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The Ottawa Hospital

Research Bringing You Tomorrow's Health Care Today

Ottawa Hospital Research Institute 2012–2013 Annual Report

In the Spotlight At a Glance Year in Review By the Numbers

In the Spotlight Leading the way to faster, better, more effective care.

At a Glance Our research, people and facilities.

Year in Review Discoveries, milestones and knowledge in action.

By the Numbers Fast facts, world firsts and $1billion.

More
The Ottawa Hospital Annual Report

We've made it easier to share!

Looking at our achievements

This year, the Ottawa Hospital Research Institute (OHRI) continued to prove itself as one of Canada's foremost hospital-based research institutes.

The Ottawa Hospital ranks in the top 3% globally for the impact of its research. We are third in terms of peer-reviewed funding received from the Canadian Institutes for Health Research. Our annual research revenues make us the sixth-highest grossing research hospital in Canada.

And to top it off, this year we achieved a remarkable milestone, surpassing the $1-billion mark for research revenues since opening our doors as OHRI in April 2001!

This ability to attract funding to Ottawa is a testament to our researchers, who continue to make discoveries and progress that will improve health care for people in our city, across Canada and around the world.

$1 Billion
Find out what $1 billion means for health research in Ottawa. Read more.

Whether we're talking about world-first clinical trials – happening right here – or a discovery that could fundamentally change our approach to treating muscular dystrophy, our scientists and clinical investigators are passionately pursuing cures, new therapies and better treatments for our patients.

> *"It is an exciting time for health research and we are leading the way, right here in Ottawa."*
>
> *–Dr. Duncan Stewart, CEO and Scientific Director, Ottawa Hospital Research Institute*

OHRI also received high praise from an international panel of highly respected scientists who conducted a scientific review of our organization this winter. Chaired by Dr. Alan Bernstein, the External Scientific Advisory Board provided a strong endorsement of the excellence of OHRI's research, highlighting our strengths, and national and international leadership in a number of our research programs, including cancer, regenerative medicine and practice-changing research.

"Overall, we remain highly optimistic for the future," concludes the External Scientific Advisory Board. "Now should be a time to move forward ambitiously and with great optimism for the future."

We couldn't agree more.

OHRI is privileged to work in and be supported by the Ottawa community, where we are inspired to conduct research that brings you tomorrow's health care today.

Ken Newport
Chair, Board of Directors, OHRI

Dr. Duncan Stewart
CEO and Scientific Director, OHRI
Vice-President, Research, The Ottawa Hospital
Professor of Medicine, University of Ottawa

Why Ottawa?

Watch the video

The Ottawa Hospital is attracting top talent to the city. View this video to see why leading clinicians and scientists chose Ottawa as the place where they want to make a difference.

> *"*I felt that collaboration was just natural here.*"*
>
> *–Dr. Vicente Corrales-Medina*

> *"*I knew this would be a place where I could be surrounded by world-class scientists who are doing cutting-edge research and bringing the latest treatments for all of their patients.*"*
>
> *–Dr. Angel Arnaout*

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About Us

Ottawa Hospital Research Institute 2012–2013 Annual Report

Vision and Strategic Research Directions Leadership Team

Vision and Strategic Research Directions

OHRI's vision is to give our patients and their loved ones new hope through research that is making tomorrow's health care possible today.

This vision expresses our commitment to research that is focused on and inspired by patients. We approach our work with compassion and dedication each day, knowing that every question we answer and every problem we solve could eventually impact many people, including our own loved ones.

To support our vision, we have developed two strategic research priorities:

1. **Regenerative and biological therapeutics:** Fostering bench-to-bedside research by turning basic discoveries in cellular and molecular biology into new regenerative and biological therapeutics to improve health.
2. **Practice-changing research:** Putting knowledge to work by performing high quality clinical research that can inform health decisions, and ensuring that results are optimally applied to improve health.

We have also developed a crosscutting strategic research theme on vascular health, which is designed to foster an exciting area of research that focuses on the role of blood vessels in health and disease. This theme cuts across all of our existing programs, fits well with our partners and addresses a major challenge for the health and wellbeing of Canadians.

Leadership Team

OHRI is a not-for-profit corporation governed by a Board of Directors that includes members of the University of Ottawa, The Ottawa Hospital and the community.

Board Chair

- Ken Newport, Biotech Entrepreneur

Board Vice-Chair and Treasurer

- Ian Mumford, Chief Operating Officer, Canadian Blood Services

Board of Directors

- Dr. Jacques Bradwejn, Dean, Faculty of Medicine, University of Ottawa
- Christa Casey, Partner & Director of the Not-for-Profit Sector Ottawa, Welch LLP
- Ian Curry, President and CEO, DNA Genotek
- Gary Hannah, President and CEO , Vocantas
- Don Hewson, President and CEO, HBS Marketing
- Dr. Jack Kitts, President and CEO, The Ottawa Hospital
- Louis Lamontagne, Entrepreneur
- Sylvie Lauzon, Dean, Faculty of Health Sciences, University of Ottawa
- Rose Lipiec Montoya, Financial Planner, TD Waterhouse Financial Planning
- Randall Marusyk, Managing Partner, MBM Intellectual Property Law
- Dr. Mona Nemer, Vice-President, Research, University of Ottawa
- Brian Radburn, CFO, Panacis
- Dr. Duncan Stewart, CEO and Scientific Director, Ottawa Hospital Research Institute, Vice-President of Research, The Ottawa Hospital and Professor of Medicine, University of Ottawa
- Bashir Surani, Member of The Ottawa Hospital Board of Governors
- D. Lynne Watt, Partner, Gowling Lafleur Henderson LLP
- Shirley Westeinde, Chair, Westeinde Group of Companies

Senior Management Team

OHRI’s senior management team provides scientific and administrative leadership.

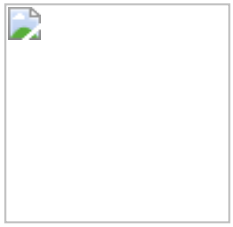
Dr. Duncan Stewart
CEO and Scientific Director

Dr. Rashmi Kothary
Deputy Scientific Director

Dr. Jay Baltz
Associate Scientific Director, Trainees

Dr. Dean Fergusson
Program Director, Clinical Epidemiology

Dr. Antoine Hakim
Program Director, Neuroscience



Robert Hanlon
Chief Operating Officer

Dr. Michael McBurney
Program Director, Cancer Therapeutics

Dr. Leo Renaud
Associate Scientific Director

Dr. Michael Rudnicki
Program Director, Regenerative Medicine

Dr. Alexander Sorisky
Program Director, Chronic Disease

Dr. Valerie Wallace
Program Director, Vision

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At a Glance

Ottawa Hospital Research Institute 2012–2013 Annual Report

Our Research Our People Our Facility

The Ottawa Hospital Research Institute (OHRI) is the research arm of The Ottawa Hospital and an affiliated institute of the University of Ottawa. Our research is focused on answering important health questions and translating new findings into benefits for patients and the community. Our goal is to make tomorrow's health care possible today; bringing new hope to our patients, while advancing health research at a global level.

