

## A Brain Sciences Centre

Submission to House of Commons Standing Committee on Finance

November 19, 2013

Sunnybrook Health Sciences Centre

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### About Sunnybrook Health Sciences Centre and The Sunnybrook Research Institute

One of Canada's largest research and teaching hospitals, Sunnybrook delivers care to more than 1.2 million patients every year. Sunnybrook strives for excellence in all that we do, while at the same time recognizing the importance of investing in a select number of clinical and academic activities which are leading the way internationally and are acknowledged to be preeminent leaders. Sunnybrook's strategic priorities are internationally renowned as delivering highly specialized care and leading in the discoveries and innovations they make, the teaching and learning opportunities they provide, and the unparalleled level of care they deliver.

Over the last decade, Sunnybrook has become one of the top five academic health science centres in Canada. As the research enterprise of the Hospital, Sunnybrook Research Institute (SRI) leads in discovery medical research and in translating discoveries into better models of prevention and care.

**Our vision:** to invent the future of health care. **Our mission:** to create an internationally competitive research enterprise through which we can achieve our aims; to advance the understanding of disease toward its prevention and cure; to improve the quality of care for those we cannot cure; and to develop innovative treatments.

The successes that Sunnybrook and SRI have led, internationally, are based upon the concept of *convergence*. Inventing the future of health care requires breaking down silos, both clinical and research. Practitioners of all specialties, health services researchers, geneticists, molecular biologists, physicists and engineers, work shoulder to shoulder towards resolution of the most devastating clinical challenges: to prevent; to diagnose early; to develop new therapies and to guide their provision with pin-point accuracy; and to monitor outcomes in real time. The essential enabler is infrastructure. Sunnybrook has accomplished this goal in cancer and in heart, and is poised to parallel these successes with a focus on **Brain Sciences**.

### The Challenge

Disorders of the brain including stroke, dementias, Parkinson's disease and brain tumours, and of the mind including depression and anxiety disorders, are intimately interconnected and represent the greatest health care challenges in the coming generation. These diseases continue to devastate patients and their families.

There are 36 million people worldwide living with dementia; in Canada, it's 500,000 and predicted to climb to more than one million within a generation.

Stroke has touched many of us: one occurs every 10 minutes, and 300,000 people in Canada are living with its effects.

Every week, almost 200 Canadians are diagnosed with brain tumours.

More than 2.8 million Canadians (over 10% of the population age 15 years and older) report symptoms consistent with one of major depression, bipolar disorder, generalized anxiety disorder, or alcohol or drug abuse.

By 2030, the social and economic burden of diseases of the brain and mind will eclipse all other diseases combined.

## **The Vision: A World Class Brain Sciences Centre**

**The 21<sup>st</sup> century will be the century of disorders of the brain and mind.** These disorders cross many disciplines and cannot be fully understood through the work of just one clinical or research specialty. Sunnybrook's Brain Sciences Program is guided by the philosophy that only through cross-discipline collaboration will we find answers to these disorders that plague so many.

Our psychiatric and neuroscience experts, currently scattered throughout Sunnybrook, will be concentrated in a state-of-the-art **Brain Sciences Centre**. Having already capitalized on this concept of *convergence* through the creation of enabling infrastructure applied to heart disease and cancer, we have a template for success in hand.

The proposed Centre will enable us to operationalize an approach we already know is essential to the future of brain and mind health. Our experts will work side-by-side in a collaboration of education, research and patient care in **a world-class Centre in the heart of one of Canada's leading academic health sciences centres**. This innovative initiative will create a different kind of facility, one that will mitigate the stigma of mental illness through its enhanced integration with the mainstream of healthcare. Research and education will be embedded directly into the leading-edge treatment offered at the Centre. Sunnybrook will become a magnet for international students and researchers seeking education within the world's best facility from the world's most knowledgeable experts. Through many centres of excellence housed in this facility, we will care for patients with a wide range of brain and mind disorders throughout the lifespan, from adolescence to their senior years.

The establishment of this facility will send a clear message: those suffering from disorders of the brain and mind are no different than those with heart disease or cancer. They deserve the best care possible within the best health sciences centre.

## **Why Sunnybrook?**

Sunnybrook has established the well-deserved reputation as the destination for the best health care in Canada – *when it matters most*. It is an internationally acclaimed leader in inventing the future of health care - **today!**

Clinical expertise in primary and veterans care, and tertiary and quaternary care in neurology, psychiatry, geriatrics and neurosurgery are all on board. **This clinical acumen is tethered seamlessly to global leadership in discovery research dedicated to resolving the most challenging problems associated with diseases of the brain and mind.**

And we have a track record of leadership.

