



**Arnie Charbonneau
Cancer Institute**

Charbonneau Cancer Institute Strategic Plan

2022 - 2027

April 12, 2022

CONTENTS

| | |
|--------------------------------------------------------|----|
| BACKGROUND | 3 |
| OVERVIEW OF THE INSTITUTE..... | 3 |
| RESEARCH THEMES | 4 |
| INSTITUTE ACTIVITIES..... | 5 |
| CORE VALUES | 5 |
| COMMITMENT TO EQUITY, DIVERSITY, AND INCLUSIVITY | 6 |
| STRATEGIC PLANNING PROCESS..... | 7 |
| MACRO AND MICROENVIRONMENTAL FORCES..... | 7 |
| Macroenvironment | 7 |
| Microenvironment | 8 |
| STRENGTHS, WEAKNESSES, OPPORTUNITIES, AND THREATS..... | 9 |
| Strengths and Opportunities | 9 |
| Weaknesses and Threats..... | 11 |
| PLANNING AND ENGAGEMENT SURVEY | 11 |
| FIVE-YEAR PLAN..... | 12 |
| VISION AND MISSION | 12 |
| THEMATIC AREAS..... | 13 |
| ACTIVITIES AND DELIVERABLES | 13 |
| Research..... | 14 |
| Education | 16 |
| Community Engagement..... | 18 |
| REVIEW AND EVALUATION..... | 19 |
| CONCLUSION..... | 20 |

BACKGROUND

In 2020, the University of Calgary and Alberta Health Services signed a memorandum of understanding (MOU) concerning cancer research in Calgary. The MOU was designed to enhance opportunities for collaboration, to facilitate the sharing of philanthropic opportunities and resources such as research space and personnel, and to streamline processes that would better enable cancer research. The need for and the spirit of the MOU was largely informed by an external review of the Arnie Charbonneau Cancer Institute in 2017 and 2018 by scientific and community experts from across North America. The review suggested the need for a stronger partnership between the academic and clinical cancer research institutions and better integration between the respective research communities. As a mechanism to achieve these goals, the MOU described a clearer role for the Institute and created a joint governance structure, whereby the Institute Director reports jointly to the University of Calgary and Alberta Health Services through the Cumming School of Medicine and Cancer Care Alberta, respectively.

Considering the MOU, and in anticipation of the approaching end date (e.g., 2022) of the previous strategic vision¹ of the Arnie Charbonneau Cancer Institute, the need was identified for a refreshed strategy that more purposefully addressed the new partnership and responsibilities of the Institute.

OVERVIEW OF THE INSTITUTE

The Arnie Charbonneau Cancer Institute is the cancer research institute of the University of Calgary and the Calgary Cancer Centre. Health research institutes were designed to ‘create the future of health’ for patients and the community at large, and nowhere is this future more challenging than in cancer. Cancer has become the leading cause of death in Canada, eclipsing heart disease (30% vs. 20%), and the number of new cases in Canada is expected to increase by 40% over the next 15 years.² To reduce the burden of cancer, a cancer research institute was established by the Cumming School of Medicine in 2003 and formally named in 2014 to recognize the generous gift of its namesake, Calgary businessman and philanthropist, Mr. Arnie Charbonneau. In 2020, the Charbonneau Cancer Institute, through an MOU between Alberta Health Services and the University of Calgary, took on the official role of the cancer research institute of the University and the Calgary Cancer Centre.

The Arnie Charbonneau Cancer Institute creates a better future for cancer patients, their families, and the community at large through cancer research. Research is what enables progress. As the cancer research engine of the University of Calgary and the Calgary Cancer Centre, we are generating new discoveries and moving knowledge to action to create a better future for patients in Alberta and beyond.

As the cancer research engine of the University of Calgary and the Calgary Cancer Centre, we are generating new discoveries and moving knowledge to action to create a better future for patients with cancer in Alberta and beyond.

¹ Charbonneau Cancer Institute. Vision 2022. University of Calgary. 2018 Sep. Accessible at: <https://charbonneau.ucalgary.ca>.

² Canadian Cancer Society. Cancer Statistics at a Glance. 2021 Apr. Accessible at: <https://action.cancer.ca>.

RESEARCH THEMES

Cancer is a multilayered challenge involving the functioning of cells and tissues within the body, individual patient factors, society and public health policy, and the functioning of the health system, all of which work together to influence who gets cancer and what their outcomes are in response to therapies and other care interventions. The goal of cancer research is to study these layers of the cancer challenge and devise new strategies to reduce the risk of cancer, detect cancer earlier when it is more treatable, improve response to cancer therapies, improve the physical, mental, and spiritual well-being of patients throughout their experience with cancer, and to support them as they transition into survivorship or face the difficulties of end-of-life care.

The Institute supports all manner of cancer research, with the ultimate goal of improving outcomes for patients and families affected by cancer, and for the community. This research includes work to address the biological and therapeutic challenge of cancer, the population and public health challenge of cancer, and the personal, family, and societal challenge of cancer. It is conducted by researchers from various University of Calgary faculties (i.e., Cumming School of Medicine, Faculty of Science, Faculty of Nursing, Faculty of Arts, Faculty of Kinesiology, and the Schulich School of Engineering), researchers from various Alberta Health Services' clinical facilities such as the Tom Baker Cancer Centre, Foothills Medical Centre, Alberta Children's Hospital, Rockyview Hospital, and other teaching hospitals, as well as those from partnering institutions, such as the Universities of Alberta and Lethbridge and Athabasca University.

