "My message to patients is: Just because you're diagnosed with this condition, doesn't necessarily mean your life is at risk. The problem with efforts to detect many diseases early, when they are more curable, is that a lot of patients are found to have conditions that would otherwise not have been diagnosed during their lifetime, and would not have affected them in any way. This is true of many cancers, including breast, thyroid, and kidney cancer, as well as prostate cancer. Some cancers, of course, are life-threatening. The challenge is to differentiate which cancers pose a threat and treat them aggressively, and manage the remainder conservatively, monitoring for evidence of a change in the risk of disease progression. That is the basis for active surveillance."

This concept inspired years of debate in the field of urology, and often resulted in Dr. Klotz in lively panel discussions with colleagues at conferences. Reflecting on what it took to persuade

PHOTOGRAPH BY DOUG NICHOLSON

others of a different way to treat low-risk prostate cancer, Dr. Klotz says he couldn't have anticipated how central the debating skills he honed as an undergraduate member of the University of Toronto's debating club would become.

"For a year, I was president of the debating club. That experience was huge for me. You learn to think on your feet," he says. "It was fortuitous that I ended up in a debate about how to manage prostate cancer. Everything you do in life, in some way, is grist for the mill, in some way helpful."

Eventually, evidence convinced colleagues of the merits of active surveillance, which is now the global standard in the management of localized, well-differentiated, low-risk prostate cancer. Dr. Klotz was named to the Order of Canada in 2014 for establishing that standard.

"A lot of people in medicine make important contributions, but not all are recognized," he says. "I'm a very fortunate guy. I never dreamed that things would work out this way."

Others are less surprised that Dr. Klotz is receiving accolades. Dr. Larry Goldenberg, founding director of the Vancouver Prostate Centre, credits Dr. Klotz with branding Canada as a leading force in the field. "He's a transformative medical thinker. He's given it his all," he says. "When he sees something that is important or is a good idea, he's been able to drive it. Every machine needs a driver, and he's very comfortable getting into the driver's seat."

Dr. Robert Siemens, who leads Queen's University's urology department and is editor-in-chief of the *Canadian Urological Association Journal*, a publication founded by Dr. Klotz, describes his colleague as "a natural and tireless leader."

"When you think of urology across the world, one of the people you think of is Laurie Klotz," Dr. Siemens says. "There has been a frame shift. Active surveillance is now considered the gold standard for low-risk prostate cancer treatment. We have changed our approach."

While the benefits of an active surveillance approach are considerable, Dr. Klotz is quick to emphasize a doctor's role also includes finding those patients in which the cancer has higher potential to spread.

"About one-third of patients who look like they have very slow-growing non-significant cancers actually have cancers that are wolves in sheep's clothing," he says. "The challenge is to find where the wolves are."

Current and future research focuses on the use of MRI and molecular biomarkers to assist in that pursuit, he says.

Dr. Klotz envisions a time where prediction is so accurate that radical intervention for most low-risk prostate cancer patients is no longer considered a reasonable option.

Dr. Klotz credits any success he's had to his willingness to seize opportunities that came along. "There was no overarching game plan. It was a matter of being opportunistic. Each issue presented its own opportunity," he says.



above:
Back in 1984,
Dr. Klotz took part
in the New York
City Marathon.

Born in Toronto, Dr. Klotz knew from an early age that he would follow the example of his grandfather, uncle and father, and go into medicine. The physical component of surgery resonated with him, and that became the focus of his study.

At the time, he says, urology seemed like a neglected specialty in terms of research. He saw an opportunity to make a difference. "I was motivated by the desire to build something academic. The remarkable thing to me was that you could work away, doing research in an area that you're interested in and publishing it," he says.

"It's the magic of publishing; people actually read [the findings]. If you are persistent enough, you develop a relationship with people who are interested in the same area," says Dr. Klotz.

"I have all kinds of research projects going on right now, and I'm enjoying every minute of it."