With more than 1,735 scientists, clinical investigators, trainees and staff, as well as total annual revenues of more than $106 million, OHRI is one of the foremost Canadian hospital-based research institutes.

$1 Billion
is the revenue milestone OHRI passed this year, since its start as the research arm of the The Ottawa Hospital on April 1, 2001.
Read more.

- Repairing a Damaged Immune System
- Rapid Diagnosis, Reduced Anxiety
- Healthier Moms, Healthier Babies

- Our Research
- Our People
- Our Faciliity

- Research Improving Health Today
- Research Providing Hope for Tomorrow
- Milestones and Recognition

- $1 Billion of Health Research
- A Numbers Story
- Financials

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Our Research

Our scientists, clinical investigators, trainees and staff are investigating virtually every major disease and condition. Our research spans the full spectrum of health science, from basic molecular biology and epidemiology, to clinical trials and the development of new therapies, to health services and knowledge translation research.

Recognized as one of the top research hospitals in Canada, OHRI has 1,916 active research projects, 883 active research grants, contracts and salary awards, and 455 active clinical trials. We also have 43 active patent families under management.

184 agencies & companies
funded the research of our scientists and investigators this past year.
See "A Numbers Story".

OHRI's research programs

Cancer Therapeutics Chronic Disease Clinical Epidemiology
Neuroscience Regenerative Medicine Vision

Our People

Research is a team activity at OHRI, involving scientists, clinical investigators, trainees and specialized support staff. Patients also play a crucial role in research by volunteering for studies and providing inspiration and ideas for improving care.

110 Scientists

OHRI has 110 scientists leading teams of five to 30 people each. Scientists have MDs, PhDs, or both, and spend the majority of their time on research. All OHRI scientists are also professors at the University of Ottawa and many are active physicians at The Ottawa Hospital.

450 Investigators

Investigators are generally physicians, nurses, or other health-care professionals at The Ottawa Hospital. They devote significant time to research while also being very active in clinical practice. OHRI has more than 450 investigators.

20 visiting scientists
came to OHRI to develop and enhance their scientific skills in areas where OHRI scientists are leaders in their field.

475 Trainees

OHRI has 475 trainees who conduct much of the hands-on research at OHRI and come up with many of the innovative ideas for new studies. Trainees include graduate students, postdoctoral fellows, undergraduates, summer students and volunteers. Most are undertaking research at OHRI as part of a degree at the University of Ottawa.

702 Support staff

OHRI depends on more than 700 highly specialized support staff to conduct groundbreaking research. Support staff members coordinate clinical trials, manage research programs and operate sophisticated laboratory equipment. They also take care of health and safety, commercialization, finance and other areas of administration.

Our Facility

OHRI is a multi-sited research facility based at The Ottawa Hospital's Civic, General and Riverside campuses, with additional space at the University of Ottawa's Faculty of Medicine. With 230,000 square feet of dedicated basic and clinical research space, OHRI has a number of specialized facilities, including the Sprott Centre for Stem Cell Research, the Centre for Innovative Cancer Research, the Centre for Practice-Changing Research and several Good Manufacturing Practice Laboratories.

Note: All figures on this page are as of March 31, 2013, except where noted.

654 physicians at The Ottawa Hospital were involved in research pursuits this year. In 2001, this number was well under 100.

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Year in Review

Ottawa Hospital Research Institute 2012–2013 Annual Report

Research Improving Health Today Research Providing Hope for Tomorrow Milestones and Recognition

The year 2012–2013 was another exciting time for discovery, collaboration and world firsts at OHRI.

Whether it was developing an iPhone app to help parents manage their children's immunizations or a making a discovery about stem cells that could profoundly affect how we approach obesity, our dedicated team of scientists and clinician-investigators is working to improve health care today and answer questions that will lead to exciting treatments for tomorrow.

Explore The Ottawa Hospital's Year in Review

The Ottawa Hospital is one of the top research hospitals in the country when it comes to attracting external funding . We have state-of-the-art facilities and the talent to do great things; to answer the big questions and make the major advances that bring you tomorrow's health care today.

$1 Billion
is the revenue milestone OHRI passed this year, since its start as the research arm of the The Ottawa Hospital on April 1, 2001.
Read more.

"We have great momentum and are making huge strides in finding the solutions, making the breakthroughs and ushering in new therapies that were inconceivable only 10 years ago," says Dr. Duncan Stewart, CEO and Scientific Director of the Ottawa Hospital Research Institute. "It is an exciting time for health research and we are help leading the way, right here in Ottawa."

> *"*It is an exciting time for health research and we are leading the way, right here in Ottawa.*"*
>
> *–Dr. Duncan Stewart, CEO and Scientific Director, Ottawa Hospital Research Institute*

- Repairing a Damaged Immune System
- Rapid Diagnosis, Reduced Anxiety
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Research Improving Health Today

Calculating how our unhealthy habits take years off our lives

Dr. Doug Manuel and his team have published two tools that help us understand how small decisions we make every day can have a significant effect on our lives. In 2012, the life expectancy calculator accompanied a study that suggests five unhealthy habits of Ontarians are costing them 7.5 years of life. If everyone modified only their most important health risk, overall life expectancy would increase by up to 3.7 years. (See *Toronto Star* or *Globe and Mail*.) In 2013, Dr. Manuel introduced the Salt Calculator to help us track the amount of salt we're eating and identify the main sources of sodium in our diets. (See *Globe and Mail* and CBC's *Marketplace*.)

Cancer Spotlight story:

Rapid diagnosis, reduced anxiety: Find out about an innovative program offering fast-track results for women at the highest risk of breast cancer

Watch the video

New iPhone app helps you track immunizations

Is it time to say goodbye to the yellow card, that iconic paper method of recording vaccinations? Thanks to an iPhone app called ImmunizeON, that time may be near. Developed under the direction of Dr. Kumanan Wilson, the app is designed to make keeping track of children's vaccinations easier by putting this important information literally at your fingertips. It also sends out reminders and alerts, as well as providing credible information on vaccines and what to do in case of an adverse reaction. The project has attracted significant interest from public health agencies across the country and Dr. Wilson is actively working to improve its reach and functionality. (See *Toronto Star*.) The app is free and available on iTunes.

