YOUR IMPACT A REPORT ON THE ODETTE CANCER PROGRAM



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On the cover: For a brain tumour called a glioma, Karen Cotnam received treatment as part of a clinical trial at Sunnybrook's Cancer Ablation Therapy Program. Thanks to the personalized care she received, Karen is doing well today. Read more about her story on page 8.



Odette Cancer Program by the numbers:

401 clinical trials

ongoing

2,260

patients currently receiving treatment for cancer as part of a clinical trial

179K+ 72%

outpatient visits for cancer in 2021-22

of total clinical visits in 2021-22 were virtual visits



virtual oncology visits in 2021-22

A message of gratitude from Dr. Calvin Law

Thank you for helping us invent the future of cancer care. Because of your generosity, our teams at Sunnybrook's Odette Cancer Program are delivering personalized and precise care and leading groundbreaking research that is transforming practice.

So often I am asked: How do you lead when the future is undefined? For me, it all comes back to having a strong strategic vision for the future and partnering with our philanthropic community to make it a reality.

In the pages that follow, you'll read about real, tangible ways that we are inventing the future of cancer care today – together with our valued donors, like you.



Precision oncology is one of the tangible ways we are inventing the future of cancer care. In this report, you'll hear from Research Director Dr. Eileen Rakovitch, who explains how precision oncology truly *is* the future of cancer care. Dr. Rakovitch details how our understanding of the human genome is revolutionizing our approach to cancer, and how your support is enabling our teams to advance new diagnostics and treatments based on this understanding.

Exciting updates across our teams then demonstrate how the future is taking shape right now. From our Cancer Ablation Therapy Program, where our trio of advanced imaging technologies are allowing us to target tumours with pinpoint precision, to the use of artificial intelligence in predicting treatment responses – we are inventing the future every day in our laboratories and in our clinics. You'll also have a chance to get to know our 10 site groups and their current leaders, who discuss how they continue to refine treatments and serve more patients for each disease site.

Of course, inventing the future of cancer care doesn't mean reinventing what already works well. Nowhere is this more true than in the compassionate, person-centred approach that our staff brings to our patients and their families. On page 8, Karen Cotnam shares the personal touches that brought her comfort during treatment for a brain tumour – from the familiar connections with her practitioners to the exceptional personalized treatment she received from Dr. Arjun Sahgal and his team.

From harnessing innovative technology and data to our tried-and-true approach of compassionate care, this is how we're inventing the future of cancer care. And it is possible because of you. Thank you.

Sincerely,

Dr. Calvin Law Chief, Odette Cancer Program Sunnybrook Health Sciences Centre

INVENTING THE FUTURE OF CANCER CARE

Odette Cancer Program Research Director Dr. Eileen Rakovitch discusses how Sunnybrook is advancing precision oncology with the help of donor support

As a radiation oncologist and research director for the Odette Cancer Program, Dr. Eileen Rakovitch is at the forefront of Sunnybrook's efforts to advance precision oncology.

Dr. Rakovitch shares her insights on what precision medicine means for cancer care, how Sunnybrook teams are individualizing treatment and the importance of philanthropy in enabling Sunnybrook to invent the future of cancer care.

What does precision medicine mean in the field of cancer care?

Precision medicine, and more specifically precision oncology, is the future of cancer care. Precision oncology means that we can evaluate an individual's cancer and identify the best treatment on an individual basis.

Historically and even today, we haven't treated cancer this way. We evaluate some characteristics of the cancer: such as its site of origin, like the breast or the lung; the cancer's stage; and what some of its biomarkers are. For the group of patients who share these characteristics, we treat them all the same way – with radiation or chemotherapy.

This approach works well for some patients. For others, their tumour does not respond, and then they are unnecessarily exposed to treatments and their side effects.

But now we are able to sequence the entire human genome. This has revolutionized medicine and cancer care. We can now examine the genes – or what we call the genomic profile – of cancer on an individual basis. And by understanding the genomic profile, we are starting to be able to determine the best treatment for an individual's cancer.

Precision oncology means moving away from a "one-size-fits-all" approach to an individualized approach to cancer treatment. And that's the future of medicine and oncology.



How are teams at the Odette Cancer Program individualizing treatment?

