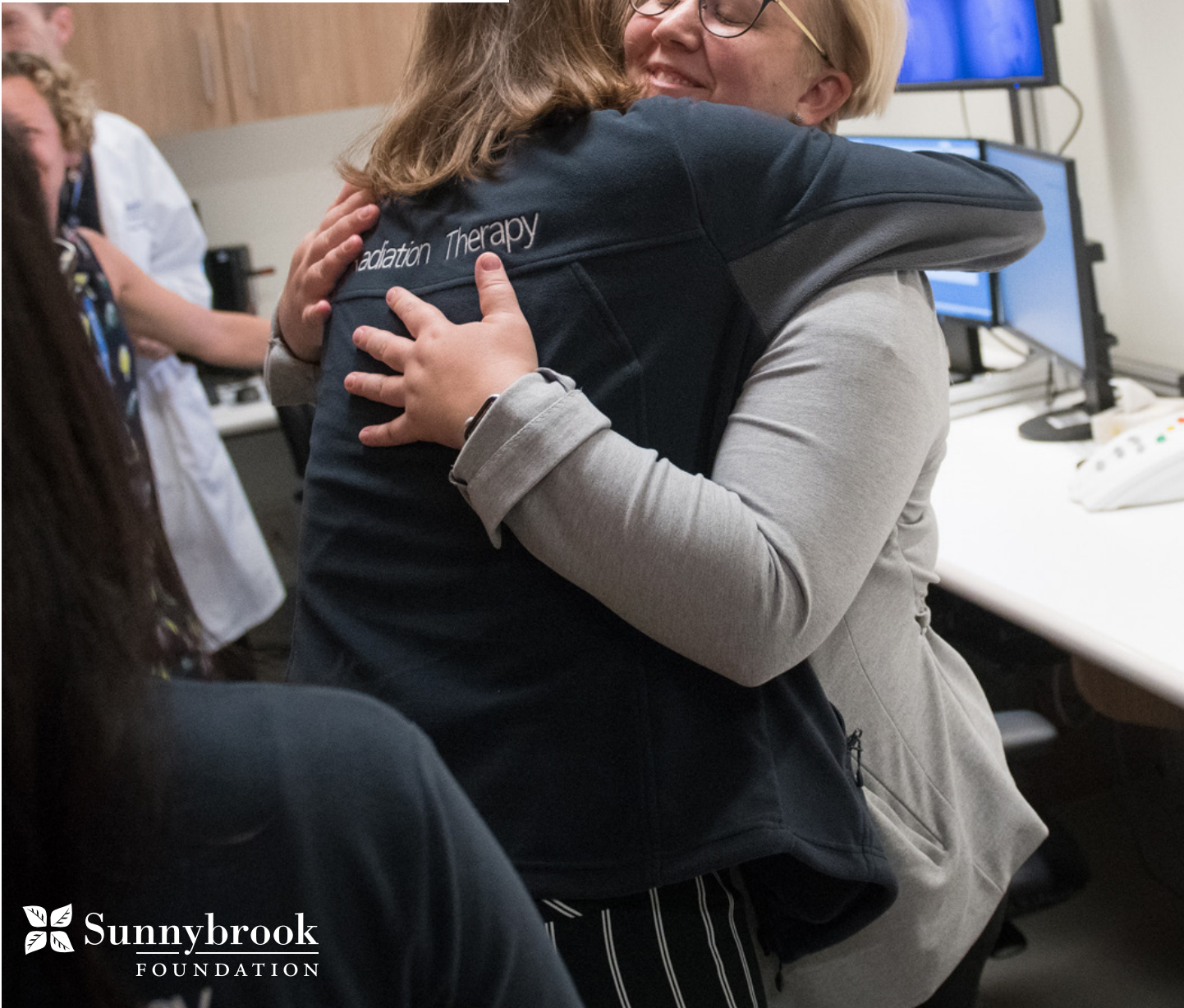


# OUR PROGRESS



Thanks to the support of our generous donors, our dedicated staff and researchers in the Odette Cancer Program are striving to bring to our patients and their loved ones the most personalized, precise and minimally invasive ways to treat cancer. Together, we are transforming cancer care.

Thanks to you



**“I have faith in Dr. Sahgal and Sunnybrook. If anyone is going to help me, it’s going to be him.”**

Salem, who was diagnosed with metastatic breast cancer that spread to her brain, is undergoing state-of-the-art treatment with the Gamma Knife Icon at the Odette Cancer Centre.

In 2018-19:

**258,000**

cancer outpatient visits

**175,000**

radiation therapy visits

**36,000**

chemotherapy visits

**1,200**

staff members and trainees



## Donor impact: Revolutionary treatment is vastly improving Salem's quality of life

Cancer touches more families than any other disease in Canada. Salem knows it all too well.

Three generations of her family have experienced multiple forms of the disease.

"Cancer to me is just like the flu," she says. "Whether I get it now, or when I am 75, my attitude has always been the same: it's going to come."

Salem was in her early teens when her maternal grandmother Evelyn died of breast cancer. It then showed up in her mother, Helen, who had a malignant tumour removed from her breast on her 50th birthday. After 15 years in remission, Helen was diagnosed with lung cancer. She passed away in December of 2015.

