Sunnybrook HEALTH SCIENCES CENTRE

Sunnybrook RESEARCH INSTITUTE

A Brain Sciences Centre

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Sunnybrook Health Sciences Centre

Executive Summary:

The incidence of diseases of the central nervous system is quickly eclipsing the aggregate of that of all other diseases. Millions of Canadians are suffering these ailments; this number is predicted to triple over the next 30 to 40 years. The costs of treating and caring for these patients are greater than the aggregate costs for treating and caring for patients with cancer and heart disease. The costs of caregiving and treatments are estimated at $10 billion per year in Canada, and predicted to rise to $100 billion per year by 2050.

Delay for disease modification and prevention is untenable. Better therapies to treat symptoms are critical, and of the most immediate value to patients and their caregivers; however, these will not stem the tide of the disease. The capacity to ameliorate disease progression exists in principle, but barriers must be broken. Business as usual cannot continue if we are to contain the ravages of neurodegenerative diseases and the associated costs.

The vision of the Brain Sciences Centre at Sunnybrook is to approach cognitive and related disorders, including dementia, movement disorders, mood and psychiatric disorders, cerebrovascular disease and metabolic disorders through a model of convergence: research embedded in care. Paramount to the vision is breaking down disciplinary silos in both research and clinical arenas; a model tested at Sunnybrook in Cancer and Heart Disease, with remarkable success.

The Centre will bring together previously separate disciplines of psychiatry, neurology, neurosurgery and neuroradiology, and imbed them with internationally renowned researchers to create a hub of innovation for discovery of new diagnostics, technologies and treatments and in turn create innovative models of care. Private sector partnerships will enable technology development and commercialization of new technologies and treatments for the major brain diseases of our time and will hasten translation of new knowledge into practice and therefore reduce the burden of these illnesses in our society.

It is recognized that the Federal Government does not directly fund the delivery of health care: this proposal is about creating an infrastructure that will enhance innovation and new discoveries that are relevant and beneficial to all Canadians. The proposed public – philanthropic partnership will build upon previous Federal investments to transform the way these brain illnesses are detected, prevented and treated; grow the next generation of high quality personnel; create new jobs in this burgeoning field; and reduce the human and economic burden of these devastating illnesses.

The challenge

The three major illnesses of our time – stroke, dementia and depression – are all diseases of the brain and are all interrelated. According to the Economic Burden of Illness report from Statistics Canada, these neuropsychiatric disorders have now outstripped cardiovascular disorders as the number one cost driver in hospital care across Canada. And hospital care represents the largest contribution to direct annual health care costs in Canada, topping $230B.

WHO reports that currently the two neurological conditions with the greatest burden to society are stroke and dementia. Furthermore, these two conditions are the only major neurological conditions that are projected to increase in burden from 2015 to 2030. The WHO projects that depression will be second only to HIV/AIDS in worldwide burden of illness over the next two decades. Therefore, these three brain conditions – stroke, depression and dementia - have become the major medical illnesses of our time; their impact on Canadian society and their prevalence over the coming decades will increase.

The goal is to:

1. Develop innovative prevention strategies to reduce onset of these conditions.
2. Discover new technologies and processes to detect these conditions early in their course.
3. Create new models of care to treat these conditions and reduce the burden of symptoms on patients and their caregivers.
4. Generate creative partnerships with industry and provincial agencies to move commercially viable technologies and models of care into the clinic.
5. Train high quality personnel and create new jobs and new companies.

The Barriers:

Despite the burden of these illnesses, there are considerable practical barriers to widespread innovation in diagnosis and care. Current diagnostic processes and treatment for these brain conditions are fragmented: delivered in different locations, by different specialists and practitioners (neurology, psychiatry, neurosurgery, neuropathology, neuropsychology, neuroradiology, neuro-ophthalmology), using different technologies and procedures. Furthermore, researchers in these fields are typically located separately from, and work independently of, the clinical teams.

Convergence of activities in four domains is required to create and accelerate a broad-based and coherent approach to prevention, treatment and care of patients suffering these brain conditions:

1. Researchers who are leading discovery and innovation need to be embedded in clinical service areas, working in collaboration with clinical practitioners enabling an integrated and seamless translation of discoveries into clinical practice.

2. Co-location of the multi-disciplinary clinical teams engaged in delivering care will ensure that patients benefit from coordinated care; and no less importantly, co-location will mean that new developments in multiple areas of research in disparate fields are shared

and implemented efficiently across these medical conditions. This is an essential convergence as these conditions are inter-related: if a person experiences depression, risk of stroke and dementia increases. Similarly, if someone has dementia, risk of stroke and depression increases. Development of new diagnostics and treatments that impact patients with one condition may have a beneficial effect on the other two. And in turn, convergence of multi-disciplinary clinical teams with the research enterprise is critical for rapid development and adoption of innovation.

3. Convergence of multi-disciplinary research and clinical teams will galvanize a focus for critical commercial and philanthropic partnerships – both of which are required to move technologies and their applications into practice.

4. Connectivity (networks) amongst researchers and clinicians across Canada will enable integrated information sharing, capitalizing on economies of scope and scale, and will enable enrolment of sufficient numbers of patients into the clinical trials required to test the innovations arising. This vision requires the creation of a Brain Sciences Centre. This centre will aid in the development of networks of these networks; for example, Stroke Networks need be informed by Depression and Dementia Networks. In addition to enabling information flow across disciplinary boundaries, this "network of networks" concept will both accelerate innovation and its translation to practice.