At Sunnybrook, we have expertise in biological sciences, imaging sciences and clinical expertise in the treatment of cancer. Personalized medicine starts with each individual seen at Sunnybrook's Odette Cancer Program with a diagnosis of cancer.

We are working toward a future where we can obtain a sample of someone's cancerous cells, and then perform a gamut of tests that evaluate the sensitivity to chemotherapy before someone is exposed to those drugs and their side effects. Additionally, our goal is to conduct these tests in prospective clinical trials to see if this is accurately predictive. This method is going to change the way we treat cancer.

The other key to how we individualize treatment is in image-guided therapy. Donor support is driving our ability to pair magnetic resonance imaging, or MRI, with radiation treatment, so that we have the ability to better visualize and target treatment.

This means fewer side effects for patients because we're treating exactly what we need to treat.



As an oncologist, this is very exciting because we haven't been able to do this until quite recently.

The ability to sequence the genome has exponentially increased our ability to move precision oncology forward over the past couple of decades, and with investments in artificial intelligence we will be able to continue expanding this exciting field.

We need to continue to develop and test these technologies and methods, but we are on the cusp of making precision oncology the standard of care.

What is the importance of donor support in continuing to advance precision medicine?

We have the expertise at Sunnybrook, from the basic science to the clinical that is advancing the future of precision oncology.

When donors support initiatives like clinical trials, advanced technology and dedicated research and clinical space, we can ensure our expertise reaches our maximum potential and that we can continue to make breakthroughs in precision oncology.

What's more, we are able to leverage philanthropic support several times over when we apply for competitive research grants.

Demonstrating that we already have donor support for a certain project or area of research increases the likelihood of obtaining those grants.

What are the major next steps for precision oncology at the Odette Cancer Program?

In partnership with dedicated donors, we are creating a new centre for precision oncology research and treatment in an existing space at the Odette Cancer Centre.

The new centre will unite experts from Sunnybrook's Odette Cancer Program, Precision Diagnostics and Therapeutics Program, and the Sunnybrook Research Institute.

As a hub for clinical trials, the new centre will equip our clinician-researchers to lead groundbreaking studies, such as the discovery of biomarkers that reliably predict an individual's treatment responses to guide treatment planning.

Meanwhile, the data our researchers collect from participating patients will build artificial intelligence algorithms to inform treatment predictions for more patients in the future.

Importantly, as a clinically based research centre, patients will receive leading-edge care, increasing access to precise diagnostics and treatments while building our capacity to serve more patients.

I'm very proud to be part of this work at Sunnybrook. We are uniquely collaborating across research and clinical teams, and our donors are right there with us helping our teams improve and advance precision medicine.

GROUNDBREAKING PROGRESS IN OUR CANCER ABLATION THERAPY PROGRAM

Because of donor support, Sunnybrook is home to three highly specialized cancer ablation therapy technologies. The Gamma Knife Icon, the MR-Linac and the MRI-guided Brachytherapy Suite are changing the way we provide personalized and precise treatments.

World-first clinical trial using the Gamma Knife Icon for hard-to-treat brain tumours

Thanks to donor support of the Gamma Knife Icon, Sunnybrook's radiation oncologists are world leaders in the treatment of multiple brain metastases.

They can precisely target and destroy 30 or more tumours in a single treatment without damaging the patient's memory, cognitive function or quality of life.

Toward a goal of delivering optimal treatment to more patients, Sunnybrook's Cancer Ablation Therapy team has reimagined a world-first clinical trial involving the Gamma Knife Icon.

The trial will compare the outcomes of targeted radiation treatment using the Gamma Knife Icon with and without whole brain radiation on patients with five to 30 brain metastases.

Rather than randomly assigning half of the 125 study participants to each of the two treatment regimes, the study's principal investigator and director of the Cancer Ablation Therapy Program Dr. Arjun Sahgal is now encouraging the referring physicians to choose the most appropriate treatment for their patient.

The goal of the trial remains to determine which treatment option is best to maintain and even improve a patient's quality of life and thinking capacity.

Approximately 38 patients to date have been accrued to the study, which is estimated to last two years.

"We're always innovating and finding new ways to use this technology to treat even more patients when everyone else is saying no," says Dr. Sahgal.