**Less than one month after her mother's death, Salem was diagnosed with stage 4 metastatic breast cancer. At best Salem was told she would have five years to live.**

From that point on, Salem knew she wanted to treat the disease in the least invasive way possible. When her cancer spread to her brain, it became apparent there was one place best suited for Salem's care: Sunnybrook. That's where she met Dr. Arjun Sahgal, one of the world's leading experts in the field of high precision non-surgical radiation therapy on brain tumours. Dr. Sahgal is a radiation oncologist and the director of the Cancer Ablation Therapy



Salem and Dr. Arjun Sahgal, director of the Cancer Ablation Therapy Program, discuss her treatment.

Program at Sunnybrook's Odette Cancer Centre. He's also the person Salem credits with drastically improving the quality of her life.

Salem knew that the standard treatment for people with metastatic brain tumours has been radiation of the entire brain. While whole brain radiation helps control tumours, it can also damage healthy tissue and harm a patient's quality of life by damaging memory and other cognitive functioning. She knew she wanted to pursue another option.

Dr. Sahgal told Salem about a form of radiation therapy at Sunnybrook: the first of its kind in Canada and the least invasive. The Gamma Knife Icon can target with pinpoint precision

dozens of tumours in the brain in one treatment, delivering low-dose radiation while sparing healthy tissue. Because it is frameless, the Icon does not need to be fixed into the patient's head. That means no incision is made.

Salem has already had several lesions treated by the Icon. Her cancer is aggressive, which means Dr. Sahgal and his team must monitor for new or recurrent lesions. However, with the Icon, treating them doesn't interrupt Salem's life as much as conventional treatments might have.

At the start of her journey, Salem was told people with her condition have about a one in five chance of surviving five years. 2020 marks the fifth year since she first heard that.

## MR-Linac: Delivering greater precision and hope

Thanks to the generous support of donors, Sunnybrook had a very productive year in the Cancer Ablation Therapy Program. With your help, we are leveraging the power of three innovative technologies with the promise to destroy tumours faster, with fewer side effects and without the need for invasive surgery.

### **In August 2019, Sunnybrook's radiation oncologists treated the first patient in Canada on the new MR-Linac.**

Incredibly, physicians watched in real time while the beam of radiation targeted a glioblastoma, the most common type of malignant brain tumour among adults. Seeing the radiation at work means we can direct – or redirect – the beam with

unprecedented precision. In the months since August, we have brought this technology to 61 patients with brain cancer.

### **In November 2019, our MR-Linac team treated its first patient with prostate cancer.**

Sunnybrook radiation oncologist and specialist in prostate and breast cancer, Dr. Danny Vesprini, said it was like his eyes had been opened.

“We are already very precise with prostate radiation on a regular linear accelerator,” he said.

“But now, this imaging allows us to really see what we are doing; we are planning the treatment based on what we see each day, and by doing that, we can decrease the radiation to the

surrounding tissue.”

The MR-Linac's technology gives our team the ability to target prostate tumours and monitor their response to radiation with unprecedented precision – even as a tumour moves inside the body – thanks to the machine's real-time MRI guidance.

Because the bladder and rectum fill differently during each treatment, this can move the prostate around, so the treatment target area has to take into account that movement. By taking the daily position of the organs into account and adjusting the radiation in real-time if the bladder or rectum fill, the team can ensure exceptional precision and spare healthy tissue.

For prostate patients enrolled in this trial called PRISM, their radiation



treatment will be planned following an MRI at the time of treatment. Typically, treatment is pre-planned based on CT images and performed based on that plan.

Since November, seven more patients with prostate cancer have been treated using this approach.

In Canada, the MR-Linac is Health Canada approved but still under evaluation, meaning that all patients treated on it are part of clinical trials. The first trials involve patients with brain tumours, to be followed by patients with prostate and pancreatic cancers, says Dr. Arjun Sahgal.

“The challenge will be to prove that treating with [this] technology is better than our current standard of care,” he says.

We are especially proud to have been instrumental in the development and implementation of this technology.

We are a founding member of the Elekta MR-Linac consortium and the first Canadian centre to install an MR-Linac.

Also, Sunnybrook is one of seven centres worldwide involved in the MOMENTUM (Multiple Outcome Evaluation of Radiotherapy Using the MR-Linac) clinical trial, which will lead to procedures for adapting a patient’s radiation treatment to changes in the tumour that may occur over time. 83 Sunnybrook patients have agreed to participate in the trial.

Patients enrolled in MOMENTUM will be asked if they are willing to share de-identified information about treatment experience, including their MR images and quality-of-life information.

Through MOMENTUM, we will

collect and contribute to data that will help researchers and oncologists here and around the world develop the best ways of ablating tumours using this technology. This kind of work is vitally important for improving patient outcomes and experience.

Data from a patient experience questionnaire revealed that half of patients (50 per cent) report being very comfortable in the treatment position. A majority (84 per cent) report not feeling claustrophobic during the treatment session, and at least 76 per cent of patients felt very calm as well.