### *The Mood and Anxiety Program*

Sunnybrook's Mood and Anxiety Program is unique in its focus on complex mood and anxiety disorders across the lifespan with acknowledged expertise in youth bipolar disorder, seasonal affective disorder, pregnancy-related mood problems, obsessive-compulsive and related disorders, and geriatric bipolar disorder. The Youth Bipolar Program is the largest in Canada and will soon be the largest in North America. Our recently opened Frederick W. Thompson Anxiety Disorder Centre has become the pre-eminent Canadian site for research, education and clinical care for obsessive-compulsive and related spectrum disorders. Our Mood and Anxiety Program provides regional leadership in the delivery of specialized care for mood and anxiety disorders and provides national and international leadership through the highly respected Canadian Network for Mood and Anxiety Treatments as well as the International Society of Bipolar Disorders.

### *The Centre for Stroke Recovery*

Sunnybrook and SRI pioneered the concept for, were founding members of, and have assumed a leadership role in the province-wide Heart & Stroke Foundation Centre for Stroke Recovery (CSR). This

centre is dedicated to the spectrum of research surrounding stroke prevention and recovery. Its scope includes the establishment of preclinical models of disease, through to the discovery and characterization of the underpinning vasculopathies, and the development of new biologics and modalities of screening and intervention. Our leadership role is through the Brain Sciences Program, and we function as the site lead of the centre for Toronto.

#### *The Toronto Dementia Research Alliance*

The costs of treating and caring for patients with Alzheimer's disease are greater than the aggregate costs for treating and caring for patients with cancer, heart disease and stroke. In North America, the costs of caregiving and treatments are estimated at \$100 billion per year, and estimated to rise to \$1 trillion per year by 2050. Business as usual cannot continue if we are to contain the ravages of neurodegenerative diseases and the associated costs. Establishing collaborative national and international initiatives, cross-sector alliances and national registries are key paths to success.

Sunnybrook has taken the lead in the Toronto Dementia Research Alliance (TDRA) through its Brain Sciences Program, dedicated to approaching cognitive and related disorders, including dementia, movement disorders, mood and psychiatric disorders, cerebrovascular disease and metabolic disorders. The goal is to function as a driver of national and international collaboration. It focuses on preclinical basic and applied research, focused on disease mechanisms and therapeutic targets; genetic risk factor identification, novel gene discovery, and imaging brain function, structure, pathology, and metabolism. And translating discovery to the clinic.

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Seeking the biological causes of these ailments, and developing therapies will mitigate the stigma many of them carry, relegating them to treatable diseases, like any other. And as we strive toward this goal, we are in parallel developing and applying new technology that ameliorates, if not cures, the ravages of diseases of the central nervous system.

Working closely with industrial partners, Sunnybrook has invented image-guided technology that makes the invisible visible. This technology enables neurosurgeons to see through the skull and into the brain, and then destroy diseased tissue with extraordinary precision, without making a single scalpel cut. Clinical trials on this breakthrough incision-less surgery are happening at Sunnybrook today.

Now imagine: technology that immediately stops strokes as they're happening, prevents dementia from advancing and treats brain lesions that cannot be removed surgically. Go even further: imagine therapy that regenerates the tissue that was harmed, restoring the brain to its healthy, fully functioning state.

This is the next frontier in brain and mind therapy, and Sunnybrook is at its forefront.

Our scientists have developed non-invasive methods to open the blood-brain barrier and safely deliver therapy into the brain, including stem cell therapy, gene therapy and immune therapy, not only to treat disease, but also to restore function and regrow cells. Using focused ultrasound to open the blood-brain barrier in a pre-clinical model of Alzheimer's disease, we are able to deliver anti-plaque therapy quickly and radically reduce toxic amyloid plaque in the brain.

We are currently building another world-first technology: a fully integrated molecular imaging system that combines MRI and PET that will dramatically accelerate translation in our target areas of stroke, dementia and other neurodegenerative disorders. This device has the potential to provide treatments and cures for diseases that have no such options. The foundational research establishing that it works, is done. We are now working towards translation of this technology into clinical studies.

The first patient study planned is to open the blood-brain barrier and deliver anti-plaque therapy directly into the brains of people with Alzheimer's disease, with the aims of reducing the plaque load and restoring some cognitive function. The MRI-PET system will enable us to see precisely where and when

the blood-brain barrier opens, and to track removal of toxic amyloid from these regions, as well as look at how it affects brain metabolism. This is not possible with MRI alone.

This same suite of technologies is advancing our capacity to deliver stem cells to the brain, another advance once deemed impossible. This advance is vital, because stem cells have the potential to become any cell in the body. In this case, the stem cells became brain cells. Pre-clinical studies have established that we can do this, and our team is now conducting behaviour tests to determine if brain function was restored.