Members are engaged in all types of cancer research, from the basic science of cancer to its psychosocial effects, including investigating the potential of lifestyle changes to prevent cancer, developing new ways to detect cancer at an earlier more curable stage, discovering how knowledge of the human genome can be harnessed to improve the precision and effectiveness of cancer treatment, improving health care delivery to ensure affordable high-quality cancer care, and understanding the special needs of cancer patients and their families and a growing number of long term survivors.

To guide its actions, the institute, in association with members in the Department of Oncology and the Cancer Centre, identified overarching cancer research themes (Figure 1) in its visioning exercise in 2018. These themes were reaffirmed in 2021 during the strategic planning process described later in this plan.

- ***Decreasing Cancer in the Population:*** understanding how cancers arise and who is at risk so that we can stop cancer before it starts; a research focus on prevention through changes in lifestyle, earlier detection of cancer, and mitigation of inherited risk will reduce the global burden of cancer.
- ***Improving Cancer Treatment:*** understanding cancer biology, how cancers arise, how they evolve and adapt to therapies, and how cancer cells interact with other cells and tissues in the patient, and then innovating and testing new biologically informed interventions so that we can increase treatment options available and be armed with the information required to select the right treatment for the right patient; cancer biology research will lead to practice changing trials that redefine care standards.



Figure 1. Calgary Cancer Research Framework (2018).

- ***Improving the Patient Experience:*** understanding the challenges faced by patients and their care givers throughout their experience with cancer and beyond and developing and testing new ways to support the physical, mental, and spiritual well-being of patient; a focus on how the whole patient is affected by cancer and the challenges thereafter will improve outcomes for more patients and survivors.
- Encompassing this work is a focus on care delivery through ***Cancer Outcomes (Health Systems) Research:*** understanding how patient, societal, and health systems factors affect the application of treatment and cancer outcomes and how different dimensions of treatment and care impact the patient experience and journey so that we can deliver our treatments and care to the right patients at the right time – effectively, sustainably, and equitably.

Focusing our research within these themes to address gaps in knowledge and practice along the entire cancer continuum, we aim to make the greatest impact for those touched by cancer.

INSTITUTE ACTIVITIES

To support and advance research, the Institute provides strategic guidance to its research programs; supports its members in developing competitive research funding proposals; works with university departments or AHS, as appropriate, to recruit outstanding scientists; works with educational leads within U Calgary to contribute to the training of graduate students, postdoctoral fellows, and clinical trainees supervised by Members of the Institute; acquires and maintains equipment to support the research mission and programs of the Institute; manages designated cancer research space at both the University and AHS; and carries out core functions, such as accounting, reporting, planning programs, and developing communications, among others.

To execute these activities, the Institute is generously funded by philanthropic giving. Donations and grants from individuals, families, corporations, foundations, trusts, and other partners, either directly to the Institute or to its programs and investigators, fuel all of this work. Philanthropy also helps supplement research grants from provincial and federal funding agencies to extend the impact of our research programs. Therefore, strong engagement with the community and our funding partners, with ongoing dialogue about research priorities, strategies, and indicators of success is of critical importance to the sustainability of the Institute.

CORE VALUES

The Arnie Charbonneau Cancer Institute will achieve excellence and impact through:

What We Do:

Maximize the research impact of philanthropy

Develop new research teams and programs

Provide mentorship and guidance on grant applications

Recruit the best and brightest scientists to Calgary

Train tomorrow's cancer research leaders

Develop, maintain, and expand excellent research facilities



Connection

We will strive to foster a strong sense of community and collaboration that harnesses our researchers' collective expertise and our public's engagement to create a research ecosystem built on trust, respect, recognition, openness, and equitable recognition.



Creativity

We will strive for creativity and ingenuity, encouraging our members to think 'what if', so that they can imagine and innovate a better tomorrow.



Accountability

We will hold ourselves scientifically and financially accountable, with a sense of responsibility for stewardship, sustainability, and transfer of knowledge.



Continuous Improvement

We will strive for continuous improvement in all our education and research endeavors, to create change for the better, and to foster a culture of growth by promoting ownership, open-mindedness, self-reflection, and the relentless pursuit of results.

COMMITMENT TO EQUITY, DIVERSITY, AND INCLUSIVITY

Equity, diversity, and inclusion are critical to driving excellence and innovation in research, through a number of mechanisms. First, physicians and scientists who come from diverse backgrounds are more likely to conduct research involving their own communities. This trust and connection to community is what can fuel more engagement between health care researchers and community members. Second, by including diverse participants in clinical studies, researchers can better identify differences in symptoms and pathologies, formulate better treatments and solutions, and improve health disparities across the entire population. This diversity of research participants is all the more critical as machine learning, data science, and precision oncology approaches are further developed and implemented. Finally, diversity



within research teams mean added lived experience, fewer errors, and more complete observations. Thus, the principles of equity, diversity, and inclusion (EDI) are foundational to all work at the Arnie Charbonneau Cancer Institute, whether in the domains of research and education or through community engagement. Activities and deliverables to enhance EDI throughout the Institute, the university, and beyond have informed and have been interwoven in the goals and activities that follow in this plan.

STRATEGIC PLANNING PROCESS

To inform strategic planning, a series of informal discussions were conducted with various academic and clinical leaders, including the Senior Associate Dean (Research) of the Cumming School of Medicine, the Scientific Director of Cancer Care Alberta, the Medical Director of the Tom Baker Cancer Centre, the Chairperson of the Institute's Strategic Advisory Board, several University of Calgary Department Heads, several Directors of partnering health research institutes, and past leaders of the Institute. Next, a strategic planning and engagement survey was conducted among faculty, trainees, staff, and external stakeholders and partners to gain a better understanding of the local context, including any new strengths and weaknesses in the environment, and to identify strategic priorities and opportunities for improvement. Finally, to ensure alignment, a review was conducted of existing research strategic plans, with a focus on the University of Calgary's strategic plan, *Growth Through Focus*³, and Alberta Health Services' *Health & Business Plan*⁴, as well as the research plans and priorities put forward by the Cumming School of Medicine, the Department of Oncology, and Cancer Care Alberta. Summarized below are the results of these inquiries.

