

STRATEGIC  
PLAN  
2019

LEVERAGING  
GENOMIC  
DISCOVERIES  
TO IMPROVE  
OUTCOMES

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## BC CANCER – VISION, MISSION & VALUES

The **vision** of BC Cancer is “A world free from cancer” and the **mission** of our organization is to reduce the burden of cancer in British Columbia.

The core **values** of BC Cancer are:

- We provide **person-centred** care and support
- We **collaborate** to deliver high-quality integrated care
- We treat all those we serve with **compassion** and kindness
- We serve with purpose and **passion**
- We inspire creativity and excellence through **innovation**

These core values support the Provincial Health Services Authority (PHSA) mission of **results through caring, leading and learning together**. PHSA’s values of person-centred care, respect, compassion, innovation and willingness to cultivate partnerships will be reflected in this Strategic Plan.







## MESSAGE FROM DR. FRANÇOIS BÉNARD, VICE PRESIDENT RESEARCH, BC CANCER

Research is deeply embedded in the fabric and culture of BC Cancer, as demonstrated by our track record of cancer research discoveries, our strong foundation of genomics research, and evidence-based adoption of transformational technologies and treatments. BC Cancer has a unique opportunity to improve patient outcomes through basic biomedical research, integration of genomics, clinical trials, health services research, cancer surveillance, and population health, the development of personalized care approaches and innovative new programs and interventions.

This document outlines a new Strategic Plan for BC Cancer Research. The ultimate goal for the plan is to strengthen our research capabilities, align strategy with the BC Cancer Foundation, PHSA, Terry Fox Research Institute (TFRI), regional health authorities, the University of British Columbia (UBC) and other partner universities, including Simon Fraser University (SFU), University of Victoria (UVic) and the University of Northern British Columbia (UNBC), to provide clear direction that improves our ability to generate knowledge, enhance the impact of our research, and support innovation in clinical care.

There is currently a strong appetite for change and progress at BC Cancer. By increasing knowledge exchange among clinicians and researchers and prioritizing the recruitment of a new generation of scientists and research-minded clinicians to bridge disciplines, we can improve how we learn from our patients and enhance our ability to advance and accelerate the translation of research discoveries to improve clinical cancer care.

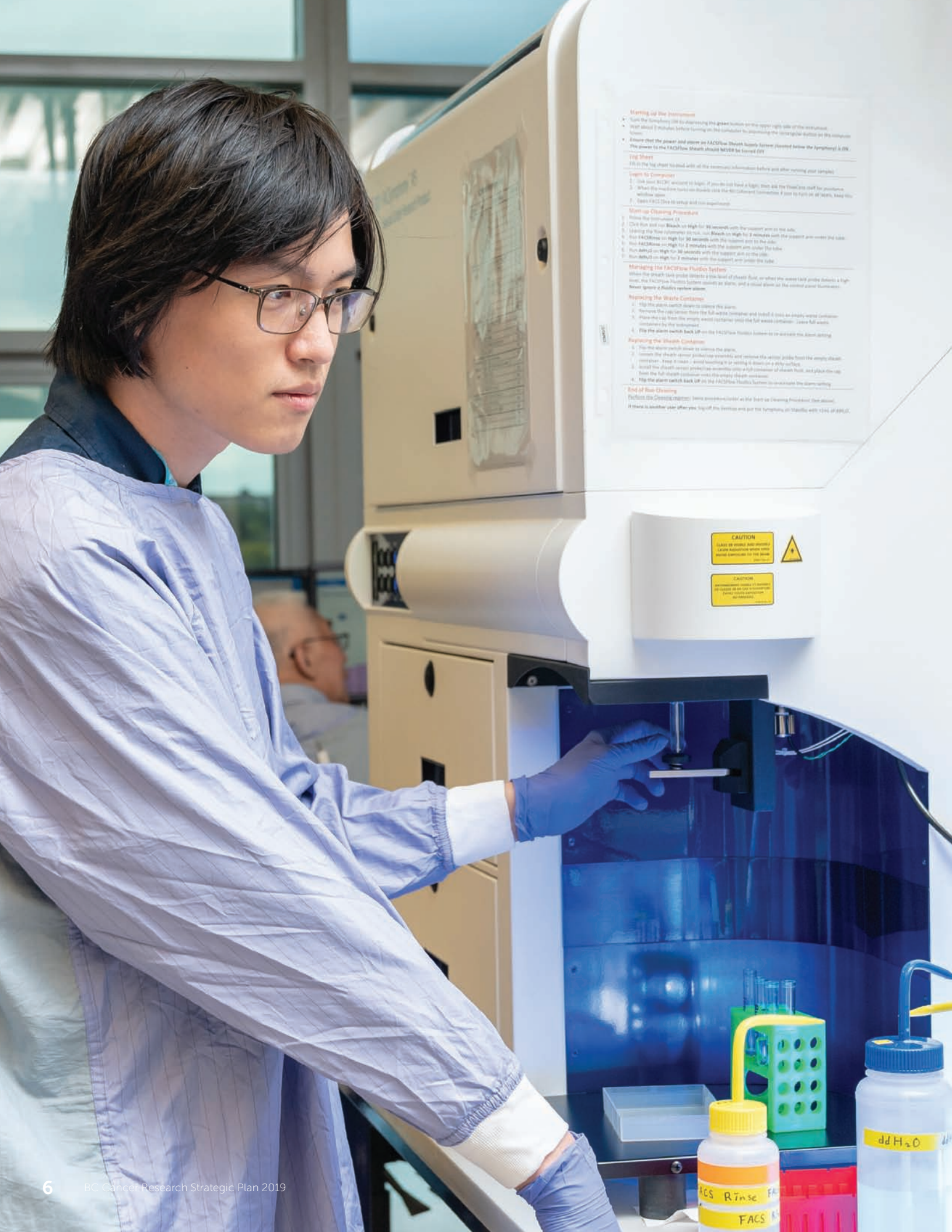
BC Cancer's research is distinguished by a strong sense of collaboration, community, and united purpose. Our biggest research assets are the innovative scientists who foster cross-disciplinary teams and strong collaborations to tackle complex problems together



with clinicians. This spirit of collegiality extends provincially, nationally and internationally to collaborators at universities, hospitals, and health research institutes.

BC Cancer's most powerful strength and mandate is the ability to study cancer on a population-wide basis. From a research perspective, this mandate is critical. We will improve our ability to learn from population data sets, and expand the use and availability of clinical genomics to generate relevant real-world evidence to inform health policy. Cancer research is evolving rapidly, and BC Cancer/PHSA's population mandate provides an unprecedented opportunity to learn from our patients and survivors and give back to our community with knowledge, prevention strategies, earlier diagnoses, and new treatments to reduce the burden of cancer on society.