> *"*While the paper yellow card remains the official vaccination record, we hope this app will make it easier for parents to keep track of their children's vaccinations.*"*
>
> *–Dr. Kumanan Wilson*

Flu shot during pregnancy has unexpected benefits

Physicians and researchers from Ottawa published a large study showing that a flu shot during pregnancy provides unanticipated benefits to the baby. Specifically, H1N1 vaccination during the pandemic was associated with a significantly reduced risk of stillbirth, preterm birth and extremely small babies at birth. "Pregnant women are generally very, very careful about what they put into their bodies. For health-care providers like me, such a large-scale study that shows no adverse perinatal outcomes resulting from the H1N1 flu vaccine will be extremely helpful when discussing maternal vaccination," says co-author Dr. Mark Walker, a senior scientist at OHRI, a high-risk obstetrician at The Ottawa Hospital, and a professor and Tier One Research Chair in Perinatal Research at the University of Ottawa. (See *New York Times* and *Ottawa Citizen*.)

Dr. David Moher, one of the driving forces behind SPIRIT 2013

The guiding SPIRIT of doing science right

OHRI continues to play a leading role in international efforts to ensure that studies and trials are asking the right questions, conducted with rigour and reported with integrity — all of which improve the value resulting from the considerable investments that go into clinical trials. The SPIRIT 2013 Statement received endorsement from high-profile journals, such as *The Lancet*, *BMJ* and the *Annals of Internal Medicine*. SPIRIT stands for Standard Protocol Items: Recommendations for Interventional

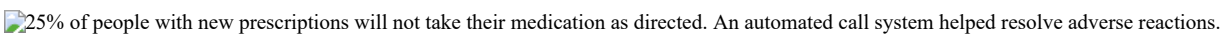
Trials and provides recommendations for a "minimum set of scientific, ethical, and administrative elements that should be addressed in a clinical trial protocol." Improving these protocols saves time and money when setting up clinical trials, and ensures that results are clearly presented in a way that improves their interpretation.

A surprising answer about blood transfusions

In a finding that runs counter to commonly held beliefs about fresh being better, a clinical trial led by Dr. Dean Fergusson shows that acutely ill premature babies who received fresher blood (stored for seven days or less) did not fare better than those who received the current standard of care (blood stored for up to 42 days). Dr. Fergusson's trial was the first controlled study in humans. Mounting evidence from observational studies using clinical data suggested that fresh red blood cells are better, which would have required blood collection and banking agencies to implement major changes and find many more donors. (See *Journal of the American Medical Association* and *MedPage Today*.)

Follow-up calls at home help people with their medications

Adverse drug reactions occur in an estimated 25 percent of patients who are not in hospital or care facilities. As well, 25 percent of people with new prescriptions will not take their medication as directed. A study by Dr. Alan Forster, senior scientist at the Ottawa Hospital Research Institute and scientific director of Clinical Quality and Performance Management at The Ottawa Hospital, published in *JAMA Internal Medicine*, has shown the potential benefits of using an automated phone system to contact these patients about their prescriptions. The system identified 46 percent of adverse drug events and influenced how 40 percent of those were managed. Dr. Forster recently received a grant from the Canadian Institutes of Health Research to further explore the effectiveness of using such a system to help people with their medications.



Research Providing Hope for Tomorrow

Fighting fat with fat: muscle stem cells key

Dr. Michael Rudnicki's lab has made the groundbreaking discovery that adult muscle stem cells can be induced to become brown fat cells, a form of good fat that could play a critical role in the fight against obesity. Dr. Rudnicki's team identified a way to trigger the production of brown fat instead of muscle. One simple injection in the hind leg of a mouse led to the production of brown fat, protected the animals from obesity and improved their ability to process glucose. It also led to increased energy production throughout the body—an effect observed after four months. (See *Ottawa Citizen*.)

Watch the video

Regenerative Medicine Spotlight story:

Repairing a damaged immune system: Our researchers are embarking on clinical trial of world's first stem-cell therapy for septic shock

Prompting the immune system to fight cancer

Drs. Rebecca Auer and John Bell have developed a promising vaccine that kick starts the body's immune response to fight cancer. The vaccine is composed of actual tumour cells that have been infected with a cancer-fighting virus. In mouse cancer models, the vaccine stimulated the immune system to reduce and, in some cases, eliminate cancer. This approach is particularly promising because unique vaccines could easily be created for individual patients using their own tumour cells. This approach also provided a lasting anti-tumour immune response, which could reduce cancer recurrence. (See CBC.ca.)

Discovery reveals fountain of youth for eggs

Dr. Johné Liu has revealed a critical reason why women experience fertility problems as they get older. The breakthrough also points to a simple solution that could increase the viability of egg cells for women in their late 30s and older — putrescine water. Putrescine is naturally produced in mammals by an enzyme called ornithine decarboxylase, or ODC, and is easily absorbed and cleared by the body. Dr. Liu has shown that ODC levels rise very little in older females and these lower enzyme levels during ovulation leads to an increase in egg cells with chromosomal defects.

Novel protein could treat muscular dystrophy

A breakthrough from Dr. Michael Rudnicki's lab holds promise for sufferers of Duchenne muscular dystrophy (DMD). His team has discovered that injecting a novel human protein into muscle affected by DMD significantly increases its size and strength, findings that could lead to a therapy akin to the use of insulin by diabetics. The injection increased muscle strength almost two-fold (to nearly normal levels), increased the size of muscle fibre and reduced the amount of muscle damage, compared to mice not given the injection. Fate Therapeutics, which acquired OHRI spinoff company Verio Therapeutics, is working to transform this knowledge into a commercial biotherapeutic.

Discovery could provide therapy for Duchenne muscular dystrophy, a genetic disorder that affects
one of every
3,500
newborn males

Blood test in first trimester identifies likelihood of tiny babies

Dr. Andrée Gruslin has found a protein in the blood of pregnant women that can predict if they are likely to have a fetus that doesn't grow properly, and thus at a high risk of stillbirth or long-term health complications because they are born so tiny. "By identifying these high-risk pregnancies early on, we will be able to monitor these women more closely and hopefully help them deliver a healthier baby," says Gruslin. The research could lead to a widely available blood test for use in the first trimester of a woman's pregnancy.

Mice lacking certain gene have bigger brains

Dr. David Picketts and his team have discovered that mice lacking a gene called Snf2l have brains that are 35 percent larger than normal. The research, published in the prestigious journal *Developmental Cell*, could lead to new approaches to stimulate brain regeneration and may provide important insight into developmental disorders such as autism and Rett syndrome. This paper earned Dr. Picketts the 2012 Dr. Michel Chrétien Researcher of the Year Award, which he received at The Ottawa Hospital Gala.

Milestones and Recognition

$1,000,000,000 in health research at OHRI

This year OHRI received its billionth dollar in revenue since it started on April 1, 2001! "For the past decade OHRI has been a driving force for research, innovation and commercialization," says Bruce Lazenby, president and CEO of Invest Ottawa. Read more about what this milestone means for Ottawa.