Thus far, we have completed more than 80 hours of imaging, and counting, including investigation of novel MRI sequences. We will also continue to serve as an invaluable source of expertise and teaching for cancer ablation specialists across the country.

Thanks to generous donor support of the MR-Linac, we’ve been able to make these incredible advances for patients.

### MRI-Brachytherapy Suite

In addition to the MR-Linac, Sunnybrook is home to the world’s only real-time MRI-Brachytherapy Suite, where radiation oncologists deliver tiny radioactive seeds into cancerous tissue and strike them with higher and better-targeted radiation doses. The procedure is drastically cutting treatment times for women and men with prostate, gynaecological and breast cancers – from as long as 10 hours to just two-and-a-half.

We’re now working to adopt a new gynaecological brachytherapy procedure with the MRI-Brachytherapy Suite as a standard of

care for patients, while also expanding the use of the brachytherapy suite to treat two new types of cancer: hepatobiliary (liver, gallbladder) and esophageal.

### Gamma Knife Icon

Our third Cancer Ablation Program technology is the Gamma Knife Icon. This first-in-Canada technology has the means to target and destroy multiple tumours in a patient’s brain in one treatment and with an unprecedented degree of patient comfort, all while sparing healthy brain tissue.

We’re now actively using the Gamma Knife to treat as many as 30 tumours at one time. Because the treatment is shorter and more efficient, we can treat more patients – up to 500 a year.

Dr. Sahgal recently shared the story of caring for a 78-year-old man with melanoma skin cancer that had spread to his lungs and brain. We used the Icon to treat Andrew’s brain metastases. A month later, the tumours were gone.

**“These technologies are going to allow people to have their treatments faster and improve quality of life. More importantly, for those who can’t be treated today, it will define how we’re going to treat them tomorrow.”**

*- Dr. Arjun Sahgal, Director, Cancer Ablation Therapy Program*

## Seeing the MR-Linac treat the first patient: “I was speechless”

The moment the first patient was treated on the MR-Linac was one of personal and professional pride for Mikki Campbell, a radiation therapist and manager of strategic initiatives at Sunnybrook who has been involved in the MR-Linac project since it started in 2013. It was also bittersweet.

“I really wanted to call my dad and tell him, ‘Dad, we did it,’” Mikki says.

Mikki was just seven years old when her 32-year-old father, Ronnie, was diagnosed with glioblastoma on Canada Day weekend. With no MRI at their hospital in Sudbury, Mikki’s parents flew back and forth to Ottawa for imaging tests.

Following one such trip to Ottawa, Mikki’s parents explained that her father would need radiation treatments to treat his brain tumour.

“When my dad realized he was coming close to the end, it was really hard for him to go in for radiation,” Mikki recalls. “But he had an outstanding radiation therapist who he’d tell me about.”

Mikki’s dad died just a few months after his diagnosis, in November 1992. Though she was still a child, Mikki decided then she’d become a radiation therapist, a job she thought “would be neat to help patients and families get through a really challenging time.”

As Mikki embarked on her career, she met Dr. Arjun Sahgal, who was joining a global group to develop new



Mikki Campbell, radiation therapist and manager of strategic initiatives, stands in front of the MR-Linac.

radiation technology.

**“As Dr. Sahgal explained the [MR-Linac] to me, I got excited by the opportunity. It really fit with what I thought of as my purpose – to improve the care for these patients and their families,” Mikki says. “It was easy for me to jump on board.”**

Since then, Dr. Sahgal, Mikki and a talented team at Sunnybrook have been involved in the MR-Linac’s development every step of the way.

Mikki says she’s excited for the MR-Linac’s precision therapy to one day become available to more patients and families. She’ll never forget the day she witnessed the first patient receive treatment. “From seeing my parents fly hours away to get an MRI,

to having one built right into the radiation-treatment device – it was overwhelming,” she says.

“I was speechless. I had to step out for a moment and call my mom. We shed some tears together.”

When Mikki went home that night, she sat down with her sons, who are aged nine and 11. “I told them what their mom did that day at work, and what that means for people in Canada and around the world,” Mikki says.

“My eldest said, ‘Mom, you did this for Grandpa Ronnie.’ And I did. We did.”



# Providing culturally supportive care for Indigenous patients



In his role as an Indigenous patient navigator, Leonard Benoit supports Indigenous patients through their cancer journey.

First Nations, Inuit and Métis people in Ontario are disproportionately affected by cancer. But they sometimes don't get the care they need because of challenges ranging from a lack of basic health services, to limited and culturally inappropriate care, to geographic barriers. With help from our donors, Sunnybrook is introducing a number of activities and workshops to help raise staff awareness about Indigenous health and create a culturally safe care experience hospital-wide:

## At a glance: 2019 activities

- In February, a Sunnybrook working group met for the first time to develop a policy on smudging, an important

Indigenous spiritual and healing practice that involves the burning of sacred medicines like sage, cedar or tobacco.