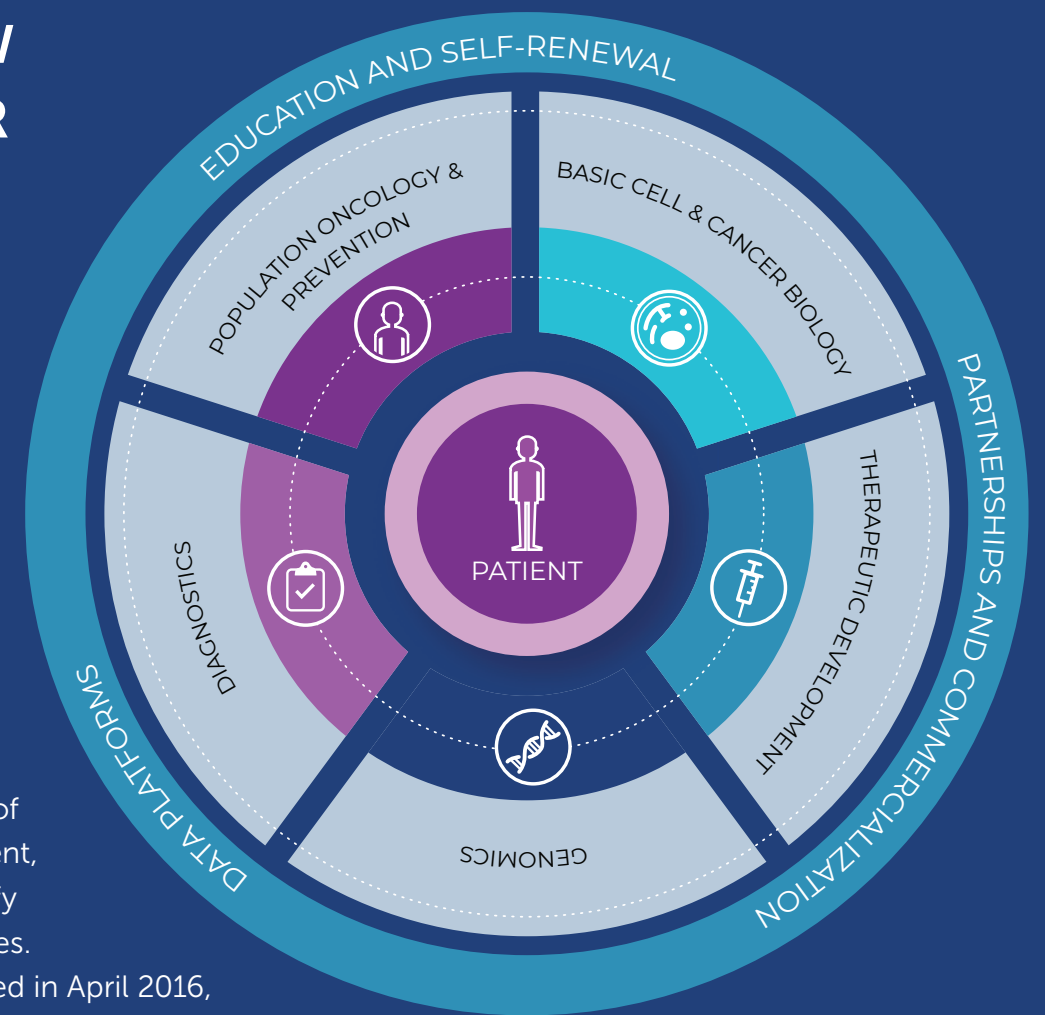
## WHY A NEW BC CANCER RESEARCH STRATEGIC PLAN?

In March 2016 a panel of national and international experts conducted an external review of research at BC Cancer to help define the mandate of the next Vice President, Research, and identify strategic opportunities.

The report, completed in April 2016, outlined areas of strength and provided specific recommendations for improvements.

As part of our leadership renewal, a Strategic Plan was identified as an essential tool to build momentum and provide direction for research at BC Cancer. Following the appointment of the new Vice President of Research, a Strategic Planning committee consisting of representatives from clinical and research departments was created to define the new vision and mission of BC Cancer Research. The committee's role was to identify research disciplines, programs, and platforms particularly effective at generating knowledge, intellectual property, and influential research supporting the mission of BC Cancer, and to define the strategic direction of the new plan.

Input into the BC Cancer Research strategic planning process was sought from stakeholders at the BC Cancer Research Centre and the six BC Cancer regional centres. The consultation process informed discussions around defining specific priorities and objectives for the new Strategic Plan to improve the quality and impact of research at BC Cancer.





## THE BENEFITS OF RESEARCH AT BC CANCER

Research promotes progress; embedding research in a health care organization has obvious advantages where access to patient data and samples, and direct input from clinicians, shape the direction and course of research. From a clinical perspective, there are some clear advantages that stem from investing in research: it advances disease knowledge with the promise of new discoveries and innovative person-centred therapies, and catalyzes their integration into high quality care; it offers a competitive edge in staff recruitment and retention where health care staff, researchers, and trainees can be embedded in a supportive and mind-expanding culture; it creates an active research program that affords a more vibrant and stimulating work environment, and fortifies our staff with pride and purpose.

Research inspires hope and builds community confidence. Cutting-edge research is critical for promoting better patient outcomes through fostering person-centred care and access to state of the art treatments through clinical trials. From a provincial perspective, research also creates important opportunities for economic growth by generating intellectual property to stimulate entrepreneurial activity and new enterprise.

Research into basic scientific discoveries and new therapeutic strategies that lead to breakthroughs can be a long journey, sometimes decades in the making. Long-term investment is therefore critical before these innovations reach the clinic. For example, an investment of nearly a decade was required to reap the rewards of the discovery of somatic mutations involving a gene called 'EZH2', discovered in specific types of lymphoma at BC Cancer in 2009. Continued investment ensured the development of EZH2 inhibitors, which

led to a Phase I/II trial of an EZH2 inhibitor in 2015, with clinical trial results presented in 2017 that showed promising objective response rates in patients whose tumours carried EZH2 mutations. As another example, volumetric arc radiotherapy ('VMAT') technology, a new approach to precisely deliver radiotherapy introduced at BC Cancer in 2007 and subsequently incorporated in multiple clinical trials, is now used in radiation oncology clinics around the world.

The **BC Cancer Foundation**, through dedicated fundraising initiatives, provides essential support to BC Cancer Research. The Foundation has supported research groups that have become international leaders in cancer research. The Foundation also supports essential programs, provides funding for staff, and facilitates critical equipment purchases. The success of many of BC Cancer's leading research programs is due in large part to this support, which has enabled leading researchers and thought leaders to mobilize additional resources and expertise, engage the wider clinical and scientific communities, and conduct cutting-edge science. Excellence in research has enabled and accelerated the genomics and precision medicine initiatives for which BC Cancer is internationally recognized.

The most successful and impactful research programs at BC Cancer have integrated large multidisciplinary teams, leveraging basic science research and genomic discoveries to tackle a clinical problem. Our most successful initiatives were launched and supported by initial and sustained investments by the BC Cancer Foundation. On the following pages we highlight some of the internationally renowned programs that demonstrate BC Cancer's contributions to knowledge and clinical care around the world.



### Breast Cancer Research (B-PRECISE)

This program's research projects included breakthroughs in decoding the genetic makeup of the most-deadly form of breast cancer, known as triple-negative subtype, and the world's largest global study of breast cancer tissue. The Breast Cancer Research Program pioneered the use of cutting edge cancer genomics techniques, preclinical genetic models, high-throughput screens, and translational research approaches. Their most recent work on the molecular taxonomy of breast cancer led to the identification of new genes that could have clinical implications for the diagnosis of breast cancer and form the basis of next-generation breast cancer treatments. The B-PRECISE program produced high-impact publications in the field of tumour heterogeneity and clonal evolution of cancer, using computational biology methods to decode the complex landscape of breast cancers, receiving international recognition for this work.





**Dr. Kim Nguyen Chi, Vice President & Chief Medical Officer and Heather Findlay, Chief Operating Officer, BC Cancer**

At BC Cancer, everything we do is driven by our focus on person-centred care and vision for a world free from cancer. As one of the largest health research institutions in British Columbia, BC Cancer Research remains a vital component of our work — it uncovers new ways to prevent, diagnose, and treat cancer to improve the outcomes for our patients. Over the years, BC Cancer has achieved excellent outcomes for patients and we continue to be a global leader in cancer care and innovative research. BC Cancer has a tremendous history of achievement — of world-class research and knowledge translation and unparalleled patient care — made possible by the collective will of all of our researchers, clinicians, and staff. This research strategic plan will help to ensure that the benefits of our robust research program are realized for years to come — improved outcomes for patients, increased engagement of our talented staff, and helping to create a sustainable health care system. We are proud of the work of our researchers and look forward to an exciting future ahead.