OHRI neurologist named to Canadian Medical Hall of Fame

Dr. Antoine Hakim was named to the Canadian Medical Hall of Fame for his groundbreaking work in establishing the Canadian Stroke Network (CSN). The Hall of Fame said he has "pushed the boundaries of discovery and innovation beyond the realm of possibility to make the world a better place." Dr. Hakim is head of the Neuroscience Program at the Ottawa Hospital Research Institute, the CSN's Scientific Director and CEO, a senior neurologist at The Ottawa Hospital and a University of Ottawa neurology professor, among many other titles. His greatest pleasure comes from hearing stroke specialists around the world refer to Canada as the leader in stroke care. He predicted that the CSN's benefit would be less-expensive health care for stroke patients; he and many partners made that a reality, saving the system billions of dollars.

Why Ottawa?

View this video to see why Dr. Thébaud and other leading clinicians and scientists chose Ottawa as the place where they want to make a difference.

Watch the video

Top stem cell scientist recruited to Ottawa

The Ottawa health care and research community recruited world-renowned scientist and pediatrician Dr. Bernard Thébaud this year. Dr. Thébaud, who began his work here in October, is researching how to use stem cells for the repair of the lungs in premature babies. In combination with groundbreaking basic science, OHRI's emphasis on translating knowledge into therapies for patients made Ottawa the only city in which Dr. Thébaud wanted to be. "To get this work into patients, I need to be around a critical mass of top stem cell biologists," says Thébaud. His research could also lead to new treatments for asthma and chronic obstructive pulmonary disease.

New centre for blood diseases houses world-class team

The Ottawa Blood Disease Centre officially opened its doors in May 2012 – a huge milestone for the more than 30,000 Ottawa-area patients under the care of hematologists. Housed in the Centre for Practice-Changing Research, this centre brings more than 100 of "the best and brightest health-care professionals and researchers together under one roof," says Dr. Marc Rodger, chief of the Division of Hematology at TOH and senior scientist at OHRI. Previously, the blood disease team was spread across nine locations, in six buildings, on two campuses.

At the funding announcement, Aimee Zeglinski-Spinney told the story of her battle with the same cancer that claimed the life of Terry Fox

$7.5 million bolsters research on cancer-fighting viruses

In October, the Terry Fox Foundation awarded $7.5 million to a multidisciplinary team based in Ottawa and led by Dr. John Bell. The funding allows the Canadian Oncolytic Virus Consortium to continue their innovative work. "Our project aims to use the revolutionary approach of harnessing oncolytic viruses as biotherapeutics and creating effective, targeted anti-cancer agents that cause few, if any, side effects," says Dr. Bell. (See *Ottawa Citizen*.)

Accolades for our scientists

Over the course of the year, a number of our scientists received other significant awards and recognition for their work. Here is a short list (in alphabetical order):

- **Dr. John Bell** received the Canadian Cancer Society's prestigious Robert L. Noble Prize—awarded for outstanding achievements in cancer research. He was also one of the first-ever recipients of the Order of Ottawa, a civic award established by city council to recognize exceptional citizen contributions to life in Ottawa.
- **Dr. Ian Graham** was awarded a Queen's Diamond Jubilee Medal.
- **Dr. David A. Grimes** was awarded a Queen's Diamond Jubilee Medal.
- **Dr. Lynn Megeney** was awarded a Queen's Diamond Jubilee Medal.
- **Dr. Michael Schlossmacher** won the prestigious Annals of Neurology Prize, awarded for an outstanding contribution to clinical neuroscience. Also of note, Dr. Schlossmacher became the first Bhargava Research Chair in Neurodegeneration, made possible by a generous $1-million gift from Sam and Uttra Bhargava.
- **Dr. Dawn Stacey** received the 2012 Excellence in Nursing Research award from the Canadian Association of Nurses in Oncology for her work in cancer symptom management.
- **Dr. Ian Stiell** was awarded the 2012 President's Award from the Canadian Association of Emergency Physicians (CAEP), as well as the 2012 Award for Outstanding Contribution in Research from the American College of Emergency Physicians.

- For the second year running, **Dr. Eve Tsai** was named to Canada's Top 25 Women of Influence list, a recognition of her groundbreaking work and her dedication to bringing researchers and clinicians together.
- **Dr. Kumanan Wilson** was awarded a Queen's Diamond Jubilee Medal.

By the Numbers

Ottawa Hospital Research Institute 2012–2013 Annual Report

$1 Billion of Health Research A Numbers Story Financials

> *"*With more than $1 billion in research … [OHRI has] made an enormous impact on Ottawa's economy, not to mention their contribution to the health and well-being of all Canadians.*"*
>
> *Bruce Lazenby, President and CEO, Invest Ottawa*

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$1,000,000,000 of health research

In March 2013, the Ottawa Hospital Research Institute took in its billionth dollar since the organization officially started as the research arm of The Ottawa Hospital (in affiliation with uOttawa) back on April 1, 2001.

Billions of dollars are often bandied about in the news, but what does that look like? How much is a billion?

Well, if you took one billion loonies and stacked them, the billionth loonie would be 1,950 km above the earth — more than five times higher than the International Space Station. On the other hand, there are about a billion protein molecules in every cell — an indication of the incredible intricacies our researchers are unravelling every day.

Here is what $1 billion looks like at OHRI.

In 2001, OHRI had 732 researchers and staff, and the combined annual revenues of the merged research institutes stood at $44.4 million. Twelve years later, we have 1,735 researchers and staff working for us, and our total revenues are $106 million (2012–2013).

We have grown!

Annual Revenues

"For the past decade OHRI has been a driving force for research, innovation and commercialization," says Bruce Lazenby, president and CEO of Invest Ottawa. "With more than $1 billion in research and employing more than 1,700 scientists, clinical researchers and staff, they have made an enormous impact on Ottawa's economy, not to mention their contribution to the health and well-being of all Canadians."

Of the $1 billion we have brought in, nearly $800 million is money from provincial, national and international sources that we have injected into the local economy. This is money that otherwise would likely not have come to Ottawa.

> *"*OHRI is a global leader in several fields and one of the key research pillars of our community.*"*
>
> *–Bruce Lazenby, president and CEO of Invest Ottawa*

OHRI also brings highly skilled knowledge workers to Ottawa. Our research programs have leaders in their fields and draw top scientists. As an institute we have numerous strengths, especially in regenerative medicine, chronic disease, cancer therapeutics and practice-changing research, all of which were recognized as such in a

review conducted this year by an international panel of renowned scientists. These strengths, along with our culture for translating discoveries into therapies, means that we are also attracting leading clinicians. They understand that research is the best road to improved care and know that the collaborative research environment at the Ottawa Hospital Research Institute fosters excellence in scientific inquiry, as well as in the health care provided to the community at the hospital.