Dr. Klotz's enthusiasm for academia is balanced by passion for his wife, Ursula, and his two children, Alex and Betsy, and by his love of jazz and sport.

He plays three instruments, including piano in the band he started, and when he's not on the tennis court, he can be found at a hockey rink or skiing. He's also a prodigious reader, having just finished Conrad Black's *Rise to Greatness: The History of Canada from the Vikings to the Present*. Dr. Klotz recently took a sailing trip in Sicily with his wife.

Such an adventurous jaunt is typical of Dr. Klotz, Dr. Siemens jokes. "The legend would appear to be true. He'll run an all-day clinic and then get on a plane to South America."

Dr. Klotz has brought as much energy to his profession as he has to other aspects of his life, Dr. Siemens says.

"He's credited with bringing us together and setting us on a course. Most of us would point to Laurie as being the driver. He's definitely a role model," says Dr. Siemens. ☛

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PHOTOGRAPH BY TIM FRASER

CARDIAC CARE

The age of robotic surgery

Computer-guided automation is becoming the most trusted assistant in the operating room

BY JUNE ROGERS

You may have heard him on the radio or TV as the voice for Leon's furniture. Or you may have seen him in movies such as *Barney's Version* or *Meatballs*. But you may not know Harvey Atkin, actor, comedian, in his most serious role – heart patient at Sunnybrook's Schulich Heart Centre.

He is also one of the first to benefit from the hospital's new, state-of-the-art robotic surgery navigation system to repair his heart.

PHOTOGRAPH BY DOUG NICHOLSON

FROM THE CONTROL BOOTH

Dr. Eugene Crystal, director of Sunnybrook's Schulich Heart Centre's Arrhythmia Services, sits in front of a 42-inch screen, a keyboard, a mouse and a joystick-like control console known as "the puck."

But he's not playing a video game. He's fixing unhealthy hearts.

With these tools, which are part of the newly installed Vdrive™ Stereotaxis robotic heart navigation system, Dr. Crystal is able to perform a procedure that eliminates the erratic heartbeats of his patients who suffer from atrial fibrillation. "Using robotic technology is better than using human hands to perform this surgery. There's greater catheter stability," says Dr. Crystal.

By manipulating two one-tonne magnets in giant pods that wheel into place on either side of his patient on the operating table, he moves a magnet-tipped, flexible, spaghetti noodle-thin catheter – or as many as three – using the magnetic field to the deepest, innermost parts of the heart to administer an ablation using radio-frequency energy at temperatures as high as 50 C. "Magnets are a lot gentler and use less force."

The Vdrive™ offers a variety of improvements over the older mechanical "pull-wire" system:

- The Stereotaxis catheter is thin and flexible.
- The catheter's tip contains three miniscule magnets that respond to a magnetic field created by two pods containing powerful iron-ore magnets on each side of the operating table.

left: Harvey Atkin was one of the first patients to benefit from heart surgery using the robotic navigation system.

2014, as a patient of Dr. Eugene Crystal, director of Sunnybrook's Schulich Heart Centre's Arrhythmia Services, Harvey underwent an operation known as a pulmonary vein isolation. This procedure is made possible with Sunnybrook's recent installation of a device known as a Vdrive™, the latest addition to the Stereotaxis computerized, magnet-guided technology. Sunnybrook is the first hospital to install the robotic navigation system in Canada.

Instead of standing by the operating table and manually guiding the catheter, Dr. Crystal performs the procedure robotically from a control booth. "The Vdrive™ enhances access, reaching the more challenging areas of the heart chambers with greater accuracy during ablation and reduced risks of complications," Dr. Crystal says.

Recovery times are also reduced. Most patients can go home the same or following day.

Ever since his Vdrive™ operation more than a year ago, Harvey has been symptom-free. "It feels great," he says. Before the procedure, he could only manage to walk up one flight of stairs. "Now I get a little winded three-quarters of the way up the CN Tower," he says, joking.