Canada is uniquely positioned to provide leadership in this arena. Although some of these kinds of networks are being established, the underpinning and required infrastructure is not in place.

In partnership with philanthropic lead donors and with the federal government, Sunnybrook is poised to take a leadership role.

The opportunity:

The Sunnybrook Brain Sciences Program has been in in operation since 2004, and has the necessary pre-requisites to become a hub for this proposed model of innovation: discovery, technology development and commercialization embedded in and driving the evolution of clinical care.

The Brain Sciences Program focuses on the three major neuropsychiatric illnesses of our society – stroke, dementia and depression. Sunnybrook is home to the Regional Stroke Centre; Sunnybrook leads the Toronto Dementia Research Alliance; and Sunnybrook houses the only centre of excellence in Youth Bipolar Disorder in Canada, the only centre of Excellence in OCD and Anxiety Disorders in Canada and the largest youth program in Mood and Anxiety in Canada. The Program already brings together the various professionals involved in brain care and research and has one of the leading research centres in both imaging and biological sciences in North America. The Brain Sciences researchers are connected to national and international networks through Brain Canada and the Ontario Brain Institute.

The Program has already established models for innovative service delivery; and progressed materially in the development of diagnostic and treatment technologies in partnership with the

private sector including non-invasive ("scalpeless") brain surgery and the capacity to reversibly increase the porosity of the blood-brain barrier that enables the delivery of therapies to the brain, heretofore impossible; both of which converge in their application through the various centres that Sunnybrook houses and leads. These include the Thompson Centre (for anxiety disorders with a focus on obsessive compulsive disorder), the Centre for Stroke Recovery, part of the Canadian Partnership for Stroke Recovery, the Traumatic Brain Injury Clinic, and the Family Navigation Project.

Notwithstanding the remarkable progress that the Program has made to date towards understanding and treating these conditions, it has been impeded by the lack of integrated infrastructure.

Importantly in this regard, Sunnybrook has already achieved the vision highlighted in this brief within the Odette Cancer Program and the Schulich Heart Program. Both these Programs now benefit from the seamless integration of research embedded in co-localized multi-disciplinary care, the collateral economic upside of job and company creation and clear metrics for improved patient care and outcomes.

The solution:

The establishment of the Brain Sciences Centre at Sunnybrook will accelerate the development and adoption of innovations in technological progress and models of care. It will be closely affiliated with the Brain Health Centre in Vancouver and with other Brain researchers and clinical programs across Canada.

Bringing this convergence vision to life will:

1. Enhance innovation: the convergence of both research and clinical disciplines into close proximity will accelerate both the discovery of new technologies, devices, diagnostics and therapeutics, and their translation to clinical practice through private sector partnerships. And networking the Brain Sciences and Health centres across Canada will enable both economies of scope and scale and accelerate national capacity to prevent and treat the three major health conditions of our time

2. Advance the development of commercial partnerships: this is achieved by making the Brain Sciences Centre at Sunnybrook a clear destination for such investment and also by providing space for these partnerships to develop.

3. Job and company creation: as we have demonstrated in other areas of health care, this goal can be realized by the development and application of new technologies, both in healthcare services and rehabilitation.

4. Enhance care: the goal will be to reduce burden of illness and the need for hospitalization. Since these neuropsychiatric illnesses are responsible for largest cost in hospitals, the new models of care developed at Sunnybrook's Brain Sciences Centre will be disseminated across Canadian healthcare institutions and internationally.

5. Protect vulnerable Canadians: this will be accomplished by helping patients and families who are affected by these devastating conditions, freeing them to be more productive within their family, their workplace and society in general. Not only is depression the leading cause worldwide of lost work productivity, but family members of people with depression have greater incidence of physical illness and loss of productivity at work. Caregivers of relatives with dementia and/or stroke report an approximately 20% reduction in productivity as a result of their caregiver responsibilities.

6. Increase the competitiveness of Canadian researchers: although Canadian researchers are international leaders, other centres across the US claim to be at the forefront of such research. The presence of the Brain Sciences Centre, as part of network of networks, will propel Canadian researchers further into leadership in the field.

7. Provide national and international recognition to the Government of Canada for its recognition of the burdens of these debilitating ailments and their burden on Canadian families.

Financing the Vision:

Research embedded in care requires that the structural and functional plan for the building proposed integrate infrastructure for clinical care and for research. The total space projected for the building is 160,000 sq.ft. The construction cost is projected as $60,000,000.

The request of the Federal Government is to come as close to $30,000,000 as possible towards the goal. The Sunnybrook Foundation is committed to raising the remainder of the $60,000,000 goal.

This public-private sector partnership presents an unprecedented opportunity to build a state of the art, "research-imbedded-in-care" facility that will integrate activities amongst Brain Sciences/Health centres across Canada. It will enhance innovation. It will accelerate discoveries and their uptake into clinical practice through private sector partnerships that will also create new jobs and new companies. It will train the next generation of high quality personnel. It reflects a unique opportunity to mitigate the profound impact of the major illnesses of our time, now, and over the decades to come.