MACRO AND MICROENVIRONMENTAL FORCES

Macroenvironment

While there are many macroenvironmental factors to consider, the ones most pertinent to the development of a five-year strategic plan for the institute include the global coronavirus pandemic that began in 2019, the economic and sociopolitical climate of Canada, and the continuous improvement in technological capabilities required for deeper learning in all disciplines.

The global coronavirus pandemic caused by the SARS-CoV-2 (COVID-19) virus and its variants has had a major negative economic impact on countries around the world, particularly those that rely on income from energy commodities. As such, the pandemic has impacted the availability of philanthropic funding overall and has redirected some of the available federal research funding toward vaccine efforts and understanding the impact of the pandemic at a societal and personal level. Moreover, as economies begin to recover from the pandemic, there is a risk that inflation could lead to higher costs for goods and services as well as labour shortages. Thus, the cost of conducting research within the academic sector may be at risk of increasing over time.



³ University of Calgary. *Growth Through Focus*. 2021 Apr. Accessible at: www.ucalgary.ca/president/congress/unstoppable-growth-through-focus.

⁴ Alberta Health Services. *Health & Business Plan*. 2021 Apr. Accessible at: www.albertahealthservices.ca/about/page13365.aspx.

According to 2019 data from the World Bank and the Organization for Economic Co-operation and Development (OECD), Canada is among the top 20 highest gross domestic product (GDP) per capita countries and top 20 most productive (e.g., USD per hour worked) countries, with a relatively low corporate tax rate (24.5%)⁵. Alberta's energy sector, a major source of provincial revenue, is well-positioned to continue to meet ongoing demands for oil and gas, while responding to the increasing emphasis on reducing climate change and the need for renewable energy sources. The positive impact on funding available for research at the federal and provincial levels, as well as from past donors and foundations, should therefore support further growth in the academic sector.

Another positive development in the macroenvironment is the availability of ever more advanced technological capabilities, which continue to expand at an incredible rate. For example, in the last couple of decades our understanding of the human genome and our ability to sequence at the single cell level has enabled the discovery of new treatments for diseases that were once considered incurable. Expanding capabilities in artificial intelligence are furthering these developments and aiding in the development of risk prediction tools and mitigation strategies for a variety of health conditions.

Simultaneously, however, the advanced technology and skills needed to use those technologies has resulted in a research landscape that is becoming increasingly specialized. Research questions and methodologies have become more and more complex. This presents an ever-greater challenge for individual researchers in single disciplines to make impactful discoveries. Instead, to be truly impactful, health research will need to rely on effective collaboration, resource sharing, and knowledge exchange among experts across multiple disciplines, institutions, and countries. In response, the global research community has proposed adopting and applying Open Science principles to promote sharing scientific knowledge, samples, methods, and data within the research community as soon as they become available so that there is a faster path to innovating new solutions. Silos must be broken down in favor of structures and policies that support wide-scale collaboration. Academic institutions must be ready to support such opportunities.

Microenvironment

The microenvironment relates most directly to forces occurring at the institutional level, the municipal level, and the provincial level. Important factors for consideration include provincial investment in postsecondary institutions, the sociodemographic, educational, and economic profile of Calgary as well as its residential affordability, institutional and municipal interest and investment in entrepreneurship and innovation, and the clinical infrastructure that enables research.

In response to the economic downturn in Alberta caused in part by several consecutive years of low global oil prices and worsened by the coronavirus pandemic, the Government of Alberta's provincial budget released in February 2021 projected an \$18.2 billion deficit. One measure by the government to reduce the province's debt was to decrease the Campus Alberta grant, which was reduced for the University of Calgary by \$83.9M, from \$496.4M annually in 2018-19 to \$412.5M annually in 2021-22. Additional cuts are anticipated for 2022-23. Reduced spending on postsecondary institutions has led to a reduction in the academic workforce, a salary freeze (since 2016) for management positions, an increase in tuition for students, a reduction in new initiatives and projects, a reduction in facilities upgrades and

⁵ The Global Economy. Business and Economic data for 200 countries. 2021 Apr. Accessible at: <https://www.theglobaleconomy.com>.

preventative maintenance, reduced spending on travel, engagement, events, and marketing, and a reduction in information technology projects and new equipment purchases. Fortunately, the provincial budget for 2021-22 included increased spending on health by over \$900 million (a 4% increase) to \$23 billion, excluding the impact of coronavirus pandemic. This included \$5.4 billion for physician compensation and development, including academic medicine. Thus, the impact of the economic downturn on new cancer research initiatives and any expensive projects or strategic hires within the university may be mitigated to some extent by adjustments to the health budget.

Despite the clear economic challenges, the City of Calgary and the University of Calgary remain strongly committed to a focus on entrepreneurship and innovation. Both have invested in infrastructure and capacity to harness the academic community's ingenuity and translate discoveries into products and services with commercial potential. Examples of these infrastructures and supports include a new Life Sciences Innovation Hub, Innovate Calgary, Creative Destruction Lab (CDL–Rockies), Alberta Health Services' Innovation, Evidence & Impact Team, and Calgary Economic Development. Moreover, the University of Calgary, through its *Growth Through Focus* plan, aims to be *the* entrepreneurial university—one where students, faculty, and staff are envisioned to face fewer barriers to innovation and have more tools at their disposal to change the world around them.