### Ovarian Cancer Research (OvCaRe)

OvCaRe is a world-leading program in ovarian and gynecologic cancer research. It is comprised of a diverse group of researchers, pathologists, geneticists, epidemiologists, and gynecologic surgeons across multiple institutions. OvCaRe is a shared initiative between BC Cancer, UBC and the Vancouver Coastal Health Research Institute, funded through donations to the BC Cancer Foundation and the VGH and UBC Hospital Foundations. The formation of OvCaRe marked the first time these organizations came together to support a major research program. This collaboration led to numerous high-impact publications on improved classification of ovarian cancers, the identification of new mutations associated with endometriosis and specific subtypes of ovarian cancer, and the development of prevention strategies by tubal removal to reduce the incidence of cancer.



### Centre for Lymphoid Cancer (CLC)

The CLC is a long-standing leader in lymphoma research, with a multidisciplinary group that has published landmark studies on novel biomarkers, and successfully integrated these findings into clinical care to improve treatment and survival for lymphoma patients. A province-wide study of personalized treatment of lymphoid cancer was recently completed by the centre, which utilized new sequencing technology to determine specific genetic and associated biologic characteristics of a patient's cancer to design unique treatment for that individual. This study validated the proof-of-concept that cutting-edge research can be provided for all patients across British Columbia in a practical way that rapidly and cost-effectively enables local cancer specialists to utilize genomic sequencing information to identify effective, personalized treatments. This B.C. driven initiative can now be replicated elsewhere around the world.







## A VIBRANT COMMUNITY OF RESEARCH TRAINEES

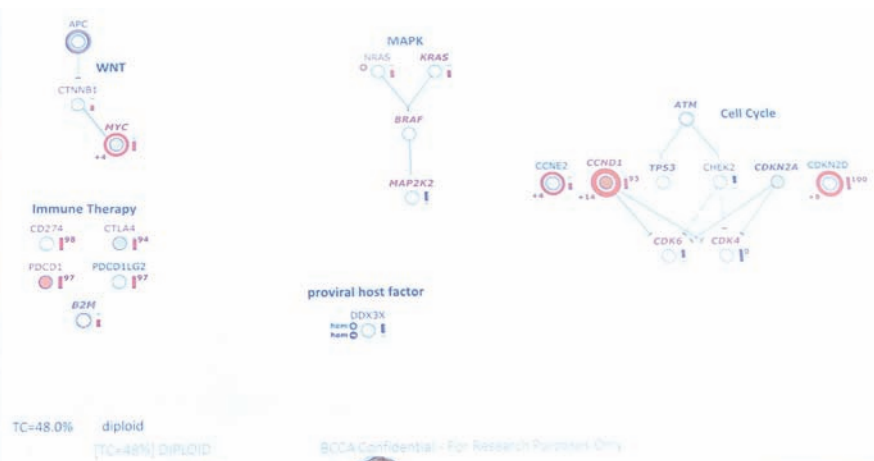
In addition to having many world-class research scientists, BC Cancer has a productive and vibrant student and postdoctoral fellow community, facilitated by the trainee-led GrasPods organization, which brings together trainees and researchers for education, networking, and social events. This has contributed to a strong sense of community and collegiality among researchers, trainees, and staff at BC Cancer. With 580 trainees in 2017/18, students are at the heart of innovation at BC Cancer, and contribute knowledge, enthusiasm, and a passion for research that is a great source of inspiration for their mentors.

### Personalized OncoGenomics Program (POG)

The POG program has developed methods and tools to enable whole-genome and transcriptome sequencing into a routine approach to generate deep knowledge about individual patients' cancers, provide this information back to the clinic in a clear, actionable way, and generate knowledge that is shared internationally

to benefit others. The sustained activities and inter-disciplinary engagement of clinicians, researchers, trainees, scientists, and management through this program has created a cultural paradigm shift at BC Cancer. Over the past five years, the POG team has grown to include more than 200 people from across

BC Cancer. Since the launch of the program in 2012, POG successfully recruited 1,000 patients with metastatic cancer into the program and completed sequencing and analysis on more than 600. Through this research program, patients and their clinicians have access to additional personalized information to inform their treatment decisions. Funding for POG provided by the BC Cancer Foundation and its donors has been leveraged multiple times over to acquire advanced research equipment, support trainees, and enable research programs to align patients in POG with targeted treatments.







**Carl Roy, President & Chief Executive Officer, Provincial Health Services Authority (PHSA)**

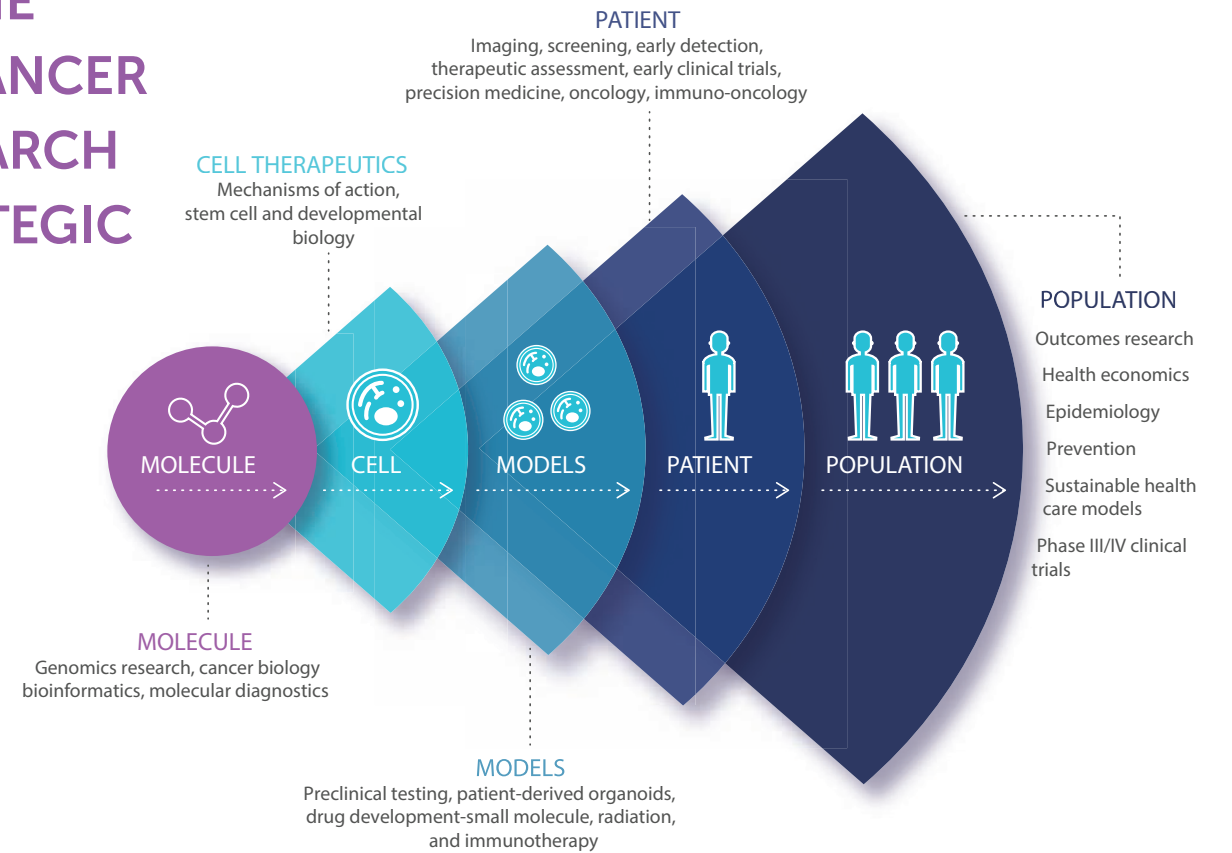
Patients and families are at the centre of all we do. The important work done by our clinicians and scientists has propelled us to provide high-quality, specialized care services to British Columbians. We value the knowledge, innovation and research done by BC Cancer to deliver transformative, province-wide solutions. We are immensely proud of the work of our research teams and believe that together we can make a profound difference in providing the best care to our patients.