Harvey can't say enough about the treatment he received at Sunnybrook. "Dr. Crystal and the team is the best I've ever known. They are all very caring and conscientious." While he is hopeful his AF is under control, he says that there's always a possibility it could come back. "If it does, I know where to go to get it fixed." 📧



- The flexibility and the robotic nature of the catheter make it much less likely to damage heart tissue.
- The electrophysiologist can move up to three catheters into place from the safety of a control booth, instead of standing by the patient's bedside and being exposed to radiation.
- The amount of radiation required is reduced by more than half.
- Patients can usually go home the same or following day. •



KIDNEY CARE CENTRE

A gold standard of kidney care

One grateful mother can testify to the quality of Sunnybrook's nephrology care. An all-new facility promises more successes in research and treatment

BY CATALINA MARGULIS

"She's perfect."

Those are the words all parents long to hear at the birth of their child, but they were particularly poignant for Racquel Abalos and her husband, Randy.

Racquel was just 27 when she was diagnosed with nephropathy, or kidney disease. When she became pregnant, her doctor at an area hospital immediately referred her to Dr. Michelle Hladunewich, head of Sunnybrook's nephrology and obstetrical medicine divisions. Dr. Hladunewich's PreKiD Clinic provides care to young women with kidney disease or hypertension who are planning a pregnancy, require follow-up during pregnancy or who need immediate postpartum care.

To improve Racquel's chances of a healthy pregnancy and successful birth, Dr. Hladunewich recommended she start treatment. "She told me I would have to go on dialysis," recalls Racquel.

"Frequent and longer dialysis sessions dramatically improve pregnancy outcomes," says Dr. Hladunewich, who

recently led a major study that showed intensive dialysis treatment in pregnant women with kidney failure leads to a higher proportion of live births than standard dialysis care. "This study provides hope to young women on dialysis who might want to consider having a family," says Dr. Hladunewich.

During her pregnancy, Racquel underwent dialysis for six hours a day, six days a week, with one day of rest before commencing again. There was also a risk the baby could be born with health issues – the medications that Racquel was taking are harmful to babies.

Dr. Hladunewich notes that pregnancy is often impossible in young women with advanced kidney disease because fertility declines as kidney disease progresses. "In the few women who are able to conceive while on dialysis, pregnancy is typically very complicated and can be dangerous for both mother and baby."

According to Dr. Hladunewich, since 2000 there have only been 22 babies born in the Greater Toronto Area to

women on dialysis. Medical complications associated with kidney disease mean that pregnancies in dialysis patients are uncommon. Typically, a pregnant woman on dialysis requires meticulous care by a dedicated health-care team, including nephrology, obstetrics and a full multidisciplinary staff. Team members are available around the clock to provide care during the pregnancy, which is considered to be high-risk.

Under the expert guidance of Dr. Hladunewich, and with the help of the team at Sunnybrook, Racquel, who has since had a kidney transplant, gave birth to Gabrielle Ivy in September 2012.

"Gabrielle means 'God is my strength,'" she says. "I had the best care possible," says Racquel. "Dr. Michelle and the home dialysis team, especially my nurse Raquel [Bersamira], cared for me 24-7. Dr. Michelle even checked in on me on weekends."

"We have very good success stories," says Dr. Hladunewich. "In pregnancy and kidney disease, women who've been told they can't have a baby or safely get through a pregnancy, that's something we're quite world-renowned for – managing pregnant women on dialysis."

Dr. Hladunewich's internationally renowned pregnancy clinic is just one example of the unique kidney care clinics and experts available at Sunnybrook. Dr. Alireza Zahirieh's HIV renal disease clinic offers care for patients with HIV infection and works in conjunction with a large HIV infectious disease clinic. Dr. David Naimark focuses on progressive diabetic kidney disease, while Dr. Sheldon Tobe is a world expert in hypertension. His hypertension clinic improves the lives of people with or at risk of developing kidney disease by focusing on the diagnosis and control of high blood pressure, a common cause of kidney disease.