The province of Alberta, and the City of Calgary especially, continue to benefit from a young and well-educated population. The median age of residents of Calgary is 37.6 years, versus the Canadian median of 40.0 years, according to Statistics Canada (2021) and, among Canadian cities, Calgary has the highest proportion of residents aged 15-64 years of age. Moreover, Calgary ranks third among Canadian cities with the highest attained education level. With a relatively high median household income greater than \$100,000 and average housing prices below the Canadian median, Calgary is an attractive city in which to work and live. Thus, as opportunities arise to recruit new and emerging scientists and postdoctoral fellows, playing up Calgary's appeal remains an important strategy for recruitment.

Alberta's single payer health care system and its strong data infrastructure provide clear advantages for the research community. The province's health data is either already connected within a single platform, with data collected on patients from entry into the system right through to follow-up and discharge or has databases that can be relatively easily linked in a short amount of time. Single-payer provincial, population-level electronic health records are unique to Alberta and equivalent systems for population level health data capture are not found in most jurisdictions in Canada or the U.S. Alberta has further invested in updating its health data platforms and is in the process of creating electronic data warehouses that can be leveraged both for both health system improvements and for the conduct of research. Researchers from neighboring provinces, particularly those working in epidemiology and health services research, have come to Alberta to take advantage of the robust health data available to them.

STRENGTHS, WEAKNESSES, OPPORTUNITIES, AND THREATS

Strengths and Opportunities

Robust clinical data assets in a single provincial electronic medical record system for inpatient and hospital-based care are a strength. There is an opportunity to further increase the richness of the cancer data environment by integrating clinical data with additional research biospecimen and molecular data. Greater lab-to-clinic data integration would position our teams to be more agile in addressing scientific questions in the areas of biomarker research, precision cancer medicine, and health technology

assessment of molecular testing approaches. A strong integrated data platform would not only serve as a platform for discovery but would also pave the way for greater use of artificial intelligence and machine learning approaches to improve cancer care and outcomes in the future.

In 2015, the Government of Alberta committed funding to construct a new cancer centre in Calgary. The new centre is scheduled to be completed in 2023 and will add a total of 60,000 square feet of net new cancer research space for a combined footprint of almost 100,000 square feet at both Alberta Health Services and the University of Calgary. Research facilities within the new centre were designed with state-of-the-art capabilities and will be able to accommodate the advanced equipment and technologies and data infrastructure required for cancer research. Moreover, the new cancer centre represents an opportunity to attract new funding for the expansion of existing research programs and the development of new programs, as well as for the recruitment of top cancer scientists.

The MOU between the University of Calgary and Alberta Health Services has strengthened the partnership between the organizations and laid a path for enhanced sharing of space, equipment, and personnel, streamlined research processes, and reduced duplication of efforts. The result of the MOU has already been a more collaborative, open, and engaging environment, with tangible improvements for the research community soon to be demonstrated as work progresses to operationalize the MOU with a companion document (Collaboration Agreement on Cancer Research) that will follow. Thus, the Institute's strategy will align with Cumming School of Medicine's Precision Health Strategy and the aspirations and priorities of Cancer Care Alberta and leverage the strength of the MOU.

Cancer researchers in Calgary are collaborative, both locally and internationally, and work across the spectrum, representing many diverse disciplines and areas of focus. Cancer research in Calgary is strong in key areas, such as cancer prevention and epidemiology, psychosocial oncology, health services and systems research, clinical trials, precision therapeutics, precision radiotherapy, patient-centered approaches, cancer biology, cancer genomics, and cancer immunotherapy, and it is strengthened by linkages with engineering faculty, science faculty, nursing faculty, kinesiology faculty, and arts faculty. Overall, the cancer research community has performed exceedingly well in national grant competitions, especially competition for tri-council (i.e., Canadian Institutes of Health Research, Natural Sciences and Engineering Research Council, Social Sciences and Humanities Research Council) funding. For example, in the Fall 2020 CIHR competition, Charbonneau researchers achieved a success rate of 41% (versus the national average of 15%), representing eleven funded projects valued collectively at over \$8.5 million. This success is due in part to the excellent science being conducted by our investigators, but also to an increasingly supportive research community that embraces a culture of internal peer review.

The cancer trainee community in Calgary is highly engaged and energetic, having established within the past few years a Charbonneau Trainee Association that developed and launched a public lecture series aimed at educating the public about cancer. The series, *Late Night Labs*, was delivered twice in person in 2019 and twice as an online webinar in 2020. Each offering was attended by over 100 members of the public and recordings of the lectures have subsequently received hundreds of views.

Despite the economic downturn experienced generally over the past several years, the philanthropic community in Calgary continues to give generously to the cancer mission. Giving to cancer research through the Arnie Charbonneau Cancer Institute reached an all-time high in 2020-21 with over \$22.8M pledged to the Institute and its members. Several new gifts from the community are supporting research focused on cancer immunotherapy, cancers of the head and neck, metastatic renal cell (kidney)

carcinoma, psychosocial oncology and survivorship in pediatric patients, novel therapeutics for glioblastoma (brain cancer), childhood cancers and blood disorders, colon cancer and surgical oncology, lung cancer, and several other areas of excellence. The recent economic upswing in Alberta's energy sector may be an opportunity for further giving that could support sustainability of the institute and provide mechanisms for recruitment of new researchers despite substantial challenges faced by the University in recent years.