## LEVERAGING OUR PROVINCIAL MANDATE

BC Cancer holds unique population-based resources and data, such as the Cancer Registry and the outcomes units, which provide significant research opportunities to study outcomes across populations, prevention initiatives, demographic variables, and the genetic basis of cancer. The BC Health Act (Section 9) and the BC Cancer Research Information Regulation specifically enable BC Cancer to collect medical information and factors influencing the occurrence of cancer in human populations for research purposes. These are essential tools for BC Cancer to serve its mission, and provide a research environment that distinguishes BC Cancer from many other cancer care organizations. These capabilities are reflected in this Research Strategic Plan 2019.



## PHILOSOPHY OF THE BC CANCER RESEARCH STRATEGIC PLAN



BC Cancer has a mandate for province-wide care, and scientists and clinicians recognize and value the opportunities for close interactions between research and clinical practice. The close proximity to patients and survivors enables both relevant basic research and promotes acceleration of new clinical research activities.

As a leading cancer research organization, this strategic plan reflects our intent to conduct globally leading science to achieve BC Cancer's vision of a world free from cancer. We strive to achieve this by:

- Learning from every person affected by cancer to improve patient outcomes
- Generating knowledge from single cells, to the individual, to the population
- Discovering the causes of cancer to find new treatments
- Translating knowledge back to society to reduce the burden of cancer

We strongly believe that conducting basic research, and in particular genomic research, is essential to improve our understanding of cancer. Health research is increasingly fueled by generating, aggregating, and sharing data. All data are valuable to inform research, whether they are generated from single cell sequencing of a patient's tumour, by exploring the mutation associated phenotypes in model systems (e.g., cell lines or patient derived organoids), or obtained from clinical trials, routine clinical follow-up, or laboratory and imaging tests. We need to integrate data sets across disciplines, research laboratories and the clinic to maximize the benefits to society and develop treatments to overcome cancer. Cancer will be conquered by researchers' willingness to share data and collaborate for the good of people affected by cancer.



## STRATEGIC PRIORITY 1

Leverage genomic discoveries to overcome incurable cancers



Genomic research generates huge data sets that offer significant potential to identify new pathways, oncogenic mutations and gene fusions, and epigenetic alterations that may only affect a small subset of cancer patients or a small subset of cancer cells within a given patient, but can lead to novel insights into the causes of cancer and potential strategies to block the affected pathways. With world-class capabilities to analyze and interpret whole genome and transcriptome data, our researchers are at the forefront of discovering new biological pathways that can be targeted to improve patient outcomes.

### Objective 1.1 Support basic research to understand clonal evolution and mechanisms of cancer initiation and progression

With the advent of improved research methodologies such as single cell sequencing, our ability to unravel the complex tumour microenvironment and study clonal evolution dynamics has greatly expanded and will be expanded further. By studying samples obtained prior to the onset of cancer, for example via the BC Generations cohort, we will gain valuable insights into genomic changes that are associated with cancer initiation. By studying samples from patients after treatment, presenting with metastatic or recurrent cancers, we will identify new genetic or epigenetic changes associated with treatment resistance. Our goal is to use knowledge derived from large-scale genomic data to identify the significance of genetic aberrations. This integrated approach of genomics with clinical data will lead to the identification of new targets, pathways, and mechanisms that drive cancer progression and resistance. **We will build a critical mass of researchers in functional genomics, bioinformatics, signaling, computational biology, and molecular and cell biology to fuel new discoveries that will lead to improved person-centred treatment options.**

### Objective 1.2 Identify new targets for therapy using multiomic approaches

We will use a variety of multiomic approaches including proteomics, metabolomics and functional genomics to identify new targets for therapy in high-risk cancers. These approaches take advantage of established expertise at BC Cancer Research, and complement genomic analyses that are being performed for childhood, adolescent and young adult (AYA) cancers (e.g. sarcoma, lymphoma, leukemia), among others. For example, analysis of the cell surface proteome (the so-called "surfaceome"), will allow us to identify new plasma membrane-expressed proteins for targeted immunotherapy. We will also test the relevancy of newly identified targets found in adult malignancies. For example, NTRK fusions, which were initially discovered in rare pediatric sarcomas, have now been identified in diverse adult malignancies, leading the pharmaceutical industry to develop specific inhibitors of NTRK kinases that have recently been approved in the USA. **We will accelerate target identification by multiomics for all cancers including childhood and AYA cancers and foster collaborations nationally and internationally.**

### Objective 1.3 Accelerate the application of whole genome/transcriptome sequencing in treatment resistant and metastatic cancers

Applying whole genome, transcriptome and eventually epigenome and proteome analyses serially to large cohorts of patients will be key to identifying significant recurring aberrations that will fuel discovery to identify new treatments. This is particularly important for patients who suffer from cancers that are hard to treat or have become metastatic. Given historic strengths in the development and analysis of whole genome and transcriptome data sets, and with some of the world's best cancer sequencing infrastructures at its Genome Sciences Centre, BC Cancer has an important role to play in leveraging its population outreach for large scale genomic initiatives, so that we learn about our patients and their genetic diversity, and fuel research that will be relevant to the B.C. population. Furthermore, we have a responsibility to contribute to international repositories of genomic data sets that will support international research collaborations from which cancer patients all over the world benefit. **We will create a large library of over 10,000 highly annotated patient data sets, with outcomes, obtained from cancer patients in B.C., in order to fuel discovery efforts in cancer biology and identify signals of treatment response, reduce futile interventions and improve patient outcomes.** This will lead to the introduction of new molecular assays in clinical research and clinical practice with rigorous data collection to improve patient selection prior to therapeutic interventions.

### Objective 1.4 Create and link data repositories and platforms to fuel discovery and guide the development of new interventions to prevent, detect and cure cancer

BC Cancer has an exclusive mandate to plan cancer care, screening, and prevention for all British Columbians, and to deliver care in partnership with health authorities across the province. Several unique investigator-initiated biobanks and outcomes units, closely associated with tumour groups, have led to pioneering research in lymphoid, breast, leukemia and ovarian cancer, among others. Our vision is to scale health data collection systems for patients who participate in genomic research studies, by increasing the number of collections and improving the depth and annotation of the collections, and to link this data with molecular and genomic information to improve our ability to learn from our patients and maximize the impact of our research. Given B.C.'s unique capabilities and infrastructure to implement large-scale genomics, we will leverage our resources and population base to build findable, accessible, secure data commons and biorepositories that will support discovery to improve our understanding towards the causes of cancer and treatment resistance. **We will build data science capabilities and the infrastructure to aggregate genomic, clinical, radiology and digital pathology data to support cutting-edge research analytics and innovations in machine learning and computational biology to make this vision a reality.**



## STRATEGIC PRIORITY 2

Translate cancer biology into diagnostic and therapeutic innovations



There is a strategic opportunity to enhance BC Cancer's expertise in the development of new molecular diagnostic methods, drugs, radiopharmaceuticals, and cell therapies. Bringing together medicinal chemists, chemical biologists, cancer biologists, immunologists, genome scientists, pathologists and clinical disease experts to enhance interactions will maximize opportunities for collaboration in therapeutics development, both within BC Cancer and with partner universities and other organizations, including UBC, SFU, UVic, non-profit organizations and pharmaceutical companies.