Beyond offering expert care, these clinics also play an important role in the practice-changing research carried out by the nephrology division – a link that helps discoveries reach patients faster. The clinics are also education hubs, where doctors train the kidney care specialists of tomorrow.

"Sunnybrook's an academic centre. Each of us

left:
Racquel Abalos (centre), pictured with husband, Randy, and Dr. Michelle Hladunewich, gave birth to baby Gabrielle after being carefully managed through a pregnancy on dialysis.

contributes in our own particular areas. There are not that many centres in the country with the kind of expertise put together here," says Dr. Tobe. "All the nephrologists in our centre are either highly productive researchers or educators, or both. A lot of our focus is on training the next generation," he says.

"Because nephrology doesn't have that many treatments, research is badly needed in terms of figuring out why people develop kidney disease and how you delay or – better yet – reverse the process. The fact that we have people involved in that makes Sunnybrook a leader," says Dr. Zahirieh.

That leadership will be all the more productive with Sunnybrook's new Kidney Care Centre, set to open this fall. The new centre promises modern, spacious facilities to help the doctors and their teams carry out their work and move forward with their research.

"Once you have space, there's the opportunity to be innovative," says Dr. Hladunewich. "We'll have the opportunity to expand and build on our existing research programs, [and] state-of-the-art facilities to teach the next generation will be critical, as well."

No doubt patients will also appreciate the new space. And if it helps practitioners enhance their already-esteemed care, all the better. "I don't think you could have a better team. We really have a collaborative environment," says Dr. Hladunewich. "We've always been ahead of our time. We've always been innovative. We're a very creative team. I think that's good for patients." ■

"ONCE YOU HAVE SPACE, THERE'S THE OPPORTUNITY TO BE INNOVATIVE."

- Dr. Michelle Hladunewich on Sunnybrook's new Kidney Care Centre

THE NEW KIDNEY CARE CENTRE

This fall, Sunnybrook hopes to cut the ribbon on a new 28,000-square-foot Kidney Care Centre, which will be located adjacent to the Bayview campus. The centre promises state-of-the-art facilities to provide dialysis for research and training, and a wider array of treatments for people with chronic kidney disease.

"We're all looking forward to the move. We're going to have a much bigger, better clinic space," says Dr. Sheldon Tobe, who has a

hypertension clinic at Sunnybrook.

In addition to 24 bright and spacious hemodialysis stations, there will also be space for education and research, aiding Sunnybrook's clinician-researchers in their quest to improve the prevention and treatment of kidney disease.

The new centre will also improve their ability to teach the next generation of kidney care experts by providing leading-edge facilities that complement the skills of the clinician-educators and teachers.

The project also includes renovating and updating the hemodialysis unit at Sunnybrook, used for patients with more acute needs who

may require immediate access to the full range of hospital services.

"Dialysis is not an easy journey – it's for four hours, three to four times a week. [Now] their families can be here with them," says Dr. Hladunewich.

Although construction is already under way, fundraising efforts continue to meet the costs of the new centre.

"Sunnybrook is poised to transform the services it provides to kidney patients and to truly become a global centre of excellence. We can only achieve this with financial support from the community," says Dr. Hladunewich. •

PHOTOGRAPH BY DOUG NICHOLSON



Linda Conn, co-ordinator of Fresh Start, says the program's success stems from its holistic approach to care.

PSYCHIATRY

A fresh start for at-risk teens

A day program helps adolescents with psychological issues transition back into high school

BY AUGUSTA DWYER

While adolescence can be tough for many teens, it has been unusually challenging for Hannah. Like other young people who are dealing with mental health difficulties, the now 18-year-old has often felt frustrated and alone, and has missed a lot of school.

She has had attention deficit hyperactivity disorder ever since childhood, she says, "but when I was 13, I was diagnosed with depression, and I already had anxiety. It was a combination of things." Her feelings of anxiety were such, she adds, that it was impossible for her to leave her home. As a result, she ended up losing out on a year and a half of high school.