- In March, an Indigenous elder opened the inaugural meeting of Sunnybrook's Indigenous Community Advisory Panel, a group of 26 Indigenous and non-Indigenous staff and community leaders committed to guiding the hospital's Indigenous care efforts going forward.
- Sunnybrook's Indigenous patient navigation specialist Leonard Benoit led a workshop on smudging and its importance as a healing practice in June.
- Also in June, 40 people attended a workshop on Indigenous relationships, culture and reconciliation. The workshop featured storytelling, honour drawing, traditional drumming and singing, cedar tea and bannock, and an Indigenous art project.
- Originally developed for Inuit female survivors of family violence in Nunavut, the December workshop, "Healing Through Art: A Community Wall-Hanging" asked, "What does wellness mean to you?" Approximately 30 drop-in participants were provided with stencils and artistic materials representing internal strengths and asked to decorate a felt square for the wall-hanging.

## Improving cancer screening for Indigenous

Dr. Jill Tinmouth wants to slow the rise of cancer among Indigenous peoples by increasing participation in cancer screening. A scientist in the Odette Cancer Research Program at Sunnybrook Research Institute and the lead scientist for Cancer Care Ontario's (CCO's) Colon Cancer Check program, she has partnered with Alethea Kewayosh, director of CCO's Indigenous Cancer Control Unit and researchers from across the province to improve communication and reverse negative associations with colorectal, breast and ovarian cancer screening and care.

## **New cases of colorectal cancer among Indigenous peoples in Ontario are at least 10 per cent higher than that of other Ontarians, and almost 10 per cent more Métis women are overdue for their tests.**

The team was awarded a five year, \$1.5-million Canadian Institutes of Health Research grant in 2019 to conduct an assessment of CCO's current practices as they relate to Indigenous culture, a review of the program's communication and develop recommendations to help participants make informed decisions around screening.

# Focused ultrasound: revolutionizing cancer treatment with sound waves



Dr. Nir Lipsman (pictured right) attends to a patient as they undergo FUS treatment. He and his research team have achieved a Canadian first, treating the first patient with breast cancer that has spread to the brain with focused ultrasound and Herceptin.

Sunnybrook is spearheading global advancements in focused ultrasound, a non-invasive, image-guided surgical technology that uses ultrasound energy to target specific areas of the body. Scalpel-free and ultra-precise, focused ultrasound has the potential to revolutionize the treatment of a wide variety of conditions, including cancer, Alzheimer's disease and depression. Thanks to the generous support of donors, we are conducting world-first research to test its safety and efficacy in order to bring this life-saving technology to more patients as soon as possible.

## Enhancing drug delivery

In a landmark clinical trial, Sunnybrook researchers are exploring

the use of focused ultrasound to open the blood-brain barrier (BBB) and enhance the delivery of chemotherapy drug Herceptin to HER2+ breast cancer that has spread to the brain.

HER2+ breast cancer is a form of the disease that tests positive for a protein called human epidermal growth factor receptor 2 (HER2). This protein promotes the growth of cancer cells and is present in approximately one of every five breast cancer cases. Patients in this trial have HER2+ breast cancer that is also metastatic, meaning it has spread beyond the breast. There is currently no treatment that can completely cure metastatic breast cancer.

In phase one of this trial, Dr. Nir

Lipsman and his team want to ensure that the BBB closes after it is opened in these patients, and that there are not adverse effects of opening it up.

The BBB is a physical barrier that protects the brain. It's invisible to the naked eye and is made up of cells that work together to prevent toxins from entering. While this is a good thing – preventing dangerous toxins from reaching our brains – it can also stop medications like chemotherapy from reaching tumours, where they are needed most.

To perform focused ultrasound, our team uses a helmet-like device, containing over 1,000 individual transducers (that convert electrical energy into sound energy), to



converge ultrasound waves onto discrete points in the brain.

In doing this, we can temporarily open the BBB to allow the passage of chemotherapy to regions surrounding the tumour. Patients in this trial will wear this special helmet and go inside an MRI that helps target the specific area of the brain where focused ultrasound is directed to temporarily open the BBB.

Our trial participants will then be given Herceptin, a chemotherapy drug that is used to treat both early stage and metastatic breast cancer.

**Dr. Lipsman and his team are theorizing that by opening the BBB, we can better deliver Herceptin straight to the tumour.**

Participants will receive MRIs after 24 hours, one month and three months, to see if there was any affect on tumour growth, as well as other cognitive functioning tests to see how the treatments are being tolerated.

For the first phase of the trial, patients are undergoing a single focused ultrasound BBB opening session with Herceptin. However, Dr. Lipsman hopes to expand this to up to six treatments as soon as possible.

### **Destroying debilitating complications of cancer**

One of the most debilitating conditions a patient with cancer can face is the development of bone metastases or “mets,” which occur when cancer cells from the primary tumour migrate to the bone. Sharp, constant pain often spreads throughout the body as a result.

Sometimes, mets can literally break bones.

**With the novel use of low-intensity focused ultrasound, awarding-winning Sunnybrook Research Institute scientist Dr. Meaghan O’Reilly is investigating how to destroy bone mets in the most minimally invasive way possible.**

Dr. O’Reilly theorizes that selectively destroying the blood supply in bone tumours will be an effective means of shrinking tumours.

