

Heart-health trailblazer

How the Peter Munk Cardiac Centre Innovation Fund is improving patient outcomes, one project at a time

BY SHELLEY WHITE

It's a busy Tuesday morning at Toronto's Peter Munk Cardiac Centre (PMCC). ¶ A middle-aged male patient is guided slowly into the rounded opening of a CT scanner in the Joint Department of Medical Imaging (JDMI), while technicians on the other side of the glass study glowing images of the chest cavity on monitors. Nurses closely monitor the progress of the hospital's most acutely ill patients in the Coronary Intensive Care Unit (CICU), while family members anxiously wait on couches located around the corner to see their loved ones. A group of medical residents and international fellows, along with a staff doctor, cluster in the hallway of the Cardiovascular Intensive Care Unit (CVICU), discussing the care of an elderly patient who had open heart surgery the day before.

In the operating room (OR) down the hall, it's that critical time after a bypass operation, when surgeons must determine whether or not a patient will require a blood transfusion.

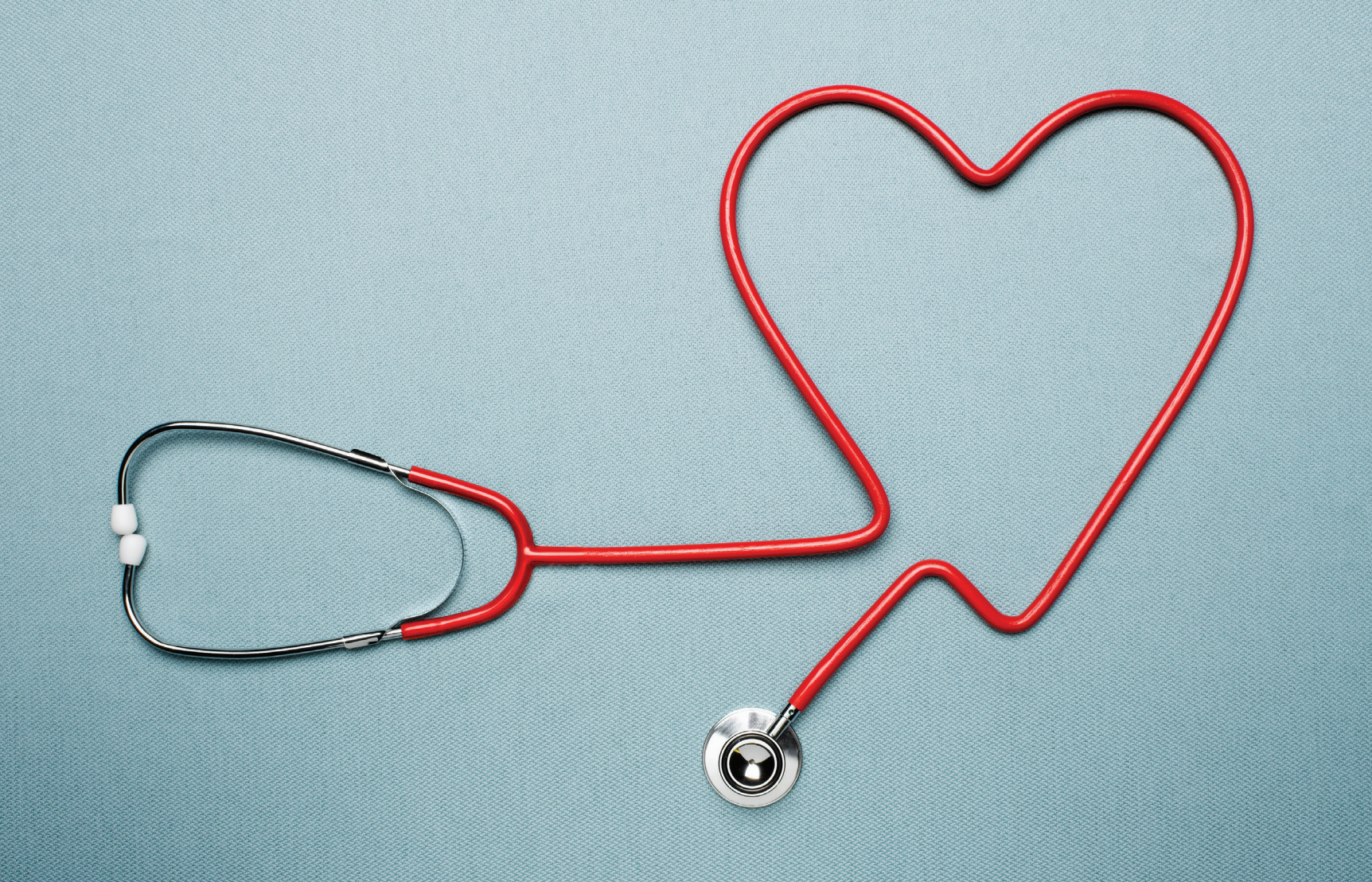
It can be tricky thing to predict. Traditionally, doctors had to make that determination by eyeballing the situation, and if a patient looked "wet" (that is, still bleeding), he or she would be given blood. But today, the OR team is utilizing a leading-edge testing process that is saving blood, saving money and improving patient outcomes. It's just one of the pioneering innovations that have been generated through the PMCC's trailblazing Innovation Fund.