In November 2013, however, Hannah began attending Sunnybrook's Fresh Start program, and her life began to change. "I had felt isolated through the whole of my teenage years, until I went there," she says.

Together with the Toronto District School Board (TDSB), Sunnybrook's Division of Youth Psychiatry has been running the intensive day-treatment program for almost three decades, transitioning troubled teens back to school.

The name Fresh Start was actually thought up by students who participated in the program, says Linda Conn, who has been its co-ordinator for the past 12 years. "These were kids who were not sick enough to be in hospital, but not well enough to be in either a traditional or even an alternative school," she explains.

Like Hannah, they are young people in recovery from mental health or addiction issues, who need a safe learning environment without the typical academic pressures of school, she adds. Rather, "the focus would be on therapy, and really helping them develop the skills to begin to assimilate and transition into school with more traditional classrooms."

With courses lasting anywhere from two to three months, class sizes are small – no more than eight students at a time. Taught by a qualified TDSB teacher and a child and youth counsel-

lor, the Fresh Start classes take place in a portable classroom on the grounds of Sunnybrook's Bayview campus.

Because participants may range in age from 14 to 19 years and are in different grades, the atmosphere is somewhat akin to an old-fashioned one-room schoolhouse, and the academic material is tailored to each student.

"The teacher is able to individualize all of the programs," Conn explains, "so that each student can earn the high-school credit commensurate with their grade."

The program's focus, however, is less on academic progress than it is on therapeutic recovery. Its focus is "on the process," says Conn, "and not the product."

By taking the stress off of academic advancement, she adds, the program's six-member team gets a better handle on how the kids are doing, "on what is getting in the way of them being able to focus, to concentrate and interact with other students," she says.

While mornings are spent on in-class projects that highlight critical and lateral thinking, afternoons are devoted to group therapy sessions. Facilitated by a team, including the youth and child counsellor, social workers and a psychiatrist, the themes range from life and social skills to creative expression, and health and well-being. Once a week, each teen meets with the program's consulting psychiatrist, Dr. David Kreindler.

The intimate class size made her feel comfortable, says Hannah, while the

emphasis on using projects to assess learning skills, measure goals and track progress gave her the kind of structure she needed. "It pushes you at a certain point, and each week you have to set a new goal," she says.

Her participation in Fresh Start made it clear, she adds, "that it's my life, and that I have a say. That is one of the main things that they do there. They say, 'This is about you. This is your life, these are your choices and this is your treatment. This isn't about anyone else.'"

While returning to high school was still challenging, she felt that the program had laid the foundation for making the transition. What's more, she says, "they help you get set up after you leave. They don't leave you in the wind."

At the same time, she adds, "they don't want us to always have to rely on them. They want us to, finally, by the end of it, be able to say, 'You know what? I'm going to be okay.'"

Today Hannah attends regular classes at an alternative school, has made new friends and is attaining A's. "I didn't know I could get amazing grades before I went to my new school," she says, "but for me to be able to do that, I had to have been able to go to Fresh Start."

For Conn, what is behind the success of Fresh Start – aside from the great team of people she co-ordinates at Sunnybrook – is the innovative program's holistic approach.

"We look at all the needs of the students," she says. "Not just their mental health needs, but their learning needs. It is just really good wraparound care."

"THEY SAY, 'THIS IS ABOUT YOU. THIS IS YOUR LIFE, THESE ARE YOUR CHOICES AND THIS IS YOUR TREATMENT. THIS ISN'T ABOUT ANYONE ELSE.'"

- Hannah, Fresh Start participant



Losing memories to Alzheimer's is devastating enough.
Now imagine losing your future.

GIVING BACK

Passing moments

Donors like Ernie Loch are helping make renovations possible for Sunnybrook's Palliative Care Unit

BY CATALINA MARGULIS

Penelope Loch was just 68 years old when she finally succumbed to cancer. What started as lung cancer had spread to other parts of her body by the time she was admitted to palliative care at Sunnybrook two and a half years ago.