### Objective 2.1 Study the role of the immune system and tumour microenvironment in cancer progression and treatment resistance

Understanding cellular ecosystems and cell-to-cell interactions within tumours is critical to understanding tumour microenvironments and related targeting using modern immunotherapies. Immuno-oncology is one of the fastest growing disciplines in cancer research with a highly translational focus given the paradigmatic breakthrough successes of cellular immunotherapies (e.g. chimeric antigen receptor [CAR] T cell therapy), immune checkpoint inhibition, and therapeutic antibodies. With support from the BC Cancer Foundation and external granting agencies, the Immunotherapy Program recently established the expertise and infrastructure to produce engineered cell therapy products for early phase clinical trials, thereby creating a foundation for innovation and growth in this area. We will invest in expanding our expertise in immuno-oncology through programmatic expansion and through strategic recruitments in the fields of basic cancer immunology, immunogenomics and clinical immunology. We will integrate our efforts with national and international initiatives such as Terry Fox Research Institute's emerging Marathon of Hope Cancer Centre Network. Novel insights using genomic characterizations of cancer and immune cells in clinical biopsy material, functional modeling, clinical test development, and drug testing *in vivo* will prioritize discoveries that will guide biomarker development and therapeutic targeting at the interface between tumour cells and host immunity.

### Objective 2.2 Leverage innovative model systems to prioritize targets for therapeutic intervention

We need to expand our ability to translate discoveries from bench to bedside. To interrogate and perturb pathways involved in cancer initiation or progression, we need experimentally tractable model systems for hypothesis generation and testing, such as patient specific disease models including organoids and other preclinical model systems. These systems will reveal fundamentally new biology that will yield new patient-tailored therapies, and are essential to screen for existing and new chemical compounds or interventions that can alter the course of cancer progression. To achieve this, we will develop a comprehensive program to build new model systems based on expertise in tissue acquisition and processing, synthetic biology and drug screening.

### Objective 2.3 Create new capacity in cancer drug and cell therapy development

There is a need in B.C. for a comprehensive program to develop treatment strategies for cancer pathways for which no drug or intervention is currently available. This can be achieved through an open science approach to develop new chemical inhibitors that will fuel the development of low cost drugs, by repurposing old drugs that have been overlooked as they were only effective in small subsets of patients, or by supporting traditional models that can generate new drugs through pharmaceutical research. We will invest in programs to design and identify new drugs and immunotherapy approaches to target proteins associated with cancer progression, and build collaborations within the B.C. ecosystem to support research in chemical biology and medicinal chemistry. We will continue to advance the clinical implementation of CAR-T cells and other cellular immunotherapies in clinical trials. We will also research approaches to repurpose existing drugs and design combination therapies to treat patients who fail traditional chemotherapy, immunotherapies or targeted therapies. In addition to benefiting cancer patients over the long term, this research can lead to significant economic benefits by generating intellectual property and seeding start-up companies that will grow the B.C. technology sector.

### Objective 2.4 Improve technologies for cancer imaging and precision radiotherapy

Early diagnosis is critical to identify cancers at a stage when the disease is curable, and characterizing and localizing cancers effectively is essential to provide treatments that are appropriate for each person affected by cancer. BC Cancer is internationally recognized for its contributions in early cancer detection, molecular imaging with radiopharmaceuticals, and as an innovator in precision radiotherapy. This includes improving cervical cancer detection, developing tools, devices and methods for early oral and lung cancer detection, developing new radiopharmaceuticals for cancer imaging and radioligand therapy, and contributions to radiobiology and technologies such as volumetric arc radiotherapy. We will develop technologies to enhance early cancer detection, improve our ability to detect cancer metastasis, and innovate in regional and systemic precision radiotherapy approaches to improve patient outcomes. Our approach to technology development will be to support an ethical and sustainable healthcare model for the benefit of our entire population.



## STRATEGIC PRIORITY 3

Increase clinical capacity to enable translation of innovations for improved patient outcomes



A vibrant cancer research organization requires the ability to move from bench to bedside, and also from cancer patients back to the laboratory to provide researchers with real world insights about the causes of cancer and mechanisms of drug resistance. A receptive community of clinicians and health professionals who are actively engaged in research to provide clinical context, gather clinical and phenotypic information, participate in the identification of research priorities, and lead cutting edge clinical research is essential to maintain and grow BC Cancer's ability to impact the care and outcomes of cancer patients.



### Objective 3.1 Enhance the clinical trial infrastructure and create expanded opportunities for patient participation

The recruitment of clinician investigators with a dedicated mandate and protected time to support innovative clinical research and clinical trials is important to embed research in the culture of care at BC Cancer, and to increase participation of cancer patients in clinical research. Clinical trials provide patients with access to innovative therapies and approaches, and give them an opportunity to help generate new knowledge. BC Cancer's regional centres can greatly contribute to this effort. To succeed they will need improved connectivity with the rest of the cancer research community, and access to research resources. We will partner with UBC, health authorities and provincial research funders to create a framework to protect academic time for clinician investigators in oncology. **We will create a clinical research department to provide improved administrative and grant facilitation support for clinical research to leverage clinician investigator time, oversee and provide support for clinical trials, and connect the regional centres with the research community.**

### Objective 3.2 Support investigator initiated studies to improve clinical practice

Clinical trials are extremely important to bring new drugs and technologies to improve the care of cancer patients. However many research questions are not being addressed by sponsored clinical trials, which are focused on proving the efficacy of a new drug. For example, for-profit sponsors rarely support the conducting of research to prevent futile interventions. Similarly, practical questions on how to improve the care of cancer patients with simple interventions, or studies that revisit the actual benefits of previously approved drugs, can have profound benefits on our health system. **We will improve the support for clinician investigators to conduct original peer-reviewed research by improving access to informatics resources to manage clinical data securely, and improve statistical support for study design for clinical investigators.** This will provide less experienced investigators the opportunity to develop preliminary data to fuel competitive external grant applications.

