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HEALTH-CARE INNOVATION: A CRITICAL ENGINE OF A KNOWLEDGE-BASED ECONOMY

Chairman: **Verity Craig**
President, The Empire Club of Canada

Head Table Guests

Anita Gupta, President and CEO, NMI Tax Consulting Group, and Director, The Empire Club of Canada; Senator Vim Kochhar; Stephen Tile, Vice-Chair, Sunnybrook Foundation's Board of Directors; Beverly Brooks, Managing Director, Kingsdale Communications, and Director, The Empire Club of Canada; Lauren Chee, Grade 11 Student, North Toronto Collegiate Institute; Rev. M. J. Perry, Vice-President and Owner of Mr. Discount Ltd., and Director, The Empire Club of Canada; Pankaj Puri, President, Internal Audit Services Inc.; and Gerrard Schmid, President and COO, Davis+Henderson.

Introduction by Verity Craig

While reading through the Web site for the Sunnybrook Centre, I was struck by the sheer size. The statistics are staggering.

- Sunnybrook has more than one million patients walk through its doors each year.

- 10,000 staff work in specialized areas such as its world-renowned cancer centre, the Veterans Hospital or the trauma and critical care unit.
- More than 600 scientists work on ground-breaking research, with a budget totalling more than $100 million each year.
- The Sunnybrook Health Centre has an annual budget of $750 million.

When I totalled up the numbers, I realized that Sunnybrook Centre was like running a city, but with the enormous responsibility and urgency to be leaders in their field, who save lives every day. I am certain that some days Dr. McLellan wonders what he has got himself into.

Dr. Barry McLellan is the President and Chief Executive Officer of Sunnybrook Health Sciences Centre in Toronto, Ontario.

The hospital provides regional programs and services including specialities in cancer, cardiovascular disease, neurological disorders, high-risk obstetrics and gynaecology, orthopaedic and arthritic conditions, trauma and critical care, and community care. In addition, Sunnybrook is Canada's largest facility caring for the country's war veterans.

Prior to his position as President and CEO at Sunnybrook, he was the Chief Coroner for Ontario.

In 1981, Dr. McLellan graduated from the University of Toronto with a medical doctorate and trained in emergency medicine. Dr. McLellan was the Director of the Trauma Program and Vice-President of Specialty Services at Sunnybrook. He was also the Director of the hospital's Emergency Department, Base Hospital Program and Trauma Research.

Dr. McLellan is a Professor in the Department of Surgery at the University of Toronto. He has published more than 60 scientific papers, written a textbook on trauma care and lectured extensively, making international presentations in the fields of trauma care and forensic investigation.

Barry McLellan

Good afternoon and thank you for inviting me here today to offer some thoughts about health-care innovation and its critical role in building a knowledge-based economy.

Innovation in all fields is about looking at current practice and saying there has to be a better way of doing things. In health care, innovation is about saving and improving lives.

In our field, you know you have progressed when you can look back and hear people say, "I can't believe they used to do that."

This is a photo of a young patient in an iron lung. One of the first uses of this technology was in 1928 at the Children's Hospital in Boston. A young girl, who was near death due to respiratory failure as a result of complications from polio, was placed in a machine just like this one and within minutes her breathing had returned to a normal rate. This case popularized the device and led to large-scale production. Essentially, a few quick breaths from a little girl helped to commercialize a product that helped thousands of other patients.

Today, however, thanks in large part to advances in the development of vaccines against diseases like polio and new respiratory technology, we can look back upon this type of machine and view it as arcane. The thought of locking a child into a device such as this seems cruel but, at the time, it meant the difference between life and death.

In the last few years, with the flood of new technology and ease of sharing information, we have been challenging the status quo more and more which has allowed us to develop breakthroughs that have made patient care safer, reduced hospital stays and has allowed people to get on with their lives faster than ever before.

Hospitals and their research teams have not been able to do this on their own. In fact we rely on government, corporate and individual donor support to partner with us to create the next improvements in care.