Why Ottawa?

View this video to see why leading clinicians and scientists chose Ottawa as the place where they want to make a difference.

Watch the video

Our scientists, who are all professors at uOttawa, also train the next generation of researchers. Since 2001, we have helped more than 1,000 trainees (postsecondary students and postdoctoral fellows) obtain their credentials. We currently have 475 trainees working with us. They are Ottawa's future innovators.

As for commercial innovation, OHRI has generated seven spinoff companies. One example is Coley Pharmaceutical Inc., which was acquired by Pfizer and continues to operate a vaccine research-and-development facility in Kanata. In addition, as of March 31, 2013, OHRI was managing 43 patent families (the group of patents filed in separate countries for an invention).

Our research and reputation has other importance for the local business community. "OHRI is a global leader in several fields and one of the key research pillars of our community, which makes it a critical selling attribute when Ottawa wants to attract international business," says Invest Ottawa's Bruce Lazenby.

But these tangible facts and figures only scratch the surface in any assessment of impact, or the return on investments in health research.

For many people, the impact of health research exists in the realm of finding cures. These are certainly the beacons that motivate many when it comes to funding and donating, not to mention those actually conducting and leading the research. At OHRI we have made significant contributions in moving toward some of those beacons, such as promising therapies using cancer-fighting viruses, biotherapeutics for Duchenne muscular dystrophy and a treatment that uses gene-enhanced stem cells to help the heart repair itself after a heart attack. These three examples, developed from basic scientific discoveries by our scientists, are now in clinical trials or are very nearly at that stage. Each represents a potential breakthrough in how we treat these diseases. And we have others.

Watch the video

Regenerative Medicine Spotlight story

Repairing a Damaged Immune System: Researchers Test World’s First Stem-Cell Therapy for Septic Shock

While we are working on cures, the reality is that many important research advances are incremental. These more modest gains are not the headline grabbers, but add up to the incredible progress and improvements we benefit from in the health care available to us today, from faster and more accurate diagnosis to more effective use of medication. This enhanced quality and effectiveness of care is critical in assessing the impact of research investments.

To that end, our researchers are making substantive contributions, whether it's evidence to support reduced doses of chemotherapy, a clinical trial that compares three common drugs and finds the most expensive to be dangerous, or a comprehensive review of existing evidence that clinicians and policy-makers can turn to with confidence.

Cancer Spotlight story

Rapid Diagnosis, Reduced Anxiety: Innovative Program Offers Fast-Track Results for Women at the Highest Risk of Breast Cancer

Watch the video

Our institute is also an international leader in providing guidance on doing science right. This expertise ensures that trials and studies are designed in a way that will authoritatively answer the right questions, thus ensuring the effectiveness of the significant investments made.

We can certainly quantify some of our achievements, such as the $10 million Canada saves annually because of rules developed here that have drastically reduced the need to order diagnostic images of ankle and knee injuries.

But how can you put a value on lives saved, the quality of lives improved, future innovations and innovators, and the importance of doing science right?

This is priceless!

A Numbers Story

Firsts

1st clinical trial	in the world of an engineered stem cell therapy to repair heart muscle after a major cardiac event (opened June 2013)
1st lab in the world	to show adult muscle stem cells turn into brown fat, a good form of energy-burning fat tissue (2013). Learn more about Dr. Michael Rudnicki's lab...
1st iPhone app	from OHRI: ImmunizeON helps people track their immunizations (available for free on iTunes 2012)
1st clinical trial	in the world of a stem cell therapy to treat septic shock, an affliction that accounts for 20% of admissions to intensive care units and kills an estimated 40% of those (to open in 2013)

Regenerative Medicine Spotlight story

Repairing a Damaged Immune System: Researchers Test World's First Stem-Cell Therapy for Septic Shock

Watch the video

1st lab in the world	to demonstrate that a viral therapy delivered intravenously can selectively infect and spread within tumours in humans (2011). Learn more about Dr. John Bell's lab...
1st lab in the world	to confirm the existence of adult stem cells in skeletal muscle (2007). Learn more about Dr. Michael Rudnicki's lab...
1st lab in the world	to report existence of stem cells in adult cardiac muscle (2002). Learn more about Dr. Lynn Megeney's lab...

Fast Facts

$1 billion	**Total revenue generated** by OHRI since April 1, 2001
184	**Number of agencies** and companies that funded research at OHRI in 2012–2013
3rd	**Rank among Canadian research hospitals** for peer-reviewed funding from the Canadian Institutes of Health Research
6th	**Rank, in terms of total research revenues,** among all Canadian hospitals (2012, RE$EARCH Infosource)
798	**Number of scientific publications** by OHRI researchers in 2012
3%	**Global impact of our scientific publications,** we rank in the top three percent (2012, SCImago)
21	**Number of OHRI scientists** with papers in the top one percent of their field (first or last author)

How we do it

7,097	**Number of pieces of lab research equipment** (items that require electrical power)
54	**Number of research labs**
1	**Ottawa Methods Centre,** created to promote and facilitate methodological excellence; home to internationally recognized experts in clinical trial design, data management and statistics
3	**Number of GMP laboratories in 2013,** built to produce biotherapeutics for use in human clinical trials
150	**Average number of pipette tips** used by a lab researcher in a week

203 **Number of Co2 incubators**

1,000 **Average number of samples placed into our Biorepository** on a weekly basis (a majority from the Ontario Health Study)

Financials

Revenue Distribution 2012-2013

Expenditure Distribution 2012-2013

Top 10 sources of peer-reviewed funding 2012-2013

Canadian Institutes of Health Research	$21.1M
Ontario Research Fund – Research Excellence	$3.3M
Ontario Institute for Cancer Research	$1.6M
Heart and Stroke Foundation of Ontario	$1.3M
The Ottawa Hospital Academic Medical Organization	$1.2M
Terry Fox Foundation	$1.1M
Canada Research Chairs Secretariat	$1.0M
Ontario Research Fund – Global Leadership	$0.9M
Canadian Breast Cancer Foundation	$0.8M
Canadian Cancer Society Research Institute	$0.7M

Canadian dollars (millions)

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The Ottawa Hospital

In the Spotlight

Ottawa Hospital Research Institute 2012–2013 Annual Report

Repairing a Damaged Immune System Rapid Diagnosis, Reduced Anxiety Healthier Moms, Healthier Babies

This year's annual report highlights three success stories that clearly demonstrate how the hospital provides the best possible care for our patients and continuously improves quality of care through research and innovation.