### Objective 3.3 Create a chair in nursing research to develop improved models of cancer care and improve patient experience

Nurses and other health professionals are the front-line staff that deliver care to our patients at BC Cancer. They support patients throughout their daily activities, and are tasked to deliver increasingly complex treatments and procedures to an

aging population. Research can be disruptive to the efficient operation of a care organization, yet it is essential to explore alternative, improved means of delivering care. To fulfill PHSA's mandate of innovation, we will support research in developing alternative models of care, and embedding a culture that embraces innovation and change in cancer care. **We will create a chair in nursing research in collaboration with UBC to improve models of care, focus on improving patient experience, and connect nurses and allied health professionals to researchers to enable a learning health system that embraces innovation.**

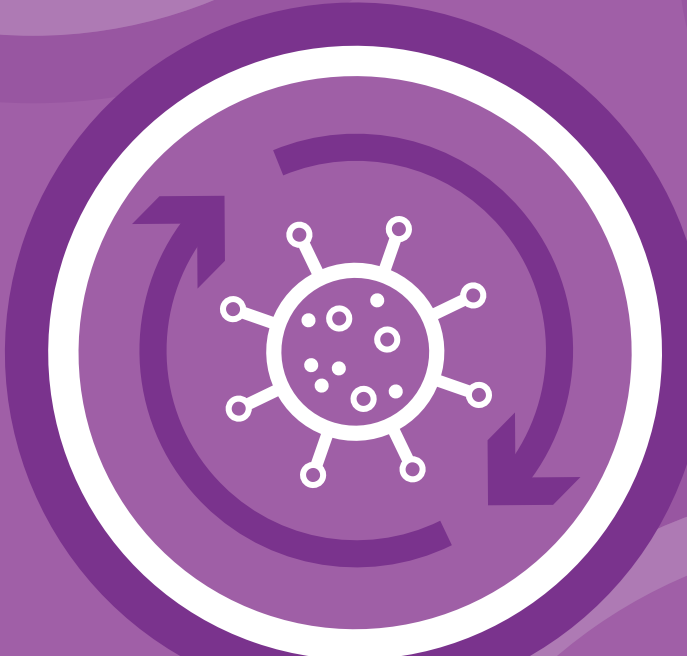
### Objective 3.4 Support thematic multidisciplinary research programs to ensure long term success and sustainability

Large multidisciplinary teams such as the Breast Cancer Research Program, Ovarian Cancer Research (OvCaRe), Centre for Lymphoid Cancer (CLC) and the Personalized OncoGenomics Program (POG), as well as other programs such as the Leukemia Program, Molecular Imaging and Therapy Program, Lung Program, Pancreas Centre BC, Prostate Cancer Program, and Immunotherapy Program have been at the centre of many of BC Cancer's most celebrated research contributions. These programs have also been powerful engines to train the next generation of young scientists invested in multidisciplinary research. We aim to continue this tradition with the formal designation of Centres of Excellence and Multidisciplinary Research Programs that integrate researchers from multiple disciplines. Current programs have grown organically, often around the strong leadership of a few, highly motivated and driven individuals. **To ensure long-term success of multidisciplinary programs that have a track record of sustained and substantial research achievements, we will seek sustainable funding to ensure that they maintain high levels of research excellence.** In particular, internationally recognized programs such as B-PRECISE, CLC, POG and OvCaRe require predictable, ongoing funding to ensure that we maintain core expertise in the team, translate research back to the clinic to benefit our community in B.C. and continue to lead the world in these areas. We will continue to support our research efforts in childhood, adolescent and young adult cancers given their high impact in terms of cancer-related life years lost due to the young age of onset of these diseases. Large multidisciplinary programs will establish a clear leadership structure with a steering committee and organize periodic external peer review. When a critical mass of researchers is present, and when there is an opportunity to regroup clinicians and researchers in a cohesive multidisciplinary group that can have a greater impact by working collectively, new programs may be created.



## STRATEGIC PRIORITY 4

Innovate for a sustainable cancer control system for all British Columbians



BC Cancer holds unique population-based resources and datasets, including the Cancer Registry and Outcomes Units, as well as the BC Generations cohort, which give B.C. researchers rich opportunities to answer important clinical and population health questions using data from all B.C. residents. The BC Generations project is a multi-year prospective cohort that has collected lifestyle, environmental, dietary, physical data, work history, medical history and biosamples in 30,000 healthy B.C. citizens. We collect data across the spectrum of cancer control including information on risk factors and prevention, cancer screening, diagnosis, treatment, mortality, survivorship, and other outcomes. The BC Generations cohort is now starting to identify individuals subsequently affected by cancer. This extensively annotated cohort, with blood samples obtained prior to cancer diagnosis, will be an important asset for epidemiological and genomic research.

### Objective 4.1 Link administrative and research data sets to support data analytics

Our vision is to link population and health services data on demography, risk factors, cancer incidence, health care utilization, outcomes and survivorship with novel genomic and clinical information. This will allow BC Cancer to maximize the impact of our research at the clinical and population levels, drawing on our established strengths in population health, health services research and genomics. **We will invest in biostatistics and data sciences to support world leading data analytics, and link administrative data sets collected at the population level with individual-level genomic and clinical research data obtained as part of our biobanking initiatives and genomic research.**

### Objective 4.2 Inform policy through leading edge research programs focused on population based approaches

Our population mandate will allow us to develop research programs focused on critical population-level policy questions. With expertise in epidemiology, health economics, health services and survivorship research, BC Cancer is uniquely positioned to inform policy positions through research programs in prevention, screening and early detection, treatment and survivorship programs, drawing on the paradigms of patient and person-centred programs, and using patient and community values. Our vision is to conduct research that will improve patient outcomes and population health by developing research focused on getting the best value for money from the cancer system, and achieving critical equity goals in terms of access and outcomes. **To achieve this, we will build capacity by hiring new faculty in prevention, epidemiology, and health services research.**



### Objective 4.3 Conduct research on early detection and population screening approaches

BC Cancer has historically been an early adopter of population based cancer screening, starting from the first implementation of a free cervical cancer screening program in 1949, the implementation of mammography and colorectal cancer screening, the introduction of fluorescence-based early oral cancer detection, and the recent demonstration that HPV testing could outperform the PAP test for cervical cancer screening. We partnered with the TFRI on the implementation of a Canada-wide lung cancer screening initiative by low dose computed tomography. There is an increasing understanding of the important contributions of hereditary predispositions to cancer, and genomic research will identify previously unknown alterations that predispose to cancer. We also expect the rapid development of blood-based or minimally invasive approaches for early cancer detection. **We will expand health services and health economics research to evaluate these new technologies and their potential benefits to the population.**

### Objective 4.4 Conduct research to understand the link between environment, lifestyle, genetic predisposition and cancer, and develop prevention strategies to reduce the burden of cancer

Many of the participants in the BC Generations project have and are subsequently developing cancer. Access to blood and urine samples obtained before the onset of cancer provides valuable insights into the genomic and epigenomic aberrations that are linked with cancer initiation. This will enable us to conduct research to identify genomic alleles associated with subsequent cancer progression, and correlate epigenetic alterations and other biomarkers with lifestyle and other correlative data. **We will conduct research on epigenetic and other biomarkers measured in healthy populations, link genomic analyses of these samples with subsequently obtained tumour tissue, and explore the links between the environment, genomic and biomarker alterations, and the onset of cancer.** This will enable us to develop targeted, scientifically informed prevention strategies that will set the stage for long-term cancer control in B.C.



## STRATEGIC PRIORITY 5

Strengthen  
the research  
infrastructure



Research platforms are strategic core facilities that enable discoveries, maximize efficiency, and improve quality of the data generated for research. BC Cancer's Genome Sciences Centre, for example, serves hundreds of researchers across the world, and has enabled over 1.1 billion dollars in research funding and contracts in British Columbia over the past 20 years. Other platforms, such as the Preclinical and Transgenic Core Facility, the Flow Cytometry Core, the Preclinical Imaging Resource, the Investigational Drug Program and our Clinical Trial Units, are essential for our research community to share equipment, expert personnel, and research at the highest standards of quality. Core facilities provide a competitive advantage for researchers to be successful at national and international grant funding competitions.