"She was in the cancer care ward at Sunnybrook. We had talked about her going into palliative care, and she didn't want to go, so I made arrangements so she could be at home – caregivers, hospital bed, oxygen, all the details," recalls her husband, Ernie Loch.

"I was all ready for her to come home when I got a call from the cancer care clinic that she had been transferred to palliative care. I went over there and her first words were, 'What a marvellous place this is,'" says Ernie, who remembers the view she enjoyed – Penny had a room that looked out on to the courtyard – and how she thought the people were "so nice."

As it turned out, Penny was in Palliative Care for about 14 weeks. "For the first six weeks or so, despite the fact she knew she was going to die, she was as happy as I had seen her in a long, long time," says Ernie. "That six weeks was a real bonus that none of us were expecting; it gave us a chance to enjoy some very good time together."

On Christmas Eve as the family was visiting, Penny took a turn for the worse. "That's when I decided the least that I could do was donate what would have been the cost of having her at home to palliative care, because of what they had done for her, giving her those six weeks that were so enjoyable for all of us," says Ernie, a self-employed entrepreneur.

"One of the reasons she was as happy as she was, was the care the staff and the nurses gave to her; it was just outstanding. They were very supportive, very helpful."

After Penny died, Ernie donated \$50,000 to palliative care at Sunnybrook. Today, a recognition plaque in Penny's memory hangs outside the room she stayed in.

Since Penny's death, the Palliative Care Unit has experienced a revival of sorts, making plans for physical improvements to the centre. "Our goal is to create a premier palliative care unit that will significantly change the end-of-life experience for our patients and their families," says Sandra De Costa, Patient Care Manager at Sunnybrook's Palliative Care Unit.

"The Palliative Care Unit at

Sunnybrook opened in 1989 with eight beds; over time and to meet the growing need, we have gradually increased the number of beds to 56. The unit was originally designed for general complex continuing care, not specifically palliative care. We recognize our physical environment needs to be enhanced to best meet the needs of our patients and families," says De Costa.

Plans for the space include a room where loved ones can gather to celebrate birthdays, anniversaries and cultural rituals, as well as a redesigned kitchen and dining area to allow families to enjoy their meals together at a dining table. Single rooms and additional sleeping accommodation will be added for family members to stay overnight, and an office space will be available for those who need to work remotely.

The renovations are only possible because of donations from the community, De Costa explains, as this type of renovation is not traditionally covered by government. The project was launched with a gift of \$1.2-million from McDermott House Canada. While funding for the first phase of the renovations is almost complete, fundraising continues for the next two phases.

Thanks to the support of donors like Ernie and McDermott House Canada, the centre will continue to offer those with a terminal illness a comforting, home-like environment where families can spend quality time with their loved ones. 🍀

PHOTOGRAPH BY MICHELLE SUI



The prospect of Alzheimer's is terrifying for Sadie. She's 28 years old. Her dad was just 57 when it took his life, putting her risk at an unnerving 50%. Sunnybrook's Brain Repair Group aims to develop treatments that will help restore and preserve critical cognitive functions in cases of familial Alzheimer's and other dementias. Learn more about Sunnybrook's Hurvitz Brain Sciences Program: sunnybrook.ca/brain

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DECONSTRUCTING CONCUSSION

The effects of concussion can linger after a head injury, sometimes for an extended period of time. Headaches, trouble concentrating, forgetfulness, unusual tiredness and trouble with balance are common symptoms.

In some cases, a premature return to work or other activity can worsen these symptoms and make them last longer.

"Unfortunately, doctors are often left to do a lot of guesswork as to when an individual is best fit to return to regular activity, as there currently is no good objective indicator of readiness to return to an activity, whether it be work, a professional sport or recreational [in nature]," says Dr. Leodante da Costa, a neurosurgeon at Sunnybrook.