Dr. Arjun Sahgal reviews brain images generated with the Gamma Knife Icon.



First-in-Sunnybrook treatment of upper abdominal cancer on the MR-Linac

In late 2022, members of Sunnybrook's radiation team completed the first-in-Sunnybrook treatment of upper abdominal cancer on the MR-Linac.

The donor-supported MR-Linac is the first technology in the world to combine radiation and high-resolution magnetic resonance imaging (MRI). The machine's real-time MRI guidance can target tumours and monitor their response to radiation with unprecedented precision.

Now, for eligible patients with pancreatic cancer or select upper abdominal cancers, sterotactic ablative radiotherapy (SABR) will take place on the MR-Linac, with daily real time imaging using motion-reduced imaging sequences (recently approved by Health Canada) and adaptive radiation planning.

"Pancreatic cancer is challenging to treat because it is located very close to normal upper abdominal organs that change in size and position. It is like trying to hit a moving target when the surrounding things you do not want to hit move in and out of the target zone in different ways each day," says Dr. Sylvia Ng, radiation oncologist and clinician scientist leading the treatment of pancreatic and liver cancers on the MR-Linac.

With treatment on the MR-Linac, the team will have a better view of the pancreatic cancer and surrounding radiosensitive organs, and will be able to adapt the radiation plan on the day of treatment to ensure it is as precise as possible. What's more, SABR involves a high dose of radiation over five or fewer treatments, delivered with pinpoint precision.

Given the typically dire prognoses associated with pancreatic cancer, the work of Dr. Ng and her team holds significant potential for impacting patient outcomes and quality of life.

Highlights from clinical trials using the MR-Linac:

• UNITED trial: Around 90 patients with glioblastoma, an aggressive type of brain tumour, are part of the UNITED trial: a pilot study that is gauging the impact of the MR-Linac on brain tumours. The UNITED trial allows for the development of weekly personalized brain maps that are adjust daily based on magnetic resonance imaging (MRI) data.

Says Dr. Sahgal, "for the first time in the world, we're seeing a reduction in the volume of tissue we're radiating, which is improving tolerability of treatment and quality of life."

• Advancing treatment for head and neck cancer: In March 2022, Sunnybrook's radiation team completed the first-in-Canada treatment for head and neck cancer using the MR-Linac.

The head and neck portion of the trial is focused on cancer caused by human papillomavirus (HPV). Instead of pre-planning radiation therapy based on CT images, doctors are now planning radiation treatment following an MRI at the time of each treatment.

• Ablating prostate cancer: After proving that the MR-Linac can deliver results for ablating prostate cancer with just five weekly doses of intense stereotactic radiation therapy informed by daily MRIs, radiation oncologist Dr. Danny Vesprini is preparing to launch a new, donorfunded randomized controlled trial evaluating the effectiveness of just two treatments, with a goal of helping patients return to their lives sooner.

INSPIRING ADVANCES IN CANCER CARE

One of many patients taking part in clinical trials at Sunnybrook, Karen Cotnam's experience inspired her to become a donor



Pictured at left: Dr. Arjun Saghal and Karen Cotnam having a conversation outside of Sunnybrook's Odette Cancer Centre.

Karen Cotnam remembers the moment she felt everything was going to be okay during her care journey. It was when a Sunnybrook MRI technologist said, "Hello, I'm Lynn."

The Montessori specialist and mother of two was at Sunnybrook's Odette Cancer Program for radiation to treat a brain tumour called a glioma. First diagnosed more than two decades earlier, the slow-growing cancer had transformed into a more aggressive, high-grade form of the disease. Cancers of this type are typically treated with surgery, but in Karen's case, the tumour was located alarmingly close to the speech centre of her brain.

Rather than undertake a risky operation, Karen's surgeon referred her to Sunnybrook's worldrenowned Cancer Ablation Therapy Program.

"Everyone I met had the same name as people in my family," chuckles Karen. "My brother-in-law is Lynn. My nurse was named Ada. That's my motherin-law's name. And on the last day of radiation, my therapist was Thomas, my father's name."

"I kept thinking that angels were watching out for me," says Karen.