These successes bring The Ottawa Hospital closer to its goal of becoming a top 10 per cent performer in quality and safety of patient care in North America and show why we have one of the foremost hospital-based research institutes in Canada.

- Repairing a Damaged Immune System
- Rapid Diagnosis, Reduced Anxiety
- Healthier Moms, Healthier Babies

- Our Research
- Our People
- Our Faciliity

- Research Improving Health Today
- Research Providing Hope for Tomorrow
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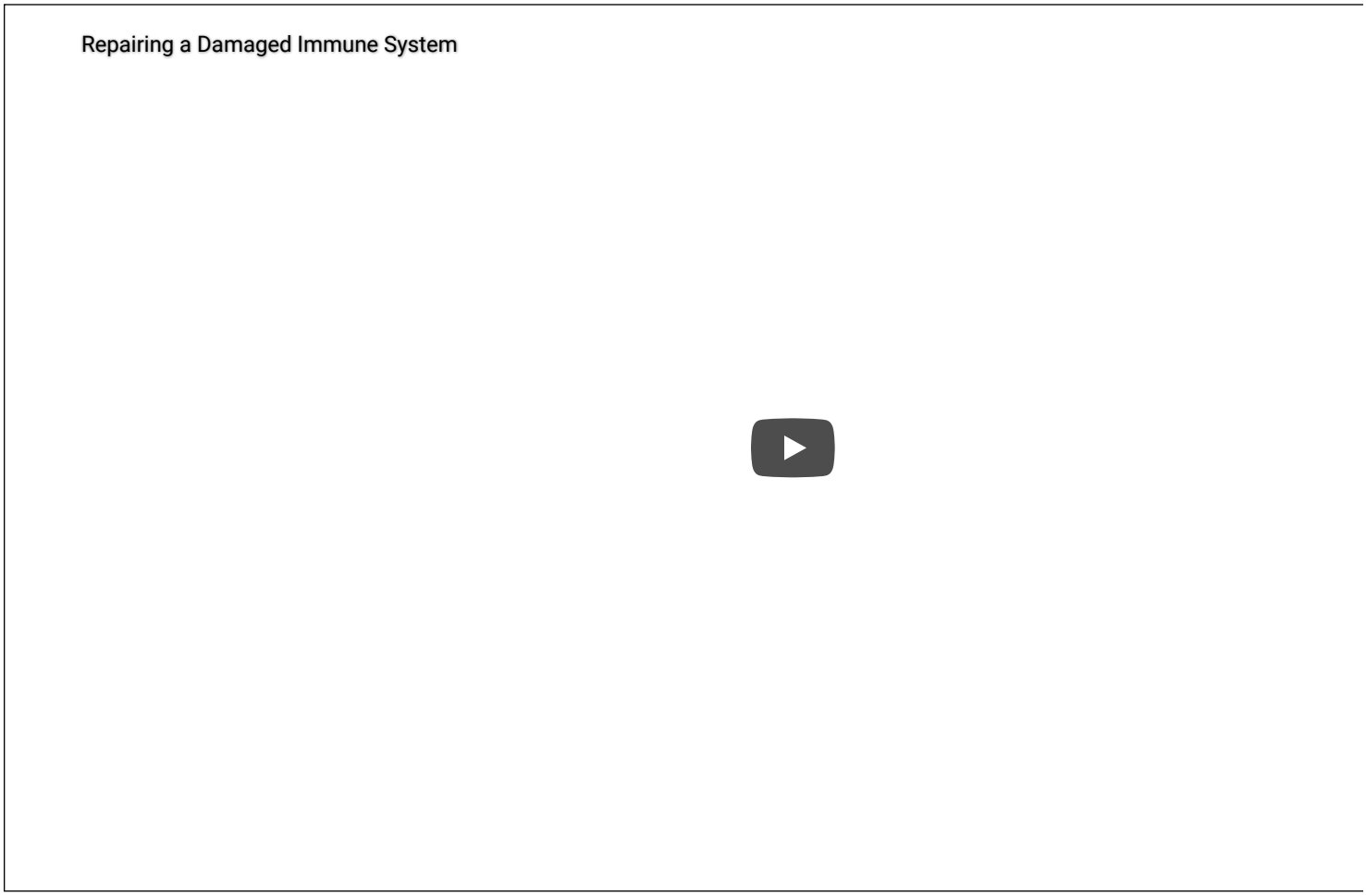
Repairing a Damaged Immune System:

Researchers Test World's First Stem-Cell Therapy for Septic Shock



Watch the video

Through a minimally invasive procedure, Jim Graves expected to have routine day surgery when he had his gall bladder removed. Instead, less than two days after the surgery, bile produced by the liver leaked into his system, causing a dangerous infection. Graves's lungs collapsed and he was put on a ventilator to help him breathe.

By the time he was rushed to The Ottawa Hospital from where he was being treated, Graves's condition was already dire. Bacteria had invaded his blood, and his heart, lungs and kidneys were shutting down.

Graves was sliding into septic shock, an avalanche of immune responses triggered by the infection in his bloodstream. With his body gripped by runaway inflammation and organ failure, Graves was fighting for his life in the intensive-care unit.

"I was in a coma for 19 days," he says. "I lost about a month of my life, which was a mystery to me. In total, I spent nearly three months in hospital. My entire body shut down during that time so I have to learn to do everything all over again, like walking."

> *"*It's not acceptable that we have such limited ways to reduce death in patients with septic shock. There have to be better ways forward to help them in the future.*"*
>
> *–Dr. Lauralyn McIntyre*

Graves was fortunate to survive. Of the one in five patients admitted to ICUs with septic shock, nearly half die, making the condition a leading cause of death among critically ill patients in hospitals.

In treating septic shock, the challenge for physicians is recognizing an invasive infection early, before the cascading damage becomes unstoppable. Patients with septic shock require aggressive resuscitation measures, large doses of intravenous antibiotics and ventilators.

Yet because septic shock can at first look like less serious ailments and cause unpredictable complications, it is often deadly.

"Despite decades of research, medical experts haven't made that much headway in developing new therapeutics to treat septic shock," says Dr. Lauralyn McIntyre, a critical-care physician and researcher at The Ottawa Hospital.

In a world first, McIntyre and her collaborators at the Ottawa Hospital Research Institute are testing an experimental stem-cell therapy to treat septic shock.

Patients are injected with donated stem cells, grown and purified in a laboratory at the hospital, which have the potential to calm the body's hyperactive immune response and reduce the cascade of inflammation that leads to organ failure.

"The neat thing about stem cells is that they can reduce inflammation in a number of ways," McIntyre explains. "Instead of affecting just one pathway, they seem to affect many different inflammatory pathways. These cells seem to restore the natural balance of the body's immune system. They seem to reduce organ failure, and they seem to reduce death."