With our wealth of health-care expertise and concentration of business and industry, Ontario is positioned uniquely to become not only a North American leader in biotechnology, but also a strong player globally.

Ontario is a hub of health-care research and driving this engine are our research-intensive hospitals that:

- conduct more than 80 per cent of publicly funded research in the province;

- represent the fourth-largest biomedical centre in North America;
- employ 10,000 researchers;
- conduct almost $1 billion of research each year; and
- can offer investors annual returns on investments as high as 39 per cent in some cases.

In a recent Research Infosource survey of the top research hospitals in Canada, based on research income, three Toronto hospitals placed in the top five in Canada.

How are we doing all of this?

We have created a culture of discovery and inquiry in our academic health sciences centres. In my own institution for example, we have set a lofty vision to "invent the future of health care."

We tell people when they are hired at Sunnybrook, regardless of their role, they will play an integral part in achieving our vision. This has helped to create an organization where people feel included in discovery and innovation.

They are motivated to do things differently than what they have done in the past. They say to themselves that there has to be a better way to do this and we reward them for finding new and innovative ways of doing things.

As an organization, we are fortunate. We have 10,000 highly motivated staff members who care for more than 1.2 million patients each year and we have 1,200 in-patient beds, so there is never a shortage of opportunities to capitalize on good ideas.

Our Research Institute has been successful in attracting more than $100 million in extramural funding each year and is continuing to grow. But we see the path to expansion of our innovation agenda as being made possible only though collaborative efforts with our sister organizations, industry and our community, and our partnership with the University of Toronto.

Growth in health-care innovation and the contribution to a knowledge economy is very much about relationships and building partnerships with people and organizations who share your vision and who share your passion for achieving it.

We want to partner with organizations that value innovation and that understand our desire to improve patient care. We want people to join us as we pursue our vision of inventing the future of health care. The reality is that we cannot do it on our own. We would be doomed if we felt we could run a closed organization that doesn't see itself as a partner that is open for business.

Our success is found in our ability to work with others and to share knowledge. If we view knowledge as a commodity in a new economy, then its value increases as we share it with others who can contribute to achieving the goal of creating an innovation that will improve the lives of those who need it most—our current and future patients, and their families.

I would like to share with you a few examples of how we have been helping to build the new knowledge economy and how our teams work with others to share their discoveries and expertise and build something that benefits society.

There are more than 300 million people worldwide who suffer from diabetes and sadly, many hundreds of thousands will develop complications such as the skin ulcers shown on this slide. On the top is a microscopic image of a poorly healing diabetic ulcer. The microscopic image on the bottom is from a healthy healing ulcer with the purple staining cells representing granulation tissue—the result of increased blood vessels and increased blood flow from treatment with a molecule called "vasculotide."

Researchers Dan Dumont and Paul Van Slyke, shown in this photo that appeared in the Globe and Mail earlier this year, discovered this molecule that aids in the wound-healing process. The challenge with diabetic ulcers is that

there is restricted blood flow to the damaged area, which prevents effective healing.

In many cases, the wounds tend to reopen which leads to infections and in some cases amputations and even death. The use of the molecule improves blood flow to the wound area and helps create a deeper and more effective healing of the area, preventing the likelihood that the wound may reopen.

So, we have this fascinating discovery that is also inexpensive to produce and we have the data to demonstrate its potential, but where can scientists, who may not have the business acumen needed to secure investments to further their work, go for help to bring this important discovery to market?

Thankfully, we have a strong partnership with a group called MaRS Innovation that is dedicated to commercializing these types of ventures.

The only way we can get our discoveries to our patients is through the rigours of the commercialization process. Beyond the scope of activity at our individual organizations, 17 research hospitals and universities in Ontario have partnered in creating MaRS Innovation where scientists and inventors are brought together with investors who are looking for high-potential opportunities, especially in the biosciences and technology.