Weaknesses and Threats

A weakness in the cancer research landscape, not just in Alberta but across international boundaries, is the sharing of cancer data and resources. Although the open science concept is gaining traction in academic institutions, research journals, and the greater scientific community, it has not yet been widely adopted in practice by investigators due to many individual and systemic factors. For the most part, local research groups are tackling the cancer challenge in silos, duplicating efforts, creating redundancies, and missing out on opportunities to share methodologies and resources. The fragmented landscape risks placing us at a competitive disadvantage and limits the research questions that our investigators can answer. To mitigate this, the institute could more actively foster open science through, for example, investing in infrastructure for data sharing, first locally within our own communities—Calgary and Alberta – with an eye toward greater sharing and collaboration nationally and internationally.

Another weakness in the cancer research landscape is the training, recruitment, and retention of highly qualified scientists, both at the faculty level and the staff level. Although federal spending on research and development within the science and technology sector has been steadily increasing over the past several years according to data from Statistics Canada, the proportion of gross domestic product (GDP) allocated to research and development in Canada is steadily declining compared to the average of all Organisation for Economic Co-operation and Development (OECD) countries; in 2020, research and development spending represented 1.698% of Canada's GDP (versus 2.476% of GDP for all OECD nations).

A current but addressable weakness is the institute's visibility. Although the institute is becoming increasingly recognized within the academic community and on social media, it remains a largely unknown entity to the public. Recognition within and around Calgary and Southern Alberta is particularly important as the Institute strives to enhance its relevance, reach, and impact. A second more local threat is the possibility of further cuts to the Campus Alberta Grant. However, as the coronavirus pandemic continues to resolve over the course of 2022 and 2023, and activities dependent on Alberta's energy sector resume, government revenue should also increase over time, possibly reducing the risk of further cuts to postsecondary institution funding.

PLANNING AND ENGAGEMENT SURVEY

To inform the strategic plan, a Strategic Planning and Engagement Survey was conducted throughout the month of February 2021. The survey was administered to over 400 faculty, trainees, and staff within the institute from across the clinical to basic science continuum. The survey was also sent to research partners and made available to the public. With an overall response rate of 48%, one highlight of the survey was the high level of satisfaction with the Institute, among faculty, trainees, and staff. The survey also identified areas for improvement or prioritization, including the need to improve engagement among members, especially among prospective members within the clinical research community, the need to improve visibility within the community (both the public and the greater research community), the need

to improve the trainee experience, the need to enhance the amount of funding available to existing researchers and teams, and the need to enhance collaboration between research groups and programs.

The information provided collectively by the environmental scan, the analysis of strengths, weaknesses, opportunities, and threats, the strategic planning survey, and content experts was reviewed by the Institute Director, Associate Directors, and members of the Charbonneau Executive Committee, who used a collaborative consensus-based process to develop the Institute's five-year strategic plan. The plan is described below and includes the Institute's vision and mission statements, core values, commitment to equity, diversity, and inclusion, and specific goals and planned activities.

FIVE-YEAR PLAN

Informed by the priorities articulated by our members, trainees, and staff, as well as the community, an understanding of our environment, and an analysis of our opportunities, strengths, weaknesses, and threats, the Arnie Charbonneau Cancer Institute will endeavor to 1) address clinically impactful research questions and 2) support this work through implementation of a series of activities in the domains of research, education, and community engagement.

VISION AND MISSION

Cancer is a complex challenge that impacts individuals physically, mentally, and emotionally, as well as the families, communities, and society around them. The Charbonneau Cancer Institute's vision is a future in which the personal and societal burden of cancer for patients, families, and the public at large is lessened through impactful, collaborative, and multidisciplinary cancer research – a future in which every patient that comes through the doors of the Calgary Cancer Centre receives treatment and care that is informed by high-quality research and, in which every patient's experience can contribute to the betterment of treatment and care for others.

Through research, we seek to advance knowledge and make discoveries that will directly impact patients and their care—by improving their treatment, their experience, and their outcomes—and by reducing the burden of cancer in the population. Our goal is to create and support the vibrant cancer research ecosystem that makes this possible – a research ecosystem that enables the most bench-to-bedside integrated, networked and community-engaged, and most real-world cancer research endeavor in the country.

We endeavor to advance knowledge and make discoveries that will impact patients—by reducing the burden of cancer in the population, improving their treatment, improving the patient experience, and improving cancer outcomes.

1) PRIORITY QUESTIONS WITHIN RESEARCH THEMES

By assessing our research themes, structures, and unique resources (e.g., data, samples, expertise), strengths, and opportunities, we can define high-impact areas of cancer research and priority questions that we are well-positioned to address. These will inform our aims, specific activities, and deliverables.