Although the study has been slowed by unforeseen delays due to the COVID-19 crisis, progress is now underway to begin the first important step: examining the effect of focused ultrasound and microbubbles on normal bone and bone tumours in a preclinical setting. Microbubbles are harmless particles of gas, smaller than a blood cell, which are injected into the bloodstream and paired with focused ultrasound. As microbubbles are known to vibrate in response to focused ultrasound to open the blood-brain barrier for a short time, Dr. O’Reilly will see if they can similarly interrupt blood supply to bone tumours.

To evaluate this aim, Dr. O’Reilly is collaborating with scientists at Robarts Research Institute in London, Ontario, who have developed a novel method to scan the vasculature in bone. The scans offer three-dimensional images of blood vessel networks, which will allow her team to measure how blood vessels respond to focused ultrasound. Different parameters will then be tested to see which is most effective in shutting down blood supply to tumours, while

sparing normal tissue. Dr. O’Reilly will also use computer simulations and experiments in bone samples to predict how particular bone density speeds up or slows down ultrasound waves, and then adjust the firing time of ultrasound beams to counteract these changes. Dr. O’Reilly’s team will also endeavour to develop new ultrasound devices, configured for deeper penetration of the focused ultrasound beams.

Finally, Dr. O’Reilly will seek the help of a patient advocate with cancer to ensure that patients have a meaningful voice in the process.

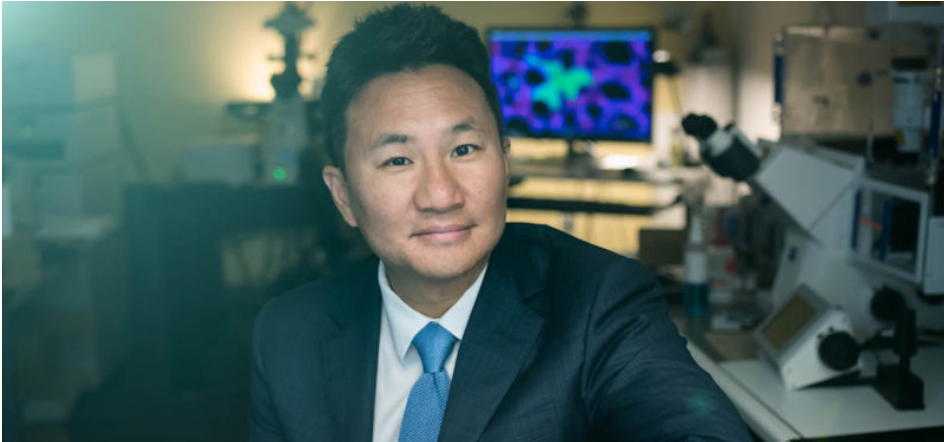
“They can let us know if there are aspects of the treatment that could be improved in the context of the patient experience,” says Dr. O’Reilly. “Having that perspective is so important.”



**“With cancer, it’s not just about finding a cure – we’re looking for treatments to help manage the disease, too. Cancer shouldn’t own people’s lives.**

*- Dr. Meaghan O’Reilly, scientist, Sunnybrook Research Institute*

# Improving prostate cancer diagnosis and treatment



Dr. Hon Leong, urology scientist in Sunnybrook's Odette Cancer Research Program.

The generosity of donors has led to exciting developments that will help us detect prostate cancer earlier and more accurately.

Thanks to donor support, Sunnybrook's medical experts are finding ways to ensure that men and their doctors can make the best, most personalized treatment decisions.

## Transforming prostate cancer detection

Dr. Hon Leong, a leading urology scientist in the Odette Cancer Research Program, wants to transform how prostate cancer is detected and diagnosed at Sunnybrook and beyond.

He and his team have been developing and fine-tuning a groundbreaking blood test, also known as a "liquid biopsy."

"When a tumour dies or grows,

fragments are constantly being shed into the blood stream like a cat or dog shedding its hair all over a living room. We developed technology to count these fragments in the blood," he says.

"Looking for cancer cell fragments is a better method than looking for travelling cancer cells, which are very difficult to catch or find. Travelling cancer cells find a place to form a new cancer as fast as possible and their presence in the blood is only temporary."

By counting the fragments from a simple blood sample, the researchers are able to determine who has prostate cancer and even whose cancer is aggressive and whose is low-risk.

Dr. Leong is teaming up with Sunnybrook imaging researchers to come up with an even more accurate

way of determining whose cancer is high-risk and requires treatment.

**"I call it 'two-step authentication.' The blood test and an MRI of the prostate work together to determine who is most at-risk and needs a biopsy," explains Dr. Leong.**

**"There would be no delay in this process. The patient gets both tests and there is minimal anxiety felt by the patient. There's no waiting game - the part that patients always hated."**

Currently, men who have a rising prostate-specific antigen (a protein produced by cancerous tissue in the prostate) or a suspicious finding on a digital rectal exam are typically referred straight to biopsy, but there is often a delay of days to weeks.

"And what we know is that very often, those biopsies are negative for cancer," he says. "We'd like to reduce the number of unnecessary biopsies, which are costly, painful and have long-term side effects. It ends up being a regretful and negative experience for many men; we want to prevent that."