In the case of the "wound-healing" molecule, our colleagues at MaRS Innovation were able to attract the interest of Sanofi and broker a multi-year deal that will help bring this discovery through further testing and ultimately into the bodies of those who need it most.

In this case everybody wins. The scientists get rewarded for their discovery. The institution that supported them gets rewarded for creating an environment to incubate the idea. The investor takes a risk to bring the product to market but will be rewarded when it is commercially successful, and most importantly, 300 million diabetics around the world stand to benefit from this dis-

covery.

Partnership with the private sector towards creating a safe and efficient new product is critical to moving our health system forward and inventing its future.

Here is another example. Focused ultrasound surgery is disruptive technology both metaphorically and literally. We think this could change the practice of certain types of surgery forever.

Through a partnership with a company called Insightec, Sunnybrook has been working to bring this technology to clinical trials, which have now been approved to move forward. Our early plans for applying this technology will be in the treatment of uterine fibroids, brain cancer, and other diseases that are difficult to treat with conventional methods.

This process takes ultra sound waves and focuses them with a level of intensity that enables them to destroy tumours. In the case of uterine fibroids, the procedure takes a couple of hours, requires no anesthesia, and the skin is never broken. The patient may take a Tylenol afterwards to manage any discomfort.

Similarly, this procedure will be applied in the very near future to patients who have brain tumours. The challenge with some brain tumours is that they are located in areas of the brain that are impossible to reach with traditional surgery. With the new device pictured here, we will be able to destroy tumours by the use of sound waves, making the once inoperable, operable.

In addition to surgery, diseases of the brain are a challenge to treat medically due in large part to a protective "blood-brain barrier"—a barrier between circulating blood and the brain extracellular fluid—something that does not exist in other parts of the body. With this innovation, we are able to use sound waves to disrupt the blood-brain barrier and deliver medications to areas of the brain that were once extremely difficult to reach.

Imagine, for Alzheimer's patients, we would be able to deliver medication to regions of the brain that are being overwhelmed with plaque build ups. In preclinical testing the results have been startling. We are achieving outcomes in just four or five days that once took months to see.

It is probably safe to say that the economic benefits gained through this technology are potentially astounding. We will be able to treat patients who were otherwise thought to be incurable and we can all but eliminate some of the more common adverse events associated with surgery such as infections.

As mentioned earlier, our children may ask us one day to tell them what traditional surgery was like. With this technology, they may say to us, "I can't believe we used to do it any other way."

This looks like an average row of computers but to a company called Sonosite, it was a $71-million innovation. When this deal was closed, it was one of the largest in the history of medical imaging.

Originally developed at Sunnybrook Research Institute, this innovation represents another unique use for ultrasound. Pictured here are early versions of high frequency ultrasound systems that are capable of seeing microscopically, deeper and more accurately into the body than ever before.

This technology is key in such clinical applications as inserting IV lines into critically ill, premature babies, determining the quality of skin grafts on burn patients, assessing blood flow in heart patients and better detection of cancers.

Earlier versions of this technology could view six frames per second and the device weighed about 350 pounds.

With the addition of investment from the government, venture capital and corporate interest, not to mention quite a bit of hard work on the part of the development

teams, that employed more than 100 people in Ontario alone, the Vevo imaging system can now show 500 frames per second and it weighs less than 15 pounds, making it perfect for bedside applications.

This technology is an enormous success and it is anticipated that revenues for this breakthrough could approach $1 billion.

As a start-up company, they credit their success to four key factors:

- Basic science innovation that was incubated at Sunnybrook's Research Institute;
- Canadian venture capital investment;
- Funding from government and tax-incentive programs; and
- The availability of highly qualified engineers and application specialists from universities right here in Ontario.

Essentially, the formula for success in this case was one we need to continue to develop and nurture. Find people with great ideas. Give them a place to let them experiment. Attract people who will invest in their ideas and ensure there is public support from government to seed and incent business to support these types of ventures.