| THEMATIC AREAS | QUESTIONS |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Individual and Population Cancer Prevention <ul style="list-style-type: none"> Behavioral, hereditary, and environmental risk factors Biology of aging and DNA sciences Exposure science Assessment of population trends and predicting future burden Social, cultural, and environmental implications of cancer Societal, economic, and policy interventions for preventing cancer | <ul style="list-style-type: none"> What are the biological, environmental, behavioral, and social determinants of cancer risk and prevention for our population? How do we integrate this information to be able to inform our patients about their risk and ways to reduce it, detect it, or treat it at early stage? How do we change health policy or practice to in our healthcare system to reduce risk economically and equitably in the population? |
| Clinical Presentation and Advanced Diagnostics <ul style="list-style-type: none"> Early cancer detection and screening Advanced diagnostics Precision cancer phenotyping Biomarkers Radiopharmaceuticals and Imaging Multi-omic analyses | <ul style="list-style-type: none"> How can we screen for and detect cancer more accurately, earlier, and less invasively? How do we leverage emerging technologies for more accurately monitoring molecules, cells, tissues, and patients to better predict how cancer will behave and respond to treatment? How do we best implement these tools considering the benefits, risks, costs, and evolving treatment paradigms? |
| Innovative Therapeutic Approaches <ul style="list-style-type: none"> Cancer biology and disease characterization Mechanisms of progression and resistance Precision cancer treatment selection Novel therapies Immune oncology | <ul style="list-style-type: none"> What are the molecular characteristics of cancers that drive disease and can inform treatment? How does tumour-host biology impact treatment efficacy and toxicity, and how can we use that information to develop more effective therapies? How do we effectively adopt new therapies or modify current approaches considering the benefits, risks, costs, and operational implications? |
| Well-Being of Patients with and after Cancer <ul style="list-style-type: none"> Person-centered care, patient-reported outcomes Supportive care Psychosocial and integrative oncology Palliative and end-of-life care Spiritual care | <ul style="list-style-type: none"> How do we enhance the psychosocial and spiritual wellbeing of patients and families throughout the cancer journey? How do we integrate additional complementary therapies and new technologies to support the care of patients? How do we reduce or prevent the late effects of cancer and its treatment to enhance survivorship and quality of life? |
| Care Delivery & System Performance <ul style="list-style-type: none"> Outcomes research Implementation science Decision- and compliance-support tools Learning health system Equity in treatment and care | <ul style="list-style-type: none"> Leveraging the rich provincial data and samples assets of AHS, how do we use real-world data to improve quality of care in real-time? How do we move new knowledge to clinical impact in the health system? How do we improve the equity of cancer treatment and reduce inequities across populations? |

2) ACTIVITIES AND DELIVERABLES

To enable our work, we have defined specific aims and activities to implement or promote within our core functional domains of **research**, **education**, and **community engagement**.

Research

The Institute commits to improving cancer treatment, improving the patient experience, improving patient outcomes, and decreasing the burden of cancer in the population by increasing the activity, quality, and impact of our research. The institute has previously supported its commitment toward research excellence by helping individual investigators achieve greater success in all applications for funding, especially from national and tri-council funding agencies. Research excellence has also been supported by critical infrastructure and people. The institute invests in core units that provide tissues, data, equipment, and other supports for research. These and other resources are available to institute investigators, trainees, and staff to further their research activities.

Recognizing that cancer research and technologies have become more complex, however, and that national and international funding agencies have increasingly focused on translational impact and multidisciplinary approaches, the Institute will strive to grow and support the collaborative environment for research by facilitating team building with strategic alignment between investigators from multiple disciplines at various clinical and academic facilities. Of particular importance to being able to address 'big questions' is the need to facilitate greater collaboration between biomedical scientists focused on cancer biology and mechanisms of disease and clinician scientists and population and public health researchers.

In the next five years, we will build on our efforts by focusing on 1) enabling transformative collaboration to address important questions through team science, 2) expanding the external grant success rate and quality of research outputs (including those from collaborative multidisciplinary teams), and 3) increasing equity, diversity, and inclusivity in our research. **Our overarching goal is to increase the activity, quality, and clinical impact of our research** in the priority research areas defined above.

Aim 1: Enable transformative collaboration to address important questions through team science

Activities:

- Activity 1.1: Create and/or support collaborative funding opportunities that bridge cancer research communities and promote translation and implementation of findings;
- Activity 1.2: Develop and/or support infrastructure that improves the discoverability and sharing of samples, data, and research tools; and
- Activity 1.3: Harness and cross-fertilize expertise across streams of research.

Deliverables:

To reduce silos between researchers and clinical teams and enable more impactful science, we will emphasize collaboration—across the province, the country, and internationally. Specifically, we will:

Connect People

- Create an inventory of existing research opportunities (internal and external) that promote collaboration between cancer researchers or could be augmented to enhance collaboration;
- Coalesce cancer researchers and teams within and beyond the institute;
- Strategically recruit the brightest minds to support the building of effective research teams; and
- Develop a mechanism for 'bridging' potential collaborators across various cancer research communities, based on user needs.

Establish Platforms, Programs, and Pathways that Enable Collaboration

- Launch new and highlight existing collaborative and cross-disciplinary funding opportunities to foster cross-disciplinary collaboration and support excellent team science;

- Develop and support an integrated data platform that promotes data discoverability and data sharing across disciplines;
- Support technology platforms that enhance visibility, access, and analysis of patient samples;
- Create mechanisms for improved wayfinding of existing infrastructure (cores, hubs, facilities);
- Create a mechanism for ongoing identification and prioritization of investments in broadly impactful tools, equipment, methods, expertise and infrastructure for effective team science; and
- Create a sustainability plan for Institute-managed cross-cutting research facilities.

Measures of success:

Success will be measured by 1) the establishment and funding of new cross-disciplinary cancer research initiatives; 2) demonstrated increases in external grant-based funding of team science; 3) an increase in the infrastructure (space, equipment) available to conduct research; and 4) an increase in the number and quality of outputs such as publications, policy impact, translational clinical trials.

Aim 2: Expand the external grant success rate and quality of research outputs

Activities:

- Activity 2.1: Promote awareness of external funding opportunities;
- Activity 2.2: Promote uptake of internal peer review (IPR);
- Activity 2.3: Expand the IPR program to include a detailed review of grant budgets to maximize potential revenue; and
- Activity 2.4: Develop research mentorship programs that meet the needs of investigators at various career stages in independent research or teams.

Deliverables:

To ensure that our research community remains highly competitive on the national and international stages and maximizes the impact of donor funding by leveraging new opportunities for provincial, federal, and international funding sources, we will emphasize continuous improvement of our investigators, researchers, and personnel. Specifically, we will:

- Develop a communications strategy to inform members about opportunities for IPR;
- Coalesce investigators around the development of new grant applications;
- Expand our IPR program to include strategies for maximizing budget requests and other components, as identified by members' needs assessment; and
- Establish research mentorship teams for early career investigators, including small-group consultations, grant development workshops, and seminars by external speakers.