Some men receive a prostate MRI, and the findings are given a score from one to five.

Those who score three or higher are typically referred for a biopsy. More than half of those who score three are found not to have cancer.

"By pairing the MRI together with the liquid biopsy, the urologist could say,

‘I see this man scores a three on MRI, but his liquid biopsy shows very few fragments. So I won’t refer him for biopsy at this time,’ says Dr. Leong. ‘The patient gets spared the burden of biopsy and is just watched carefully by their family doctor.’

Clinical trials for this approach are underway in collaboration with imaging scientists, radiologists, and other experts at Sunnybrook and the Ontario Institute for Cancer Research.

Dr. Leong is also looking to find an easier and more accurate way to determine who is at risk of prostate cancer by working on developing an at-home test.

In the SMART biopsy method, men whose at-home test show signs of prostate cancer would then be referred to their family doctor to initiate the next step – the two-step authentication test, which would be the ‘liquid biopsy’ blood test and an MRI.

‘The moonshot of this program is that within several years, the current screening methods for prostate cancer will be obsolete in favour of this new SMART biopsy method,’ Dr. Leong says.

‘This could help more men avoid prostate surgery and instead undergo active surveillance if they know the cancer is low risk.’

### Understanding prostate cancer biology

Dr. Robert Nam, head of Sunnybrook’s

Genitourinary Cancer Care Group, is leading research to unravel the genetic clues behind prostate cancer – the genetic markers that show who is more likely to get the disease and which forms of prostate cancer are likely to behave more aggressively.

Working together with Sunnybrook Research Institute senior scientist Dr. Arun Seth, Dr. Nam has made significant strides in understanding the effect of microRNA (miRNA) genetic molecules on the growth and spread of prostate cancer cells.

After discovering five miRNA biomarkers linked to prostate cancer, they have focused on mapping the biologic function of each to determine what role they play in the cell cycle, and their significance as a marker of a tumour’s aggressiveness.

Armed with this knowledge, Dr. Nam explains, health-care providers will be better able to interpret diagnostic test results in order to make personalized treatment decisions for individual patients. To date, Drs. Nam and Seth have completed a map of three miRNA biomarkers, including, miR-139, which they showed to be a powerful predictor of cancer recurrence. A research paper on the topic was submitted for publication last year.

They’re now turning their attention to the interactions between the three mapped biomarkers. The final, defining step will be to validate their findings by testing the biomarker panel on patients to see if it can, in fact, predict tumour behaviour.

**‘None of this work would be possible without donor support,’ says Dr. Nam.**

**‘Our funders have made a substantial investment in advancing the world of prostate cancer care and I’m grateful for that.’**

### Sunnybrook Prostate Cancer Program:



**6,880**

patients treated in 2019

**18,149**

patient visits in 2019



# Preventing life-altering side effects of cancer treatments

**“Since we have a critical mass of experts doing important research in different realms, we can work together to answer a unique question.”**

*- Dr. Tony Eskander,  
head and neck oncologist, adjunct scientist*



Head and neck cancer is expected to affect approximately 833,000 people worldwide in 2020.

For most patients, treatment comes with long-term side effects. Whether through surgery, chemotherapy or radiotherapy, patients may experience significant changes to the way they eat, talk, hear, breathe or even to their outward appearance. The degree of severity may vary, but any impediment to critical functioning can give rise to cognitive deficits, depression and other emotional and social limitations for patients and their loved ones. Of these debilitating side effects, so many patients tell us they just “learn to live with it.”

Not content for patients to live this way, Dr. Tony Eskander, head and neck oncologist and adjunct scientist at the Institute for Clinical Evaluative Studies, is determined to improve patient outcomes.

## Reducing risk of hearing loss

Dr. Eskander and otologist Dr. Trung Le are working to decrease the

prevalence of hearing loss caused by chemotherapy. Up to 70 per cent of patients who undergo chemotherapy will experience this debilitating side effect. They have developed a multi-institutional clinical trial to test the efficacy of a special antioxidant, called N-AcetylCystine. Preliminary evidence suggests injecting this antioxidant directly into the middle ear can substantially reduce the risk of hearing loss from high-dose chemotherapy. The antioxidant is injected 30 minutes before a chemotherapy session.

Dr. Eskander is grateful for Sunnybrook’s unique multidisciplinary environment. “Since we have a critical mass of experts doing important research in different realms, we can work together to answer a unique question that impacts both the ear and head and neck cancer outcomes,” says Dr. Eskander.

## Improving HPV-related cancer treatment

Oropharyngeal cancer (cancers of the throat, tonsils or base of tongue)

has become the most common head and neck cancer. Up to 80 per cent of these cancers are related to human papillomavirus (HPV), a virus that most people will be exposed to in their lifetime. The number of cases that present each year is rising exponentially. The good news is that this cancer is very sensitive to radiation and surgery. However, the side effects of treatment can affect quality life, with dry mouth, difficulty swallowing, eating and more.

Dr. Eskander is exploring how to decrease side effects while maintaining the same high cure rates. He’s spearheading a trial involving two groups: one which will receive surgery and very little (if any) radiation; and another group who will receive low-dose radiation and chemotherapy.