### Objective 5.1 Ensure sustainable and productive use of our core facilities

Because they are required to operate consistently, all of our platforms are vulnerable to grant funding fluctuations, personnel changes, and equipment obsolescence. An analysis of current research platforms and equipment maintenance contracts will be performed. We will continue to encourage researchers to support research platforms and avoid equipment duplication, and aggregate whenever possible service contracts for research equipment to improve service and reduce costs. **We will invest in world-class technology through core facilities that will support all aspects of this strategic plan, by optimizing their operations, providing stable resources and engaging with the entire research community.**

### Objective 5.2 Create a system to make biobanks more efficient, findable and accessible and improve access to biospecimens for research use

Access to high quality clinical material, notably blood samples and tissues, is critical to sustain strong translational research programs. Currently, while there has been progress in mandatory registration of biobanks, access to tissues and biobanks remains fragmented, complex, time consuming and inefficient. For patient and blood collection, the Centre for Lymphoid Cancer (CLC) and the Breast Program recently joined forces with the Genitourinary Cancer tumour group to create a province-wide BioCancer Initiative – a system to consent patients, and collect and store biospecimens for translational and clinical research. As an additional resource, the Tumour Tissue Repository (TTR) and their associated biobanking and biospecimen research services have been implemented as provincial biobanking services. The BioCancer Initiative is a great example of a collaborative approach to pool resources and enable BC Cancer to conduct research across the province and across tumour types. **We will build a system to make our biobanks findable, better annotated, and support the collection and retrieval of tissues and samples for research use. The BioCancer initiative will be supported and extended to benefit additional tumour groups.** This will require collaboration with the Provincial Laboratory Agency to build a provincial model for accessing cancer samples for research. The same system would ultimately serve all other research sectors beyond oncology. We will link our biobanks together to harmonize standards, make them searchable, improve their annotation with clinical and outcomes information, and provide clarity about access rules and governance.

### Objective 5.3 Create a research data sciences core

BC Cancer has many different units that collect information on patient outcomes for a variety of purposes, including quality assurance, service delivery planning, and for research use. For the latter, BC Cancer benefits from special legislation that enables our organization to collect clinical and outcomes data from hospitals across the province. We will simplify the architecture and governance of clinical outcomes units, with clear policies and accountability for ethical and privacy-compliant access to the data for research use, and harmonized architecture and data dictionaries to facilitate secure linkages with biobanks, genomic initiatives and other research uses. **We will build capacity to harmonize data collection from outcomes units, and make these data available to researchers for analysis.** Improving statistical support, for both biomedical and clinical research, is also a key priority that could be addressed by creating a core resource in health data science.

### Objective 5.4 Expand the Technology Development Office (TDO)

The PHSA Technology Development Office (TDO) contributes to the development of intellectual property (IP) created by researchers and clinicians. The role of the TDO is to maximize synergy with our institutional and corporate partners to reach the full potential of collaborative research and commercial opportunities alongside BC Cancer's scientific progress. When breakthrough technologies and research methods are identified, the TDO encourages and assists scientists and clinicians at BC Cancer to actively participate in spin-off companies that emerge from these novel discoveries. **We will support the TDO to address increasing complexity in the nature of commercialization efforts, research contracts and clinical trial data and specimen sharing agreements.**







**Dr. Dermot Kelleher**  
Dean, Faculty of  
Medicine &  
Vice-President  
of Health at UBC

Each day we are making impactful discoveries to improve the health of the communities we serve. Working in collaboration, the University of British Columbia and BC Cancer are bridging academic science and clinical research to support patients and families affected by cancer. The integration of research has created new knowledge and far-reaching transformative results to improve the health and well-being of British Columbians. Together, we have built a strong partnership dedicated to delivering effective treatments and world class cancer care.

## PARTNERSHIPS IN THE ACADEMIC ECOSYSTEM

BC Cancer, as part of its role within PHSA, is tasked with planning and coordinating cancer care in British Columbia, but also delivers radiation oncology services and a significant proportion of chemotherapy services. Regional health authorities have an important role in delivering acute and chronic care for cancer patients. Most diagnostic and surgical oncology services are delivered in regional health authorities. Similarly, many outstanding researchers in other research institutes and affiliated universities, notably UBC, contribute greatly to advance science that benefits cancer patients. To advance BC Cancer's strategic plan, collaboration with these partners is essential and should be mutually beneficial.

We will strengthen our ties with our partner universities. **We will closely coordinate to plan the recruitment of new research faculty that will support the strategic priorities outlined in this plan.** We will continue to support UBC by providing faculty and training opportunities in our flagship training programs (bioinformatics, interdisciplinary oncology, genome sciences and technology). **We will also explore, in partnership with UBC, the creation of a formal academic home for oncological sciences,** to enable cancer researchers and clinicians to have clearer channels of communication with the university, centralize education resources in oncology, and improve the strategic alignment around research and education between UBC and BC Cancer. **We will invest in creating additional opportunities to bring together faculty members and trainees interested in cancer research to meet formally as part of annual cancer conferences or meetings.**

We recognize that it is essential for our research mission to attract the best and brightest trainees, from Canada and abroad. In order to improve our international visibility, **we will completely revise and modernize our website and invest in communication resources** to maintain it and provide a window into our vibrant research community. **We will add new competitive graduate scholarships, and continue to support GrasPods' activities for a vibrant trainee community.**

BC Cancer is part of PHSA and thus has a provincial reach. The expanded mandate of PHSA, notably the integration of BC's Agency for Pathology and Laboratory Medicine and Lower Mainland Laboratories provides unique opportunities to improve research access to biospecimen and laboratory data collected around the province. This is essential for BC Cancer Research to reach its full potential in translational and clinical research. We will engage cooperatively with our health authority to seek opportunities to improve



specimen acquisition and access for research use. We will work within PHSA to coordinate data and analytics capabilities for research, ensure secure access to health system data in compliance with privacy regulations, and provide our health authority with specialized resources to support its research needs.

We will strengthen our partnership with the Michael Cuccione Childhood Cancer Research Program at BC Children's Hospital and pursue our involvement with national and international collaborative networks in pediatric oncology.

Beyond British Columbia, we will enthusiastically support collaborative and connection opportunities to engage with other academic health organizations in the Cascadia corridor, to nurture a strong environment of intellectual and economic progress. We will also support the vision of the Terry Fox Research Institute of creating the Marathon of Hope Cancer Centres Network, a collaborative network that will conduct large-scale initiatives, integrate expertise across the country and achieve a new level of competitiveness in cancer research for Canada on the international stage. We will continue to work with large-scale cancer research initiatives and consortia to benefit the international community.