Also keeping a close eye on her progress was Dr. Arjun Sahgal, director of the Cancer Ablation Therapy Program and the radiation oncologist who oversaw Karen's treatment.

A participant in a Sunnybrook clinical trial, Karen received magnetic resonance imaging (MRI) before and at key points throughout her radiation series. Dr. Sahgal and his team used the scans to visualize the tumour and adapt Karen's treatment accordingly.

"If it wasn't working, Dr. Sahgal wanted to change the course then instead of waiting a month for the result," says Karen, who took comfort in this personalized approach. The results of this and subsequent studies at Sunnybrook are helping to inform the development of standard procedures for adapting a patient's radiation treatment to changes in the tumour that may occur over time.

Knowing her participation could help future patients inspired her to make an impact in another way as well. Karen recently made a donation to thank Dr. Sahgal and the Cancer Ablation Therapy team for their extraordinary care and to support their research going forward.

HARNESSING THE POWER OF ARTIFICIAL INTELLIGENCE TO PERSONALIZE CANCER CARE





From left: Dr. Kasia Jerzak, Dr. William Tran, Dr. Fang-I Lu.



Video: A look inside the Andrews lab.

Improving treatment planning for breast cancer with the help of AI

Odette Cancer Research Program scientist William Tran, MRT(T), PhD, set out to evaluate and improve care for women with breast cancer who undergo neoadjuvant chemotherapy to shrink their tumour ahead of surgery. "Our overall goal was to see if we could predict the tumour's response to chemotherapy, and empower our clinicians to adapt each patient's therapy accordingly," he explains.

Dr. Tran partnered with Sunnybrook pathologist Dr. Fang-I Lu to gather data from past breast biopsies to inform the development of a predictive algorithm. From a cohort of 1,200 patients, they amassed 485 tumour samples – the largest collection of its kind in the country.

This foundation of patient data is powering a donor-supported digital pathology system, which is capable of mapping breast tissue samples and producing an intricate depiction of the tumour's biology. "The more data we feed into the digital pathology system, the better equipped it is to recognize cancer's many features," says Dr. Lu.

Now, with Sunnybrook medical oncologist Dr. Kasia Jerzak, Dr. Tran is testing the ability of the digital pathology system to find biomarkers and assess treatment response for very aggressive and locally advanced cancers. For Dr. Lu, the possibilities are game-changing: "In so many instances now, the computer is outperforming pathologists. It can even recognize features that can't be seen with the naked eye."

Using AI to develop personalized and precise treatments for lymphoma

With as many as 60 different types of lymphoma and various stages of the disease, no two diagnoses or experiences are alike.

Treatment options have advanced in recent years, but Sunnybrook haematologist and senior scientist Dr. David Spaner aims to advance them further.

Dr. Spaner and his team, including David Andrews, PhD, director of the Biological Sciences Research Platform at Sunnybrook Research Institute, are trying to identify drug therapeutics that, when paired with the kinase-inhibitor drug venetoclax, can eradicate lymphoma cells without many of the side effects associated with traditional therapy.

Given that effective combinations will be unique to each individual, there are potentially thousands of possible combinations to be tested in order to determine which is most effective for specific patients.

To tackle this immense testing effort, Dr. Spaner and his team have developed an AIbased method that enables them to efficiently test venetoclax in combination with all of the roughly 3,000 drugs currently approved by Health Canada for use in various human diseases.

With the help of donor support, Dr. Spaner's research aims to achieve a level of precision that results in fewer side effects and longer lives for people with various forms of lymphoma.

UNPARALLELED CARE ACROSS 10 SITE GROUPS

We're pleased to introduce you to the leads of 10 site groups at the Odette Cancer Program for the 2022-2025 term. Learn how each of their teams is there for patients and families, when it matters most.



Central nervous system

Site group lead: Dr. Arjun Sahgal

Our site group has increased our neuro-oncologists and radiation oncologists to serve more patients with brain tumours.

We are leading several studies that are advancing how we pair imaging and radiation to spare healthy brain tissue while treating cancer effectively. This includes a trial to treat multiple brain metastases using radiosurgery on the Gamma Knife Icon (see page 6 for more details).