Measures of success:

Success will be measured by: (1) increase in the number of Institute members using IPR; (2) increase in the number of successful grants; and (3) increase in average revenue per successful grant from external competitive sources.

Aim 3: Increase equity, diversity, and inclusivity in our research

We will endeavour to increase exposure and transparency on EDI-based issues and intersectionality in our research by committing to:

- encouraging seminar talks that incorporate issues surrounding EDI;
- hosting open panel discussions on EDI and intersectionality in research;

- developing and maintaining a resource with information on EDI as it relates to research; and
- advocating for and helping to foster a supportive environment for EDI within the Institute, the university, and beyond.

We will endeavour to improve equity, diversity, and inclusion within our Institute by committing to:

- implementing strategies to decrease unconscious biases in internal awards adjudication;
- encouraging faculty to participate in campus-wide initiatives supporting EDI;
- identifying and promoting relevant EDI funding opportunities and EDI training opportunities for faculty, staff, and trainees;
- establishing new EDI-based awards and funding opportunities targeted to research that incorporates aspects of EDI; and
- continually reviewing our progress in achieving these EDI objectives.

Education

The Arnie Charbonneau Cancer Institute commits to training the next generation of cancer researchers. The institute currently provides trainees with a research home and opportunities to present their research at weekly ‘work-in-progress’ seminars and yearly research symposia. These opportunities are intended to promote constructive feedback on research ideas and data and stimulate collaboration among trainees and others. Additional dimensions of training, however, include the ability to network and acquire resources or other supports needed for their work, and frame their work within the greater landscape of cancer knowledge and care. In the next phase, we aim to 1) further skills-development in scientific knowledge exchange, 2) attract and promote outstanding trainees locally, nationally, and internationally, and 3) increase research capacity by growing the funding available to support trainees, with a particular focus on equity, diversity, and inclusivity. **Our overarching education goal is to enable our trainees to become engaged members of the scientific community and prepare them be future leaders in science and beyond.**

Aim 1: Promote skills in scientific knowledge exchange

Activities:

- Activity 1.1: Improve delivery trainee seminar series and mechanisms for providing feedback;
- Activity 1.2: Encourage peer-to-peer support to share specialized technical expertise;
- Activity 1.3: Identify opportunities for trainees to become involved in public forums that educate lay audiences; and
- Activity 1.4: Implement career guidance for trainees, both for academic career pursuits and non-academic career interests.

Deliverables:

To ensure that tomorrow’s cancer research leaders value collaboration, open science, engagement with their communities, and are supported in developing careers both within and outside of academia, we will:

- Develop a strategy for delivering trainee seminars in formats pertinent to real-world challenges;
- Develop a strategy for providing more relevant and useful feedback to trainees during seminars, including peer-to-peer feedback and inquiry;
- Develop mechanisms (e.g., technical expertise registry) for trainees to identify new techniques and scientific areas they would like to learn about;

- Plan and deliver public outreach activities that encourage trainee participation, including trainee talks and demonstrations at events to support scientific communication skills development; and
- Enhance opportunities for trainees to explore diverse career pathways, including through networking with former and current Charbonneau trainees.

Measures of success:

Success will be measured by: (1) increase in the number of opportunities for trainees to present work and receive feedback; (2) increase in the number of opportunities for trainees to learn new skills and techniques outside of their home lab or research group; and (3) increase in the number of opportunities for trainees to engage with the public during their training.

Aim 2: Attract and promote outstanding trainees locally, nationally, and internationally

Activities:

- Activity 2.1: Cultivate awareness of the institute and its research in undergraduates interested in pursuing science graduate studies;
- Activity 2.2: Provide our trainees with exceptional cross-disciplinary training experiences; and
- Activity 2.3: Highlight trainee accomplishments.

Deliverables:

To ensure that tomorrow's cancer research leaders are highly skilled, understand the value of collaboration across disciplines, fields, industries, and sectors, and positioned to succeed, we will:

- Host an annual recruitment event to connect excellent undergraduates from across campus with Charbonneau faculty and labs that are looking for summer students and/or graduate students;
- Identify opportunities for graduate students to present their work ('3-min thesis-style') at undergraduate lectures or recruitment events;
- Develop a strategy for promoting work and training opportunities in Charbonneau labs and teams via social media, including the Charbonneau website, Instagram, Facebook, and Twitter;
- Provide additional scholarships and/or top-up awards for summer students to increase the attractiveness of the institute as a place to work and learn;
- Create new opportunities for trainees to engage in partnered multi-disciplinary/department research, partnered academic/industry research, and collaborative academic/clinical work through joint training programs.

Measures of success:

Success will be measured by: (1) increase in the number of undergraduates interested in cancer science; and (2) increase in the number of opportunities for students to engage with the Institute.

Aim 3: Increase research capacity and opportunities for trainees to be involved in research

Activities:

- Activity 3.1: Increase application to and success of trainees in external scholarship competitions;
- Activity 3.2: Develop new internally supported scholarship opportunities; and
- Activity 3.3: Improve access to educational programs and funding for our trainees, with a particular focus on equity, diversity, and inclusivity.