**Sarah Roth,**  
BC Cancer  
Foundation  
President & CEO

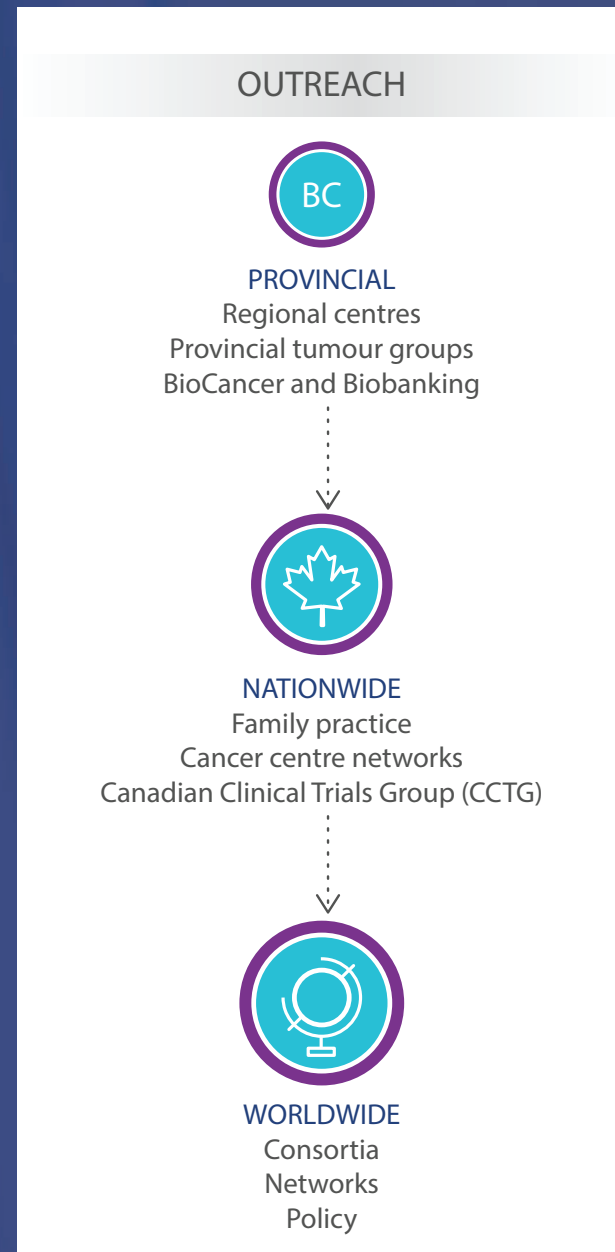
The BC Cancer Foundation is committed to driving awareness and donor support for BC Cancer's world-class scientists driving excellence in research platforms and programs.

A committed donor Gia Tran, who comes to our office daily to make a donation, says "I want to help people." Her simple, yet powerful intent underscores the essence of our community of 100,000 donors. They give to help you break down cancer to change the outcome for patients today and tomorrow.



## IMPLEMENTING THE STRATEGIC PLAN

The BC Cancer Strategic Plan 2019 includes five strategic priorities, with 18 action items (shown on page 31). These strategic priorities will improve patient outcomes through basic biomedical research, integration of genomics, clinical trials, health services



research, cancer surveillance, and population health, the development of personalized care approaches and innovative new programs and interventions. But we cannot execute this ambitious plan alone. We need the engagement of our partners, including other programs within the Provincial Health Services Authority, the BC Cancer Foundation, UBC, SFU, Terry Fox Research Institute, health authority partners, non-profit organizations and pharmaceutical companies. Working in partnership with these organizations will strengthen our research capabilities, align strategies and provide clear direction that improves our ability to generate knowledge, enhance the impact of our research, and support innovation in clinical care. During the course of our five-year Strategic Plan, we will review our research output and adjust our strategic priorities to reflect the rapidly changing cancer research landscape.

In implementing this Strategic Plan, BC Cancer is committed to equity, diversity and inclusivity. We will endeavor to integrate these principles into the organization's research by engaging trainees within a culture of science that embraces equality and fairness, adopting more transparent hiring practices, aspiring to diversity among new recruits and providing support to enable success. In particular, we will strive to achieve more equitable representation of female faculty scientists. We believe they can become the role models needed for further diversity at PHSA, by attracting female youth to science and by mentoring them to become the next generation of scientists.

## STRATEGIC PRIORITIES



Cancer research in B.C. has produced cutting-edge scientific and clinical findings that have impacted cancer care in this province and around the world. It is an exciting time in cancer research as discoveries are being rapidly translated into better therapies and outcomes for patients. Our strategic priorities represent a seamless continuum from basic discovery to population health with provincial outreach. Several key priorities are reflected in multiple specific objectives that are designed to create synergies between areas of BC Cancer core strengths and strategic development.



## SYNERGIZING RESEARCH DEPARTMENT STRUCTURE

Review of department structure by the Strategic Planning committee and feedback from the researchers confirmed the need to restructure some of the research departments to improve clarity on the departmental identities, to allow for better alignment of research themes and synergies, and to maintain a critical mass of researchers within a department structure.

We will reorganize research departments to align with delivery of the mission, in line with the strategic priorities, in order to maximize synergies, maintain a high level of scientific and administrative accountability, and support sustained growth in research outputs.

## RESEARCH AT THE REGIONAL CANCER CENTRES



The six BC Cancer regional centres identified an appetite for improved research support services, including biostatistics, grant writing support, and technology development for industry collaboration and patent support, and to ensure idea exchange and contributions of centres to provincial research, capitalizing on areas of strength unique to each centre. There is interest in expanding and nurturing provincial research groups aligned by tumour site, by discipline, or areas of common interest.

Regional cancer centres collaborate for translational research studies and enable BC Cancer to conduct research across the entire province. Some sites have prioritized quality improvement projects, and they have been actively working to reduce impediments such as lack of clear guidelines for research data sharing,

delays in data retrieval and redundant and excessive use of paperwork to obtain data for research purposes, and limited resources at partner health authorities for clinical trials.

Multicentre partnerships established through regional medical directors and the provincial leads are an effective way to ensure that regional centres contribute to major research initiatives at BC Cancer. **We will establish a forum to engage representatives from regional medical directors, provincial leads, research departments, tumour group leads and thematic program directors to improve communications among researchers and clinicians across the province, improve access to research opportunities and resources, and foster a culture of inclusiveness and collaboration.**



## BC Cancer Research 2019 Strategic Priorities

### Strategic Priority 1: Leverage genomic discoveries to overcome incurable cancers

- 1.1 Support basic research to understand clonal evolution and mechanisms of cancer initiation and progression
- 1.2 Identify new targets for therapy using multiomic approaches
- 1.3 Accelerate the application of whole genome/transcriptome sequencing in treatment resistant and metastatic cancers
- 1.4 Create and link data repositories and platforms to fuel discovery and guide the development of new interventions to prevent, detect and cure cancer

### Strategic Priority 2: Translate cancer biology into diagnostic and therapeutic innovations

- 2.1 Study the role of the immune system and tumour microenvironment in cancer progression and treatment resistance
- 2.2 Leverage innovative model systems to prioritize targets for therapeutic intervention
- 2.3 Create new capacity in cancer drug and cell therapy development
- 2.4 Improve technologies for cancer imaging and precision radiotherapy

### Strategic Priority 3: Increase clinical capacity to enable translation of innovations for improved patient outcomes

- 3.1 Enhance the clinical trial infrastructure and create expanded opportunities for patient participation
- 3.2 Support investigator initiated studies to improve clinical practice
- 3.3 Create a chair in nursing research to develop improved models of cancer care and improve patient experience
- 3.4 Support thematic multidisciplinary research programs to ensure long term success and sustainability

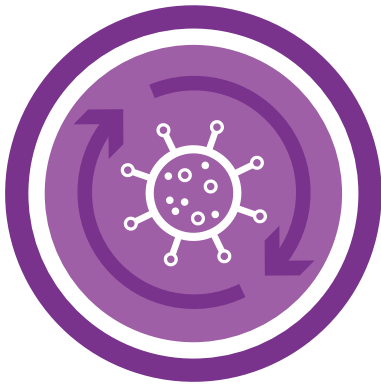
### Strategic Priority 4: Innovate for a sustainable cancer control system for all British Columbians

- 4.1 Link administrative and research data sets to support data analytics
- 4.2 Inform policy through leading edge research programs focused on population based approaches
- 4.3 Conduct research on early detection and population screening approaches
- 4.4 Conduct research to understand the link between environment, lifestyle, genetic predisposition and cancer, and develop prevention strategies to reduce the burden of cancer

### Strategic Priority 5: Strengthen research infrastructure

- 5.1 Ensure sustainable and productive use of our core facilities
- 5.2 Create a system to make biobanks more efficient, findable and accessible and improve access to biospecimens for research use
- 5.3 Create a Research Data Sciences Core
- 5.4 Expand the Technology Development Office (TDO)





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