The blood-conservation project was conceived three years ago by Dr. Keyvan Karkouti, Deputy-Anesthesiologist-in-Chief at Toronto General Hospital. It works in a two-part approach: First, during heart surgery, a nurse takes a sample of the patient's blood and tests it in a machine (in a down-the-hall lab) that immediately indicates how well the blood is coagulating. Second, surgeons pack sponges around the heart and then weigh the sponges after exactly five minutes. If the sponges weigh more than 60 grams, the coagulation tests dictate if a patient needs blood. No guesswork required.

Since adopting the blood-conservation project, "our red blood cell transfusions have dropped by about 20 per cent, our plasma transfusions have dropped by 60 per cent and platelets by about 40 per cent," says Dr. Karkouti. (It's also saved the hospital more than \$1-million this year.) "But, more importantly, it's changing how we manage bleeding patients, with improvement in patient outcomes."

Dr. Karkouti says kidney damage has been reduced, as well as the need for re-exploration after surgery. "Before the program, 7 per cent of patients would finish surgery, go to the [Intensive Care Unit] and then either start bleeding or continue to bleed and would have to come back to the OR. That's dropped in half, from 7 to 3 per cent," he says.

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Dr. Barry Rubin (left) and Dr. Harry Rakowski (right) are the architects of the Peter Munk Cardiac Centre's unique and successful Innovation Fund, a vehicle for staff to submit and test innovative ideas.

The Innovation Fund provided the \$150,000 needed to pilot the blood-conservation project at the PMCC, and Dr. Karkouti says that funding was essential to make the project a reality. "It not only made it fast, [but] it also made it possible," he says.

"Within a year, we had a permanent new program, and that's unheard of," says Dr. Karkouti. In addition, the pilot project's positive results helped Dr. Karkouti get a Canadian Institutes of Health Research (CIHR) grant to run a multicentre study of the blood-conservation project in 12 hospitals across Canada. It's only been three years from the pilot project's inception, and results of the larger study are almost finalized.

"Based on my experience, similar projects would normally take at least five to 10 years to get through," says Dr. Karkouti. "If the multicentre results are positive, it's going to change practice across North America by next year."

It's the kind of success story for which the Innovation Fund was created.

A Dragons' Den approach

When the PMCC's Medical Director,

of doing that. But the questions are: "How do you bring those ideas forward? And how do we vet those ideas?"

Generous donors had supplied \$5-million to get the program off the ground. Dr. Rubin and Dr. Rakowski decided that the new Innovation Fund would be open to all 1,000 people working at the PMCC, from cardiac surgeons to physiotherapists. Unlike typical granting bodies that require pages of detailed proposals, applicants would only need to answer 10 questions about their project, with submissions accepted quarterly. That makes the Innovation Fund nimble and able to rapidly support evaluation of new ideas and medical devices, says Dr. Rubin. The fund would also change the way proposals are typically assessed in a hospital.

"Rather than [vetting ideas] in the traditional way – a physician and an executive sit down and make the decision – we would make the process more broad-based, with both physicians and non-physicians on a committee that reflect diverse interests and skill sets," says Dr. Rakowski.

The Innovation Committee is currently made up of 14 people,

including physicians, surgeons, scientists, a nurse practitioner, a psychologist, administrators, entrepreneurs and real estate developers. Everybody gets an equal vote – thumbs-up or thumbs-down.

"Usually, I try to pair a medical person and a business person to evaluate proposals, so that somebody can always explain the science, and the other can look at it from a business point of view," says Dr. Rakowski. "Does the idea make sense? Can they achieve what they want to achieve with the funds they will have? Is it sustainable, so they can likely get more funding for a larger-scale study that will impact care? And, from a personal patient perspective, is this just a good idea?"

Because of the mix of medical and business committee members, the Innovation Committee had been dubbed "the *Dragons' Den* of health care." Jordan Dermer, co-founder and managing partner at Capital Developments, a Toronto-based real estate development firm, is one of the business leaders on the Innovation Committee, and he says there is some truth to the comparison.

"The debates are healthy, but, unlike *Dragons' Den*, we're not trying to make money on their ideas," says Mr. Dermer. "It's interesting when you get two doctors debating on two different sides of an issue, and it gets a little hot in the kitchen. But, in the end, we all walk away smiling, and there are no hard feelings."