“The normal dose of radiation is 70 grays,” explains Dr. Eskander. “By lowering the dose to 50, or even just 60 grays, the decrease in side effects for patients is substantial.” Trial recruitment is underway.

# Revitalization project kicks off



A mock-up of the new Patient and Family Supportive Care Centre.

Thanks to generous donor support, phase one of our \$15-million revitalization of the Odette Cancer Centre is ready to begin. With two distinct phases to minimize disruption to patient care, this ambitious project will ensure our world-class centre continues to run as efficiently as possible and is not stretched beyond its capacity. We are tremendously grateful to our community for making this project possible.

## Phase one: revitalized radiation reception area

Since 2016, radiation therapy patient visits have increased by 54 per cent to 185,000 annually. The revitalized radiation reception area will be an open, accessible and welcoming space for patients and their loved ones.

Although the launch of this project has been delayed due to COVID-19, renovations of this space are scheduled to begin in the fall and will include a centralized radiation reception desk, a comfortable and inviting radiation

waiting area with automatic check-in kiosks to reduce wait times, and a more accessible nursing station to help patients receive care for acute medical issues more efficiently.

## Phase two: enhanced Patient and Family Supportive Care Centre

Now that phase one is underway, we are fundraising for phase two: expansion of our Patient and Family Supportive Care Centre to 5,500 square feet. This much-needed additional space will include a larger waiting room to accommodate mobility issues, a satellite library, improved counselling spaces, a group room to be used by community partners to hold classes and to accommodate group counselling sessions, a larger wig salon, a kitchenette for volunteers to prepare refreshments for patients; a physical therapy room, and a clinical nutrition exam room for assessing and teaching patients.

## Palliative care key to improving quality of life for patients with blood cancer

A recent study lead by haematologist Dr. Matthew Cheung, shows that early palliative care involvement for patients with blood cancer nearing the end of life may significantly increase their time spent at home with loved ones.

Palliative care is specialized medical care focused on providing an extra layer of support to improve quality of life for both the patient and their family.

Dr. Cheung's study, published in *Leukemia & Lymphoma* this January, used administrative databases in Ontario between 2005 and 2013 to determine the number of days patients with blood cancer spent at home in the last six months of life. The study uncovered that patients with haematologic malignancies were more likely to experience their end of life in the hospital than patients with solid organ cancers.

However, Dr. Cheung also found that patients with blood cancer saw the greatest impact from palliative care to increase their days at home – perhaps due in part to more advanced planning and explicit discussions about goals of care.

# Leading world-first breast cancer research to personalize treatment



From left: Drs. Kasia Jerzak and William Tran are leading groundbreaking research to personalize care.

The Louise Temerty Breast Cancer Centre is a hub of innovative research and unparalleled patient care. Here are some of the highlights achieved in partnership with our donors.

## Inventing the future of breast cancer care

Last year, we reported that two emerging leaders at Sunnybrook were embarking on research to tailor breast cancer treatment based on new discoveries using radiogenomics. Drs. William Tran and Kasia Jerzak have sped full-steam ahead in the past year to combine radiomics, the use of high-resolution imaging, genomics and liquid biopsies to confirm the biological character of breast tumours.

Tumour cells and their blood supply are irregular in ways that are apparent under imaging and cell analysis. Combining information about their

characteristics from various assays can create a highly detailed and objective portrait of tumours.

With the help of oncologist Dr. Sonal Gandhi, Dr. Jerzak and Dr. Tran have identified 800 patients who they can study retrospectively. They are taking the vast sum of information generated and using artificial intelligence (AI) software developed in Dr. Tran's laboratory to create predictive models for tumour treatment. The sum of this data will allow Sunnybrook to determine who will respond to standard treatment and who has an aggressive tumour that may benefit from a more tailored approach.

Traditionally, a pathologist will manually study a tissue sample and report certain clinical variables that may predict if a patient's cancer will respond to treatment or not. However, based on Dr. Tran and Dr. Jerzak's

investigation of predictive modelling, the predictive accuracy of traditional clinical biomarkers is just 55 to 60 per cent. This has only strengthened their resolve to improve the process. Dr. Tran explains: "Our catchphrase is always: how can we do better?"

The team is now extracting novel imaging biomarkers, identifying tumour cells at the microscopic level and using AI to extract features and compare them with patients whose tumours do and don't respond to treatment optimally.

"We need to understand what the risk factors are for these patients right from the get-go. And we need to move them into personalized care as soon as possible," explains Dr. Tran. "This is one of the ways to expedite the process and get them into the clinic maybe in a few days instead of a few weeks."

The team has also used AI to develop a computational staining method with the potential to vastly improve diagnostic efficiency and accuracy. Pathologists currently manually stain their slides (highlight the important features of tissue). But with the help of breast pathologist Dr. Fang-I Lu, they discovered that conducting a computer analysis of the sample and digitally staining it can be much more efficient - taking a mere 20 minutes instead of two hours - and could potentially be more accurate.

"There's the potential for AI to complement the pathologist in their



daily workflow; which will enhance processing time, increase diagnostic accuracy and ultimately expedite care for patients,” says Jerzak.