Dr. da Costa and his research team wanted to find a solution to the lack of objective criteria to assess patients with brain injuries. They are using a unique technique for precisely measuring the brain's vascular response to the stimulus of carbon dioxide (CO₂) during MRI scans.

"The technique is similar to breathing in a paper bag, but the inhaled and exhaled gases are precisely measured," says Dr. da Costa. "It's a breathing challenge that acts as a stress test for the brain."

In the study, a precise amount of CO₂ is given through a breathing mask while the patient is still in the MRI. The CO₂ causes an increase in the size of healthy vessels, and a specialized imaging technique known as a BOLD sequence is taken to measure the changes in oxygen inside the vessels. If the vessels don't react to CO₂, the brain could still be recovering from trauma.

The researchers hope to develop an imaging marker of recovery for concussion that doctors can use to more objectively measure when it is safe for patients to become active again.

Dr. da Costa's team was the only Canadian group to receive funding for their study from the GE-NFL Head Health Challenge.



GETTING A BETTER HANDLE ON SUPERBUGS

Forewarned is forearmed. That's why Sunnybrook researchers are helping to more frequently survey and assess the presence of superbugs, or antibiotic-resistant organisms, in Canadian hospitals. Their goal is to better inform infection prevention and control programs, and to stem the tide of antibiotic resistance, which has been declared a major threat by the Public Health Agency of Canada and the World Health Organization.

Dr. Andrew Simor, chief of Sunnybrook's Microbiology Department, and the Division of Infectious Diseases, and his team are measuring the impact of antibiotic resistance and demonstrating to the medical community that careful use of antibiotics is critical to patient health.

Dr. Simor led the first national survey of prevalence rates in more than 176 acute-care hospitals. The 2013 report provided a much-needed baseline and more detailed national picture of rates of superbugs like MRSA (methicillin-resistant *Staphylococcus aureus*) and VRE (vancomycin-resistant *enterococci*) and the related CDI (*Clostridium difficile* infection).

His follow-up survey published in 2015 found that on any given day, at least one in 11 patients across the country carries or is infected with an antibiotic-resistant organism. The report identified a number of important infection prevention and control practices that were associated with lower antibiotic-resistance rates.

This study was the first to provide national prevalence results for multidrug-resistant superbugs in Canada.

"The more we know on a timely basis about what's happening in hospitals across the country, the more equipped we are to stop antibiotic-resistant bugs from growing and spreading," says Dr. Simor. •

NEW TERRAIN FOR TAVI

Sunnybrook is breaking new ground on the minimally invasive transcatheter aortic valve implantation (TAVI) procedure for an entirely new group of patients deemed too high risk for open-heart surgery.

Sunnybrook pioneered the use of the TAVI procedure to repair the aortic valve of patients who are too frail to withstand open-heart surgery. It involves loading a collapsible replacement valve into a catheter and sending it through an artery up the leg and through to the aortic valve. Here, the new valve sits inside the damaged one and takes over the job of regulating blood flow.

Recently, Sunnybrook experts were among the first in Canada to implant TAVI valves, made from artificial material and designed for the aorta, inside one patient's failing artificial mitral valve and inside another patient's artificial tricuspid valve.

These are patients whose own valves failed years ago and who had surgery to implant replacement tissue valves. But these tissue replacement valves have a limited life span, says cardiovascular surgeon, Dr. Gideon Cohen. They become calcified and degenerate over time, typically lasting up to about 10 years.

"What's different about this new procedure is the use of TAVI technology to replace valves other than the aortic valve," says Dr. Cohen, who performed the new procedure with cardiologists Dr. Sam Radhakrishnan and Dr. Harindra Wijeyesundera. "This is much less risky, it's a much quicker recovery and you get the same result as surgery."

All TAVI procedures at Sunnybrook were once funded entirely through the generosity of donors. Convinced of its efficacy after Sunnybrook experts saved more than 150 lives with TAVI, the procedure is now funded by the provincial government. •

SLEEP AWAY THOSE TOXINS

Cleanses are all the rage, but how about detoxing your brain? A Sunnybrook research team has a simple fix: good-quality sleep.