Here is what happens when you give a cancer surgeon, his resident, and a couple of engineering students a Microsoft Xbox game console, an iMac, access to Linux, and some duct tape. It sounds a little like MacGyver but in this case, the bad guys they were fighting were bugs that can cause serious infections.

As one of our general surgery residents was jogging with his engineering friend one day, they began discussing their work and life in the operating room. One of the challenges in the OR is maintaining the sterile field while having to view CT and MR scans of the patient.

This is particularly important when removing a tumour. You want to make sure you resect the diseased tissue and leave as much of the healthy tissue as intact as possible. Achieving this requires consulting with medical images displayed on a computer screen. The unfortunate part about this is that you may have to actually leave the sterile field to manipulate the image on the screen by using a mouse or some other method.

Fortunately, our students were well versed in the use of new gaming software that enables players to motion in front of the screen to interact with the game. By moving your hands and waving your arms in a certain manner you can blast aliens, play tennis or do a whole host of other things—likely known better to your children than many of you.

Our young gamers had a better idea. What if you could use the same technology to move medical images in the OR without ever having to leave the patient's side or the sterile field?

Take the same movements that you use to play a game and apply them to the electronic scans of our patients that appear on a computer screen in an OR. They tried it and it worked famously.

In fact, Microsoft has spoken about this internationally as an example of one of the most innovative uses of their technology that they have ever seen.

Let me show you, in a 30-second video clip, how this actually works in real life.

Our formula for innovation holds true here. We have found people with a great idea. We gave them the room to develop it and we have attracted interest from a rather large company called Microsoft, that is exploring this in further development.

What we've talked about so far has included innovations happening with people inside our organization, but I would like to leave you with an example of a new technol-

ogy from an Oakville company that was developed in partnership with our organization.

The role of an academic health sciences centre should go beyond sharing and translating knowledge. We should also be a resource for people who have a concept, but need an institution to help them bring it to market. In this case, we played an incubator role for a small organization with a big idea.

If you're not close to a pharmacy, how can you get your prescription filled? This company proposed to answer that question with the help of a prescription vending machine. Now, this is much more sophisticated than where you may turn to buy a snack but it operates on a similar principle. The company, called PharmaTrust, partnered with Sunnybrook and our pharmacists to help pilot a new technology that would dispense medication to people by way of teleconferencing and a kiosk.

Patients and family members at our Holland Orthopaedic and Arthritic Institute have been able to get their prescriptions filled by placing their script in the machine and connecting with a pharmacist via videoconferencing. This is wonderfully convenient for patients leaving the hospital. We will also be trialing the new version of this called TouchPoint in our Emergency Department beginning in the next couple of weeks.

In this case, we have been able to help the company research the technology and act as a kind of living laboratory to safely trial the device. The company receives advice from our clinicians and patients and we are able to offer people a unique and convenient experience.

Since its original launch, PharmaTrust has attracted significant interest across Canada and internationally in the United Kingdom to implement this technology. We are proud to say that we have helped this company develop a service that has the potential to benefit many thousands of people each year.

In closing, while showing images of two health-care innovations separated in time by 83 years, I want to reiterate a couple of my earlier points.

We have the ingredients in Ontario to build a sustainable economy that has, as one of its key drivers, innovation and discovery—but this doesn't come without effort and commitment.

As leaders in industry, government, and health-care delivery, we have to challenge ourselves to ask the question—what is next? How can we improve what we are doing? We have to say, there has to be a better way but saying it is not enough.

We have to continue to incent people and organizations to support and encourage innovation. Tax breaks, venture capital, and creating an environment where people can experiment, and fail and succeed, is critical to moving forward.

We have to own a sense of discomfort for the present, and have a vision for the future that inspires others to do something they haven't done before. We have to say that we can do better than this and we have to work collaboratively to achieve the things we never thought possible.

I want to thank you all for coming today and I—like you—look forward to seeing what comes next.

Thank you.

The appreciation of the meeting was expressed by Anita Gupta, President and CEO, NMI Tax Consulting Group, and Director, The Empire Club of Canada.