The team is excited about what the future has in store. “The work Dr. Jerzak and I are doing is unprecedented at Sunnybrook because it’s leveraging such a large data set in one institution. Our hope as we validate this predictive signature with our 800 patients, is that we can begin a clinical trial to identify patients from the beginning - and develop a truly personalized approach for each one.”

### Landmark trial to personalize cancer treatment

This past summer, Exactis Innovation awarded a team co-led by Dr. Helen MacKay, a senior scientist in Biological Sciences at Sunnybrook Research Institute (SRI), a \$1-million

grant to support a multicentre clinical trial in cancer. The award will fund efforts to personalize treatment for women with ovarian and breast cancer.

Women with high-grade serious ovarian cancer and triple-negative breast cancer, both of which come with a poor prognosis, have few therapeutic options. Co-led by Dr. Diane Provencher of Centre hospitalier de l’Université de Montréal (CHUM), the team will address this by evaluating a combination of therapies, with the goal of personalizing treatments.

The trial will draw on research carried out in the labs of Sunnybrook’s Dr. David Andrews, director of Biological Sciences at SRI, and Drs. Anne-Marie Mes-Masson and Francis Rodier of CHUM Research Centre. Dr. Andrews and his lab have shown how an interaction between proteins

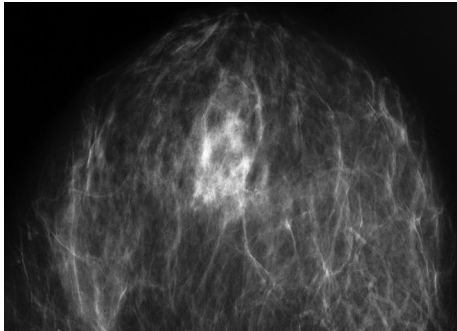
promotes cancer cell survival. The group used a customized microscope to visualize the interaction.

Their discovery stresses the need to investigate further where these proteins engage with each other, so that potential drugs to treat cancer can target these sites. Dr. MacKay is hopeful their results will make a significant impact on women and, one day, all patients with cancer.

“In combining a clinical trial with patient-derived ‘avatar’ models in the laboratory we hope to bring a new approach to personalizing treatment for women diagnosed with these cancers. We hope this will benefit not only women with breast and ovarian cancers, but be applicable to those diagnosed with other types of cancer,” she says.



Dr. David Andrews in Sunnybrook’s High Content Screening Lab.



Top: Dr. Greg Czarnota

Bottom: WaveCheck has created the first complete characterization of breast tumours.

### Life-saving technology measures impact of chemotherapy

A landmark randomized clinical trial is underway for WaveCheck, a life-saving technology co-invented by Dr. Greg Czarnota, director of the Odette Cancer Research Program. WaveCheck measures the impact of chemotherapy just weeks instead of months into treatment, providing oncologists the opportunity to adjust treatment as needed. A total of 120 women with breast cancer are participating in this exciting phase of development, in which researchers and physicians are using the WaveCheck system to monitor the treatment one and four weeks after treatment starts. While a portion of

participants are receiving standard chemotherapy treatment without receiving data from WaveCheck, the physicians of patients in the second group are monitoring therapy results with WaveCheck and modifying treatment if the results aren't meeting expectations.

“The idea is if it's not working, they can potentially switch to a different treatment rather than continue something for four to six months that isn't going to work,” says Dr. Czarnota. This milestone is a significant step closer to achieving Dr. Czarnota's ultimate goal: bringing WaveCheck across North America and, eventually, to women around the world.

The trial is set to conclude in 2022.

### Recognition for our world-class staff

With our international reputation and commitment to innovation, the Odette Cancer Program is fortunate to retain some of the best and brightest oncology experts. Our staff have been recognized with many prestigious awards in the past year, including:

**Dr. Natalie Coburn:** Innovative Curriculum Award from the Sunnybrook Excellence in Education Awards. A general surgeon at the Odette Cancer Centre, Dr. Coburn recognized a gap in the surgical practice in Canada for treating gastric cancer. To close the gap, she developed the first surgical course on the life-saving D2 Lymph Node Dissection surgery in Canada, bringing to Toronto renowned surgical experts from Japan and South Korea.

**Dr. Tony Eskander:** New Investigator Award from the Terry Fox Research Institute and the Canadian Institutes of Health Research. The \$450,000 award will help fund his upcoming research project, looking at how cancer and treatment-related symptoms affect everything from survival to the cost of care to unplanned hospital visits for patients.

**Dr. Laurence Klotz:** Lifetime Achievement Award from the Canadian Urological Association. Dr. Klotz is an acclaimed affiliate scientist in the Odette Cancer Research Program and Chief of Sunnybrook's division of urology.

**Dr. Gerard Morton:** fellow of the American Brachytherapy Society. An affiliate scientist in the Odette Cancer Research Program, Dr. Morton was recognized for his contributions and accomplishments in the field of brachytherapy.

# Thank you



On behalf of the Odette Cancer Program's team, our patients and their family members who benefit from the important research and leading care made possible by you, we thank you for your support.

Your generosity, vision and compassion are inventing the future of cancer care.