Stem cells can turn into a variety of specialized cells and tissues that have the potential to repair and regenerate damaged organs.

Early results from animal studies even raise the possibility that the stem cells, derived from the bone marrow of healthy donors, could eliminate the bacteria that causes septic shock, although their impact on humans is not yet known. That's the focus of McIntyre's clinical trial, which will start with a safety evaluation in up to 15 patients.

> *"*I don't wish septic shock on anybody so I hope the researchers at the hospital are successful with their study.*"*
>
> *–Jim Graves*

While it's theoretically possible to use a patient's own stem cells to repair damaged tissue, septic shock is such a quick and overwhelming illness that there is simply no time to harvest cells from someone with the infection.

McIntyre credits her colleagues at the Ottawa Hospital Research Institute, some of whom are leading stem-cells experts, for nurturing the idea of the experimental therapy. "The people I work with are committed to answering the big questions that could help our patients. But they also care about doing research correctly."

As with any research study, there are no guarantees that the lengthy testing will actually result in a beneficial treatment for patients. However, McIntyre remains optimistic. "That's the nature of medical discovery. I feel passionate that we need to push the boundaries and explore new ways to help patients," she says.

"It's not acceptable that we have such limited ways to reduce death in patients with septic shock. There have to be better ways forward to help them in the future."

Jim Graves is finally beginning the long road to recovery. With his wife, Frances, at his side, he has started learning to walk again.

"Getting my strength back has been very slow, but I'm grateful to be alive and I'm grateful for the excellent care that I got," says Graves. "I don't wish septic shock on anybody so I hope the researchers at the hospital are successful with their study."

Research for Tomorrow: Rebuilding a Damaged Heart

To survive a heart attack is victory enough. To rebuild a heart once it has been damaged would be an extraordinary leap forward. Dr. Duncan Stewart, Chief Executive Officer of the Ottawa Hospital Researh Institute, is leading the world's first clinical trial of a genetically enhanced stem-cell therapy for heart-attack survivors.

In a mid-phase study of up to 100 volunteers, Stewart and his team are testing the ability of a patient's own stem cells, derived from blood, to repair damaged tissue caused by a heart attack. The key is genetically engineering the stem cells to have extra-strong healing powers. Previous studies have shown that while the human heart has the capacity to generate new muscle cells, that ability diminishes as people age, especially if they have suffered heart attacks.

"The stem cells that come from heart-attack survivors who are 60 or 70 years old don't have the same youth and potency as those from young, healthy adults," says Stewart. "Our strategy rejuvenates and restores the activity of these aging stem cells. We have shown that these 'rejuvenated' stem cells are better able to stimulate repair and can reduce scar tissue, which impairs the heart's ability to pump blood efficiently."

Rapid Diagnosis, Reduced Anxiety:

Innovative Program Offers Fast-Track Results for Women at the Highest Risk of Breast Cancer

Watch the video

When a mammogram reveals a suspicious lump, women often find themselves in a maddening state of uncertainty. Waiting months for the results of a breast biopsy can be every bit as stressful as finding out about a cancer diagnosis.

Dr. Angel Arnaout, a surgical oncologist at The Ottawa Hospital, is concerned that the stress and anxiety of waiting can make life a whole lot worse for patients and their families.

Arnaout believes Eastern Ontario women deserve better.

Over the past two years, she and her collaborators at the hospital's Women's Breast Health Centre have worked tirelessly to drive down diagnostic and surgical wait times for patients who are at the highest risk of developing breast cancer.

The rapid diagnosis and treatment program established by Arnaout's team has lowered wait times at every stage of the long, circuitous journey from diagnosis to surgery.

Of the 700 women treated at the centre every year, 200 have the type of abnormal mammogram that gives them at least a 90-per-cent risk of cancer. "These are the women who have the most urgent need for speedy diagnosis and treatment," says Arnaout.

The hospital already leads Ontario's 14 cancer centres in providing the fastest assessment and diagnosis for all women with abnormal mammograms. With Arnaout's fast-track program, women in the highest risk group are getting diagnosed and treated even more quickly.

The faster access to care starts with a shorter wait for a diagnosis, which now takes an average of seven business days, a dramatic drop from 52 days in 2011. The second wait, from diagnosis to the first meeting with a surgeon, has fallen to an average of five days, down from 16. From there, the wait to surgery is now 24 days, down from an average of 31.

> *"*Cancer is my reality now. It's the reality for a lot of women. So if we can find the safest, quickest, most efficient way of dealing with it and getting through it, I'm all for it.*"*
>
> *–Cathy Crosthwait*

Of all the wait times, perhaps the most vexing for a majority of women is the time to diagnosis, which can take up to three months. That's because every woman with an abnormal mammogram must go through multiple tests to get a biopsy result.

Each step – diagnostic scans, biopsy, pathology – inevitably had its own waiting list, which has not traditionally been tracked. Only after all these tests are done do patients finally get a diagnosis – and an appointment with a surgeon to discuss treatment options.

The lengthy, seemingly haphazard journey can create efficiency gaps that contribute to longer wait times. It can also leave women feeling lost and neglected.

"During that whole time, somebody is waiting around, getting called back for another test, not knowing what's going on. And all that time, they're thinking that they're going to die from breast cancer," Arnaout explains. "That's just not right. I want to change processes so that I can reduce the anxiety of patients who are waiting for their diagnosis."

Cathy Crosthwait was referred to the rapid diagnosis and treatment program and given her breast-cancer diagnosis within a week. She also benefited from speedy access to surgery after meeting with Arnaout, her surgeon.

“The fast-track care made sure that I was not forgotten,” says Crosthwait. “Cancer is my reality now. It’s the reality for a lot of women. So if we can find the safest, quickest, most efficient way of dealing with it and getting through it, I’m all for it.”

Arnaout and her collaborators tackled the long wait times by creating a way of prioritizing appointments at every stage of the diagnostic journey. “Previously, we never triaged diagnostic tests,” says Arnaout. “Now, we’re moving the highest-risk women to the front of the line.”

Another game-changer has been the assignment of a nurse to help patients navigate the system and close any efficiency gaps. The nurse makes sure that high-risk patients get the first available appointments and the fastest pathology results possible. She also staffs a helpline to answer patients’ questions and provide them with information about what to expect at each of their appointments.

The counselling ensures that women are informed and prepared when they finally meet their surgeon, reducing the need for additional follow-up appointments.

Taken together, these deceptively simple interventions can shave weeks off the diagnostic journey. “We found that if the wait time for each was reduced somewhat, then the entire wait time was reduced dramatically,” says Arnaout.

Crosthwait, a mother of three grown children, said getting a speedy diagnosis has given her and her family a sense of confidence in the health-care system. It has also allowed her to get on with her life.