Another unique part of the program is that, while most funding bodies reject unsuccessful applicants without so much as an explanation, the PMCC Innovation Fund gives constructive input, both before and after the submission process.

"If you submit something, and we think you could do it better, cheaper, whatever, we're going to give you that constructive input," says Dr. Rakowski. "We'll let you resubmit or put you in touch with people who can make it better."

Since the Innovation Fund program started three years ago, they've awarded \$1-million per year to a total of 31 recipients, with approximately 80 per cent of applications being funded, in comparison with the 15% funding rate for projects submitted to the Canadian Institutes of Health Research. For example, the Transcatheter Aortic Valve Implantation (TAVI) procedure – a non-invasive surgical technique that can be performed while the patient is awake – has become a viable way to replace failing valves for patients who are too unwell for open heart surgery. Other successes include iHeartChange.org, a website for young



people with congenital heart disease who are transitioning to adult cardiac care, and an antioxidant cocktail made up of beta carotene, ascorbic acid and red apple skin that prevents radiation damage during X-rays.

One requirement of the Innovation Fund process is that projects must be submitted to the Ontario Health Technology Assessment Committee (OHTAC), which decides if new treatments are safe and effective. If OHTAC supports the use of a new device or drug, the Ministry of Health will usually provide funding.

It's another example of how the Innovation Fund helps to get leading-edge devices and drugs into the system, says Dr. Rakowski. For example, the OHTAC has given the PMCC about \$2-million to fund the valves and stents used during the TAVI procedure.

One of the Innovation Fund's latest successes has to do with what many believe is the next frontier in treating cardiovascular disease – regenerative medicine.

Hits and misses

Can stem cells really repair a broken heart?

That's the question Dr. Terence Yau was looking to answer when he proposed his next-generation stem cell therapy project to the Peter Munk Cardiac Centre Innovation Committee. As a cardiovascular surgeon at the PMCC, Dr. Yau had come up with a new way to utilize a patient's own stem cells to improve the patient's heart function after bypass surgery. And it could happen right in the operating room.

With this therapy, stem cells are harvested from the bone marrow

of a patient's hip bone the morning of the operation. While the patient is undergoing heart bypass surgery, the cells are taken to a lab right in the operating room and put through a process to isolate "a very particular kind of stem cell that's good at improving blood flow and heart function," says Dr. Yau.

"During heart bypass surgery, and before we take the patient off the bypass machine, we inject the stem cells directly into the heart," he says, to strengthen areas that have been damaged by a heart attack.

After receiving \$90,000 from the Innovation Fund, a pilot study was conducted with 20 patients at the PMCC and 20 more at Maisonneuve-Rosemont Hospital in Montreal. The procedure was found to be safe and feasible, says Dr. Yau, but did it improve heart function?

"In some of the outcomes assessing how well the heart squeezes, the improvement is so dramatic, to the point where even I said, 'Really?'" says Dr. Yau. "We will be doing more studies to confirm that, but it's a surprisingly positive result."

While results like this show just how beneficial the Innovation Fund can be, failure can sometimes be equally important, points out Dr. Rakowski.

An early example of an Innovation Fund project that failed was a renal denervation procedure, where you "burn the nerve around the artery to the kidney for people with severe high blood pressure," says Dr. Rakowski.

"Of everything we funded, this was the no-brainer. We knew it was going to work," he says. "And it didn't. That is what's so interesting about innovation. If you go in with a preconceived idea,

you're often going to be surprised."

In addition to being a successful applicant, Dr. Yau is also a member of the Innovation Committee (members can pitch ideas themselves, but have to excuse themselves from the decision-making for their own projects). Despite the fact that the renal denervation procedure didn't work, Dr. Yau says he's glad the committee funded it, "because, frankly, otherwise we wouldn't have known."

"If you're batting a thousand, then you're probably not funding a lot of stuff that you should have funded," says Dr. Yau. "If you only go for the short bets, you'll miss out on a lot of opportunities."

Funding the future

The unique approach of the Innovation Committee has drawn interest from the wider medical community, says Dr. Rakowski, and he's been approached by organizations who are hoping to create an innovation fund of their own.

"We are in the process of writing up our experience for a scientific publication as a potential model for others to emulate," he says.

When it comes to funding, Dr. Rakowski says he hopes the Innovation Fund will be around for the long haul. With an 80-20 success rate, they are proving their ability to recognize true innovation and help bring it to fruition.

"We'd like to have three to five years of sustainable funding," says Dr. Rakowski. "And I think the success we've had so far is important for donors because they like to see there is benefit for the money they give," he says.

"If you look at that bang--the-buck concept, I think we've done pretty well."

Operating room nurse Sarah Lo (pictured in red cap) prepares a catheter that is used by a multidisciplinary surgical team (right) to repair an abdominal aortic aneurysm.

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