Finally, and a compelling example of Sunnybrook inventing the future of health care **today**: focused ultrasound for the **treatment** of brain disorders. Our scientists have created a way to pass ultrasound beams through a skull safely. This too had been deemed impossible. In partnership with the private sector, this medical device has been commercialized and has obtained Health Canada approval. It, too, is in trials to ablate brain tumours and other lesions causing the debilitating disorder of “essential tremor” with breathtaking results [<http://www.youtube.com/watch?v=ZCPeswPaUvM>].

***Sunnybrook is the only place in the world doing this work.*** We have leading clinical and research experts in these areas with a strategic focus on image-guided therapy, backed by substantial institutional investment and industry partnership, and the patient populations needed to test and get advances to the clinic efficiently.

As a fully affiliated research intensive and teaching hospital within the largest medical school in Canada, we have the opportunity to have enormous positive impact on the current health care system and to shape its future. The new generation of researchers and healthcare providers cultivated at Sunnybrook will discover, adopt and disseminate a new way of understanding Brain Sciences that promotes an integrated, collaborative and patient and family-focused approach to care.

### **The Proposal: a strategic public-private sector partnership**

The cost of the transformative infrastructure to bring the **Brain Sciences Centre** to life is \$60 million. It will create a regional hub of brain sciences clinical care and research and education, located at Sunnybrook Health Sciences Centre in Toronto. The request of the Government of Canada is to make a \$30 million investment. The breakdown of revenue sources envisioned and in hand are as follows:

- **\$30 million from the Government of Canada**
- \$20 million-plus private philanthropy from various sources, including the naming donor
- Possible provincial participation

### **The value proposition:**

- **Creation** of the only facility in Eastern Canada that seamlessly incorporates all aspects of mental health and related brain sciences – neurology, geriatrics, neurosurgery, neuroimaging and neuropsychology – under one roof.
- **Advancing** the development of a national network of brain sciences centres of excellence. In particular, this strategic initiative will build upon the government’s funding of the University of British Columbia’s Centre for Brain Health by creating a similar centre in the Greater Toronto Area/Eastern Canada.

Though similar, there are important differences between the *UBC Centre for Brain Health* and the proposed Sunnybrook *Brain Sciences Centre*. The latter will be physically embedded within Canada’s largest single-site academic health sciences centre, which provides ready access to patient populations for practical and groundbreaking brain sciences research.

- **Expansion** of and building of new linkages across Canada for research, education and treatment related to disorders of the brain and mind.
- **Leveraging** of current collaboration between Sunnybrook's Brain Sciences Program and other leading research centres, such as the University of British Columbia's Centre for Brain Health and the Hotchkiss Brain Institute in Calgary. Just one of many examples is Sunnybrook's Dr. Sandra Black, an international leader in stroke and dementia research, who is partnering with UBC colleagues through the Canadian Consortium for Neurodegeneration and Aging.

### **The new space: a physical transformation**

Our current mental health wing will be transformed to combine renovated and retrofitted areas with a vast expansion. Our current space is approximately 62,000 square feet. This new centre will be seamless, pristine and approximately twice that size. The renovated sections will blend seamlessly with the new building.

#### Mental Health Inpatient Unit

This unit will house a 37-bed mental health inpatient unit fully oriented to wellness. In the inpatient unit, single-patient rooms will create a safer environment for both staff and patients. Thanks to these private rooms, patient confidentiality will be protected, and infection control improved.

#### Multidisciplinary Ambulatory Clinics

Multidisciplinary ambulatory care will feature prominently in the new Brain Sciences Centre. This Centre will be the only facility of its kind in Canada where psychiatrists, neurologists, neurosurgeons, neuropsychologists, geriatricians and other allied professionals and researchers will work together side by side in one setting organized by a single academic Brain Sciences Program.

Some of the clinics and centres of excellence that will benefit from this cross collaboration and purpose built space, all of which are housed at Sunnybrook, include: the Traumatic Brain Injury Clinic, the Memory and Dementia Clinics, The Regional Stroke Program, The Heart and Stroke Foundation Centre for Stroke Recovery, The Frederick W. Thompson Anxiety Disorders Centre, the Centre for Psycho-Oncology, the Centre for Medications & the Brain, Women's Mental Health with a focus on depression during pregnancy and post-partum depression, the ALS Clinic, the Multiple Sclerosis Clinic, the Centre for Brain Therapeutics, and Mood Disorders Across the Lifespan including youth, adult and the elderly.

With our expertise established in these areas and our desire to respond to community and national health care needs, the opportunity to establish this vision is at hand. And a collateral upside is the potential for other new centres of excellence to capitalize on the products of this vision. Centres of excellence that would benefit from this investment include sports head injuries through the existing Traumatic Brain Injury Clinic as well as posttraumatic stress disorders for Canadian Veterans through the existing Frederick W. Thompson Anxiety Disorders Centre.

We are dedicated to addressing the health care needs of today and tomorrow in this unique multi-disciplinary facility.