“I have a family history of breast cancer so when I got the diagnosis, I was not in shock,” says Crosthwait. “The main advantage is that I can reduce the anxiety of not knowing. And I can start doing other things before I have surgery, like spending time with my children and grandchild. Life doesn’t stop because something bad happens. You have to be able to take what life gives you and move forward.”

Research for Tomorrow: Can a Blood Thinner Also Fight Cancer?

The weeks before and after surgery can make cancer patients feel like they’re in medical limbo. No treatments are typically given out of concern that they could compromise a patient’s ability to heal.

Increasingly, however, researchers believe this hands-off period could actually be prime time to test new cancer therapies. Dr. Rebecca Auer, a surgical oncologist at The Ottawa Hospital, is testing treatments that could stimulate a patient’s immune system at a time when it is weakened, enabling cancer to grow and spread.

“The period around surgery is a golden opportunity for us to intervene and yet nothing is given,” says Auer, who’s also a scientist at the Ottawa Hospital Research Institute. “I think it’s really important that we target new cancer therapies to that peri-operative period.”

Auer and haematologist Dr. Marc Carrier have launched a “window-of-opportunity” study to test the tumour-fighting effects of low molecular-weight heparin, which has long been used as a blood thinner to prevent and treat blood clots. In animal studies, heparin has shown promising signs of preventing the spread of tumours by restoring balance to the body’s wound-healing mechanisms, which often get hijacked by cancer cells, leading to metastasis.

The study, which will enrol up to 1,000 colon-cancer patients from across the country, will test the effectiveness of heparin when it’s given as a preventive treatment in the weeks before and after cancer surgery.

Healthier Moms, Healthier Babies:

Lives are Transformed at a Unique Inner-City Clinic for Pregnant Teens

Watch the video

At an age when most young women dream of going to the high-school prom, or getting their driver's licence, Adysan Vincent is preparing to have a baby.

Vincent, 16, learned that she was pregnant on the day of a scheduled tonsil surgery. A pre-operative pregnancy test came out positive, catching Vincent and her mother by surprise. The father of her child was just as shocked.

"I didn't know at the time that I was already two months pregnant," Vincent admits. "It took me another three months to decide I wanted to keep the baby."

The location makes the clinic easy and comfortable for teens to visit. While taking high-school courses at St. Mary's, provided by the Ottawa Catholic School Board, Vincent can take a short stroll down the hall for her appointments with Fleming.

Dr. Fleming's clinic is the only one of its kind in Canada.

Of the 42,000 Canadian teenagers who become pregnant every year, Vincent is among the four in 10 who choose to carry their babies to term.

On the advice of a friend, she started taking prenatal classes at the Young Parent Outreach Centre at St. Mary's Home, a refuge for pregnant teens as well as teen mothers and their newborns. The centre offers all kinds of wrap-around services under one roof, including parenting classes, a satellite high school and a shelter for pregnant teens who are homeless and need a safe place to stay.

At St. Mary's, Vincent met Dr. Nathalie Fleming, an obstetrician and gynecologist at The Ottawa Hospital.

Fleming runs a perinatal clinic at St. Mary's, making it the only one in Canada to be based, not at a hospital, but at a place where adolescent moms and moms-to-be gather. In effect, Fleming's clinic is a little piece of The Ottawa Hospital in the neighbourhood of Vanier, where St. Mary's Home is located.

"We're not waiting for them to come to us. We're actually bringing the medical care to them."

–Dr. Nathalie Fleming

"I don't have to sit in a waiting room," says Vincent. "I just tell them to come and get me. That way, I can sit in class and do my work while I'm waiting."

By simply basing her clinic out of a teen-friendly centre, Fleming has cultivated the loyalty and trust of her patients, who see her early and often, especially during the crucial first months of pregnancy.

In contrast, pregnant teens who must travel to hospitals or doctors' offices often delay getting prenatal care.

By the time they see a doctor, many are well into their second or third trimester. The delay puts the women and their unborn children at higher risk of developing serious health complications.

The health risks can quickly add up given that many of these expectant mothers struggle with addictions, mental illness, violence, poverty, homelessness, or an unstable family life.

“We’re not waiting for them to come to us. We’re actually bringing the medical care to them,” says Fleming.

> *“*It now means we have healthier mothers and healthier children at birth, rather than children who need to be kept in a neonatal intensive care unit for a lengthy period of time.*”*
>
> *–Nancy MacNider*

“It’s very difficult to look after this population from a doctor’s office or hospital-based clinic. Many of these women simply can’t or won’t come. They may not have the money to take a bus. They may not have a family doctor. They may feel ashamed to go see a doctor. They may hide their pregnancy. They may not find out until very late that they’re actually pregnant. They’re looking for help, but society has judged them and they feel stigmatized.”

Vincent remembers feeling the sting of shame the first time she showed up at another doctor’s office for a prenatal visit.

“When I walked in, I was the youngest person pregnant. Everyone else stared at me. It made me feel awkward,” she says during an afternoon at St Mary’s. “Here, I don’t feel judged. Dr. Fleming takes the time to listen to what your issues are. She's somebody you can talk to.”

Since starting the clinic in 2006, Fleming has been able to show that providing perinatal care where pregnant teens gather can actually improve the health of the young mothers and their newborns.

Compared to pregnant teens who get their prenatal and post-partum care through hospital-based clinics or doctors’ offices, the women who go to Fleming’s clinic have fewer pre-term births. They have lower rates of caesarean sections. And they tend to deliver babies with higher birth weights, Fleming showed in a recently published study.

“The impact of having Nathalie's clinic here has been nothing short of profound," says Nancy MacNider, executive director of St. Mary’s Home. "It now means we have healthier mothers and healthier children at birth, rather than children who need to be kept in a neonatal intensive care unit for a lengthy period of time.”

MacNider praises Fleming for her vision and dedication. "It was her energy, enthusiasm and willingness to take risks that gave life to this clinic. It is first-rate health care provided by a medical specialist who, out of her own philosophy of care, is giving a very marginalized group of young people the very best that there is."

Fleming, a mother of two pre-teen girls, says she draws inspiration from many of her young patients.

"I have been a witness to so many success stories here at the clinic. It's fantastic to see some of these teens go from being in the street, using all sorts of drugs, to young women who come to St. Mary's, get plugged into the medical system and turn their lives around."

Vincent is one of those young women. Having initially dropped out of high school, she resolved to return after learning that she was pregnant. At St. Mary’s, she is taking Grade 10 classes run by Immaculata High School. And she has quit smoking, curbed her intake of junk food and started exercising.

"It's not about me anymore. It's about the baby," says Vincent. "I chose to go back to school because I realize I wasn't going to be able to support a baby without my education. I know I'm still going to struggle, but I'm keeping the baby mostly because I know that I have every single support system that I can get."