"Sleep may play an important role in clearing waste and toxins in the brain that may contribute to the development of brain diseases," says Dr. Mark Boulos, a stroke and sleep neurologist in the Hurvitz Brain Sciences Program at Sunnybrook.

Unlike other organs in the body, the brain doesn't have a dedicated lymphatic waste removal system. Instead, researchers believe it uses fluid-filled channels that surround the brain's blood vessels to drain toxins and waste products away.

The Sunnybrook research team looked at MRI brain scans and overnight sleep studies from 26 patients who were being evaluated for stroke or a suspected cerebrovascular event. Using MRI brain scans, researchers could see that those with poor-quality sleep, or "choppy" sleep with frequent waking, had more enlarged channels around their brain's blood vessels than those with healthy sleep patterns. Researchers believe that could be a result of a buildup of toxins.

Dr. Boulos says the research could potentially provide a novel treatment option for patients living with the effects of stroke or other brain diseases.

Should you worry about the occasional night of bad sleep? "If you have a sleep problem, see your doctor about improving your quality of sleep," says Dr. Boulos. "Don't just attribute poor sleep to your age or an underlying health condition. It's good to have it checked out because, over the years, it could have implications for your overall health."

That's advice to sleep on. •

DOGS WITH JOBS

Therapist on four legs

BY MONICA MATYS



Breed: Portuguese Water Dog
Birthplace: Calgary
Heritage: parents were accomplished show dogs
Beauty routine: bath every two days and professional dental cleaning annually
Bragging rights: has her own frequent flyer card

Ivy swaggers onto the Sunnybrook campus accompanied by therapy dog volunteers to treat patients with her own form of medicine three times per week. As a member of Therapeutic Paws of Canada, this eight-year-old Portuguese Water Dog (or portie, as her breed is affectionately called) knows her job well. She makes people happy during some of their most difficult moments.

Ivy has touched the lives of hundreds of patients and residents during the two years she's been at Sunnybrook. Her vast portfolio has her making the rounds in the Palliative Care Unit, in-patient psychiatry and the Veterans Centre.

And as Ivy moves from patient to patient, she'll either intuitively discern what they need or remember from a previous visit. Sometimes, it's just a quiet moment of physical connection. Other patients prefer one of her many tricks, like a double high-five or rolling over.

Therapy dogs have been shown to reduce blood pressure, fatigue, pain and even feelings of stress and anxiety. Her owner, Sarah Alexis, is a strong believer in the power of therapy dogs and the unconditional love they bring to every patient

interaction. Sarah Alexis's parents, Nick and Carol, take turns volunteering their time to bring Ivy in for her Sunnybrook shifts.

Becoming a certified therapy dog requires a great temperament and the ability to be sociable with strangers. Ivy grew up in a perfect training ground: a house full of children. She easily passed further formalized testing that evaluated her reactions to the stimuli of the hospital environment.

Porties are also perfect for the health-care setting because they are hypoallergenic. Ivy's thick coat is actually hair, not fur, so she doesn't shed. Knowing this, it's fitting that her favourite reward for performing all those tricks is a fish treat. A diet rich in omega-3s – along with her favourite oatmeal shampoo – keep Ivy's black coat shiny, soft and ready to cocoon a hand in need.

Ivy is a four-legged antidote to the medical realities many patients face. And while she cannot cure, she can definitely be there when it matters most. 🐾

PHOTOGRAPH BY DOUG NICHOLSON

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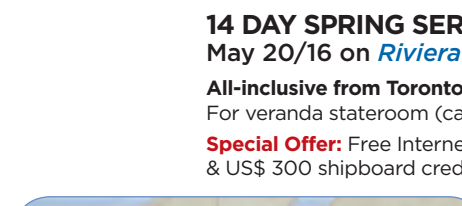
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