Deliverables:

To ensure that tomorrow's cancer research leaders are provided with equitable opportunities to develop new ideas, ask big questions, and test hypotheses while training to become excellent, highly competent independent researchers, we will:

- Provide an expanded suite of scholarships, based on broad areas of need/interest across the research continuum, for:
 - existing graduate students and postdoctoral fellows,
 - incoming graduate students and postdoctoral fellows,
 - international trainees who are not eligible for specific national awards, and
 - trainees who identify with marginalized or underrepresented groups or who face barriers to higher education and conducting research;
- Develop and implement an IPR program for grad student and postdoctoral funding applications, including a bank of examples of successful applications and leveraging information sessions from CSM or elsewhere; and
- Recognize and promote trainee accomplishments.

Measures of success:

Success will be measured by a sustained 20% increase in annual funding to cancer trainees by 2025.

Community Engagement

Community engagement is foundational to our success. First, integration of the Charbonneau Cancer Institute within and around Calgary and Southern Alberta is an important way to enhance the relevance, reach, and impact of our research, both by ensuring that we are creating value for the community and by communicating the value of new discoveries made by our members to the public, including patients and families touched by cancer. Second, integration of the institute within the community ensures that we fulfill our role as an educator in a meaningful way, by creating opportunities to educate the public about the cancer topics for which they are most interested. Finally, philanthropy is a major driver of research initiatives, as evidenced by transformative gifts from donors, charitable organizations, and foundations. A strong connection to our community is key to the ongoing success of our research programs.

In the past, we have engaged the Charbonneau Trainee Association to help organize public education events, such as *Late Night Labs* and *Science in the Cinema*. We are committed to continuing these endeavours, hosting web-based and in-person educational sessions for the public (as circumstances allow) and working jointly with the Cumming School of Medicine Advancement Office and the Alberta Cancer Foundation through Cancer Care Alberta to articulate the need for cancer research funding through the "Own Cancer" campaign, which is geared toward leveraging the opportunity of the new cancer centre. We commit to cultivating our relationship with the community through greater knowledge exchange and partnership. **Our overarching goal is to increase the connection of the Institute to the community at large, as well as the general and cancer-specific scientific communities.**

Aim 1: Cultivate our relationship with the community

- Activity 1.1: Achieve a stronger and more active presence in the community;
- Activity 1.2: Increase awareness by the public of advances made by our investigators and teams;

- Activity 1.3: Increase exposure to EDI-based issues and intersectionality in cancer research through public lectures that discuss the importance of EDI; and
- Activity 1.4: Work with our partners to develop our goals and ensure the success of cancer research in Calgary and Southern Alberta.

Deliverables:

- Refinement of the institute brand and mission statement to improve Institute recognition and enhance clarity between the various partnering institutions and entities;
- Strategy for collecting and distributing institute news, stories, and achievements (content gathering) from Charbonneau Institute members on a rolling basis;
- Multi-year, coordinated social media plan to increase exposure, including the development and deployment of video content to showcase ongoing research and promote members; and
- Development of a consistent, best-evidence approach for external public relations, as they relate to publicizing novel research findings, new funding, personal journeys, new infrastructure projects, EDI-related issues in cancer research, and other news-worthy items.

Aim 2: Exchange knowledge with the community and partner in research

- Activity 2.1: Positively impact people experiencing cancer, scientific and medical professionals, and the broader public through education about cancer research;
- Activity 2.2: Foster public interest in cancer research by promoting citizen science-based initiatives;
- Activity 2.3: Reduce the prevalence of EDI-based issues and intersectionality in research by promoting broad accessibility and involvement in cancer research; and
- Activity 2.4: Connect with those in the local academic and external community (community at large) to ensure that research is inclusive of our diverse population.

Deliverables:

- Identification, development, and implementation of opportunities to host ‘flagship’ cancer awareness events (and non-events but other communication / knowledge exchange mechanism)
- Development of strategies and opportunities to become involved in cancer research.

Measures of success:

Success will be measured by our participation in community-based events, our presence on social media channels, print media, and television, and our engagement of the community in our research.

REVIEW AND EVALUATION

The health research institutes are evaluated annually using pre-determined metrics:

- Research revenue, including total revenue, CIHR revenue, and clinical research revenue;
- Research applications and success rates, including number of tri-council grants; and
- Number of research publications and citations, including total number, average number, number per institute member, and number of papers cited > 50 times in the first 5 years.

Performance is tracked year over year and compared to the overall performance of all institutes, after being normalized by allocated space and number of faculty. Additionally, through an annual report, the institute will describe advances in knowledge in *decreasing cancer in the population*, *improving cancer treatment*, and *improving the patient experience*, and will report progress in implementing its strategic plan, including new recruitments, trainee successes, philanthropic pledges received, and other relevant

measures. The Arnie Charbonneau Cancer Institute will use this data to understand how to better support its members, trainees, and staff, improve its performance, and serve the Calgary community.

The Arnie Charbonneau Cancer Institute will also undergo regular review by its scientific External Advisory Board to seek feedback on performance and ensure that it is positioned to excel at the international level.

CONCLUSION

Through the implementation of this plan, we endeavor to advance knowledge and make discoveries that will impact patients by improving their treatment, their experience, and their outcomes—and by reducing the burden of cancer in the population. Through this process, we aim to become the most integrated, most engaged, and most real-world cancer research endeavor in the country, known as a centre that embraces citizen science and keeps its eye on clinical impact across the entire spectrum of basic-to-clinical research. This ambitious plan will leverage the institute's special relationship with the Tom Baker Cancer Centre and the future Calgary Cancer Centre, and requires partnership from key stakeholders including Cancer Care Alberta and research leaders within Alberta Health Services; the Cumming School of Medicine and other faculties/departments across the University of Calgary; the many philanthropic and fundraising organizations that support our work; and our communities of Calgary and Southern Alberta. Community support has been and will continue to be a foundational enabler for our work and an inspiration for us to constantly strive for new ways to improve the lives of our patients.



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