Gastrointestinal Site group lead: Dr. Natalie Coburn

Our program offers patients highly specialized treatments for colorectal. gastric. pancreatic, biliary and hepatocellular cancers (HCC or liver cancer) and neuroendocrine tumours (NETs). We perform the highest volume of colorectal cancer surgeries in Ontario. Our multidisciplinary team personalizes care to each patient and are world leaders in minimally invasive surgery, patientcentred care and research to improve outcomes in cancer patients.



Gynaecological Site group lead: Dr. Lilian Gien

Our site group is one of the highest volume centres treating gynaecologic malignancies in Canada. Thanks to donor support, we have expanded our research in targeted therapy for ovarian cancers and rare tumours of the cervix. and we have established IndYGO: a new clinic dedicated to Individual care for Young Gynecologic Oncology patients. We also continue to be leaders in cervix cancer prevention.



Complex Malignant Haematology

Site group lead: Dr. Matthew Cheung

Members of our team are internationally recognized for their expertise and research across a variety of cancers of the blood and bone marrow, and in the past year have served more than 850 patients for radiation and chemotherapy. With donor support, we have also built a new program to address the medical and psychosocial needs of young adults with complex malignant haematology diagnoses.



Head & Neck Site group lead: Dr. Antoine Eskander

The head and neck site group is growing in patient volume and clinical trials as well as team capacity with the recent addition of a radiation oncologist and two medical oncologists. We are increasing our clinical capacity by expanding fiberoptic endoscopy to all examination rooms. We are also developing liquid biopsy to monitor certain forms of cancer through a simple blood test, among other exciting trials.



Lung

Site group lead: Dr. Alexander Louie

The lung cancer team at Sunnvbrook is one of the largest in Canada, and includes medical and radiation oncologists, thoracic surgeons, pathologists, radiologists, respirologists, nurses, pharmacists and radiation therapists.

We are one of the largest referral centres in Ontario for lung cancer biomarker testing, and are actively working on our ability to offer liquid biopsy in the near future: a less invasive testing method that involves a simple blood test rather than lung tissue.



Melanoma

Site group lead: Dr. Teresa Petrella

We are one of the largest highly specialized melanoma and non-melanoma skin cancer teams in Ontario.

Our Sunnybrook multidisciplinary team includes medical, radiation and surgical oncology, plastic surgery, dermatology and pathology. We see more than 400 new patients per year and provide them with efficient and optimal treatment.

We also have a large clinical trials program that invites patients to participate in novel therapies that can improve outcomes for melanoma and non-melanoma skin cancers.



Skin & Pigmented Lesion

Site group lead: Dr. Toni Barnes

We are Canada's largest multidisciplinary skin cancer clinic, seeing more than 500 new patients per year.

Our teams of dermatologists, radiation oncologists and plastic surgeons collaborate to optimize patient outcomes.

Our primary goal is to expand to accommodate the increasing number of referrals for skin cancer, the most common cancer in Canada.

We are planning to incorporate new imaging technology to precisely image superficial skin tumours to guide treatment.







Breast

Site group leads: Dr. Andrea Eisen and Dr. Amanda Roberts

The Louise Temerty Breast Cancer Centre treats one of the highest volumes of breast cancer patients in the country. We pride ourselves on a full circle of care model: from entry through the Rapid Diagnosis Unit: to medical. radiation and surgical oncology consultations; to specialized interdisciplinary care; and a transition phase in our unique survivorship program. We also run one of the largest highrisk assessment programs for individuals with a family history of cancer.



Genitourinary

Site group leads: Dr. Andrew Loblaw and Dr. Urban Emmenegger

Our goal is to improve the experience and outcomes for people with genitourinary cancers. Our genitourinary care group is one of the largest in Canada, representing a centre of excellence in the treatment of prostate. bladder and kidney cancer.

Driven by our team's deep passion to help patients, through our research we are advancing the latest in imaging and biological sciences to reinvent the future of cancer care.

OUR THANKS TO YOU

As we invent the future of cancer care and push the boundaries of what is possible for personalized and precise diagnoses and treatments of all forms of cancer, we have our donors to thank for what we have achieved and what we continue to advance.

Because of you, we are there for more patients and their families when it matters most, now and in the future. Thank you.



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